

REVISE SYLLABUS FOR DIPLOMA IN AGRICULTURAL ENGINEERING

THREE YEARS DIPLOMA IN AGRICULTURAL ENGINEERING

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1.0	3rd Semester

1.1	Computer Application
1.2	Engineering Economics & Accountancy
1.3	Elements of Electrical Engineering
1.4	Elements of Mechanical Engineering
1.5	Surveying And Levelling
1.6	Farm Power-I
1.7	Professional Practice- I

2.0	4th Semester

2.1	Strength of Materials
2.2	Civil Engg Drawing & Estimating
2.3	Theory Of Machine
2.4	Farm Power-II
2.5	Hydraulics
2.6	Soil Science And Soil Mechanics
2.7	Professional Practice- II

3..0	5th Semester

3.1	Post Harvest Technology
3.2	Farm Machinery & Equipments
3.3	Crop Production Technology
3.4	Farm Building Structure
3.5	Renewable Energy Resource
3.6	Tea Engineering-I
3.7	Professional Practice- III

4.0	6th Semester
4.1	Advance Farm Machinery
4.2	Water Resource Engineering
4.3	Hydraulic Machine
4.4	Refrigeration & Cold Storage
4.5	Project
4.6	Tea Engineering-II
4.7	Professional Practice- IV

MANUFACTURES OF THE CURRICULUM

1. COURSE TITLE	DIPLOMA IN AGRICULTURAL ENGINEERING
2. DURATION OF THE COURSE	THREE YEARS (SIX SEMESTER)
3.TYPE OF COURSE	FULL TIME PATTERN
4.ENTRY QUALIFICATION	PASS HIGH SCHOOL WITH 40% MARKS
5. INTAKE	20
6. ADMISSION CRITERIA	THROUGH POLYTECHNIC ADMISSION TEST(PAT)

NEED ANALYSIS

It was considered essential to revive of Diploma course of Agricultural Engineering to accommodate new areas of technology as well as update and modernise the existing course contents so as to make it more relevant to the needs of the world of the work. Accordingly workshop are organised to look into the gap in the existing curriculum and revise the same. Experts from the higher technological Institutes emphasised the need of making the course more technology oriented and practise based. Need for inclusion of course computer application, entrepreneurship development, life skill and professional skill development and linkage of polytechnic with the world of work was also emphasised. Expert from the higher technical institutes were also of viewed that curriculum should be of broad based in nature so as to provide large base of employment and flexibility in functioning.

Based on the above curriculum of Agricultural Engineering was revised and during revision topics on entrepreneurship development, non conventional source of energy have been in the curriculum.

The course outline, detail course content and resource input was developed in the workshop adopting the following process.

- i) Analyzing activities into knowledge and skill
- ii) Determining the course objectives.
- iii) Deriving the subject area from course objective
- iv) Development of study and evaluation scheme
- v) Development of detailed course content and coverage time keeping in view the knowledge and skill requirement.
- vi) Listing job potential and job activities,

Review of this draft structure of curriculum was done in workshop held at NITTR Extension centre, Guwahati, Assam on i. Syllabus scrutiny Committee meeting held on 03-11-2016 and . O.B.E. meeting held on 04.04.2018,23.04.2018& 23-04-2018

It is hoped that revised curriculum of diploma in Agricultural Engineering will be useful in producing the desired type of middle level trained manpower for agricultural world of work.

JOB OPPORTUNITIES

Sl.No	Name of Deptt.	Name of Post
1	Agriculture a. Ground water cell (Tube well and major irrigation, Irrigation deptt) b. Soil and Water Conservation c. Non Conventional Energy Sources d.Agricultural Engineering	Supervisor/J.E.
2	Command Area Development Project	Supervisor/J.E
3	Agro Industrial Corporation a. Workshop b. Marketing of Tractors, Implement c.Seeding & Harvesting Equipments	Foreman/Supervisor
4	National and State Seed Corporation	Supervisor/J.E
5	State Farmers Corporation	
6	Fertilizer Corporation of India	
7	Ware House Corporation	
8	Rice/Wheat Mills	
9	State Forest Department	Supervisor
10	Banks, Assam GraminVikas Bank Ltd.	Tech. Supervisor/J.E.
11	Research & Extension Deptt. of Agriculture	Research Assistant
12	Repair and Maintenance of Tractors & Agro Implements	Supervisor/Foreman
13	Teaching Institute	Asstt.Lect/Foreman
14	KrishiVigyan Kendra	Supervisor/J.E
15	Town & Country Planning	Supervisor/J.E
16	Water Resource Department	Supervisor/J.E
17	Assam Khadi& Village Industries Board	Supervisor/J.E
18	Auto Tractors Ltd.	Supervisor/J.E
19	Tea Industries	Supervisor/J.E
20	NABARD	Supervisor/J.E
21	Food Corporation of India	Supervisor/J.E
22	Panchayat and Rural Development	Supervisor/J.E
23	Vocational Teaching	Supervisor/J.E
24	Coffee Industries	Supervisor/J.E

25	Rubber Industries	Supervisor/J.E
26	Spice Industries	Supervisor/J.E
27	State Sericulture	Supervisor/J.E
28	. State Horticulture Dept.	Supervisor/J.E
29	State Fishery Dept.	Supervisor/J.E
30	Indian Council of Agricultural Research	J.E./Demonstrator
31	Agriculture Universities	J.E./Demonstrator
32	Veterinary Dept.(Dairy Industry)	J.E./Demonstrator
33	Agriculture University	J.E./Demonstrator
34	Food Processing Industries	J.E./Demonstrator
35	. Fruits and Vegetables Preservation Unit.	J.E./Demonstrator
36	Jute Industries	J.E./Demonstrator
37	Agricultural implements ii. Pump sets iii.Fibre Processing iv. Crop Processing (b) Repair & Maintenance Centre of Agri.Implements	Supervisor/J.E

JOB ACTIVITIES

Sl. No.

Name of Activities

1. Surveys the land and water resources of command areas.
2. Supervises Land levelling operations.
3. Prepares plans for surface & sub surface water conveyance system.
4. Supervises construction of farm structures.
5. Assists in planning and execution of the schemes for
 - (i) Rain fall
 - (ii) Run off
 - (iii) Water harvesting and its recycling
 - (iv) Water shed management
6. Interprets production drawings.
7. Procures raw materials.
8. Assists in quality control in production process of the products.

9. Controls labour for optimum production.
10. Diagnose faults in equipment/machinery.
11. Estimates the repair cost including requirement of spares.
12. Procures spares and prepare their inventory.
13. Tests the equipment and machinery for desired performance.
14. Conducts demonstration of various products.
15. Markets the products.
16. Provides costumer hire service.
17. Assists farmer in arranging finance for land development work.
18. Plans and executes land reclamation works.
19. Supervises land development work.
20. Performs after sales service to agricultural implements.
21. Survey for the feasibility of tube wells.
22. Installs trial bores for the area where such sources are lacking
23. Selects bore size for a given situation.
24. Selects pumps, power units and pipe line for a pump house.
25. Prepare estimates and cost for distribution lines for installation of tube wells.
26. Supervises installation and trial run of a tube well.
27. Supervises rejuvenation of old choked tube wells.
28. Assists in determining aquifer parameters by performing pump test.
29. Supervises operations, maintenance and repair of irrigation pumping sets.
30. Demonstrates and popularise use of improved agricultural implements.
31. Guides the farmers for the efficient use of tube wells, pumping sets and other lifting devices like wind mill etc.

32. Collects data for pre & post monsoon water table of observation well.
33. Supervises installation & maintenance of biogasplant, wind mills, solar pumps, solar crop dryer and other non conventional energy equipments.
34. Guides the farmers in arranging finance for purchasing non conventional energy source equipments.
35. Guides the fabricators for standard design and quality of equipments.
36. Guides the farmers for operation and maintenance of tractors and other allied equipments
37. Supervises the construction of drainage & irrigation system of fields.
38. Plans and constructs soil and water conservation structure.
39. Plans the layout of farms.
40. Supervises operation maintenance & servicing of land development equipments.
41. Supervises installation, erecting and commissioning of seed processing plants.
42. Supervises storing of processed seeds.
43. Supervises storage of food grains.
44. Operates and maintains grain handling equipments and storage structures.
45. Supervises handling, operations & Maintenance of rice processing machinery.
46. Assists farmers in preparing loan application for agricultural equipments.
47. Prepares feasibility report for loan.
48. Scrutinises applications for loan with reference to assets & liabilities.
49. Does liaison between bank & loaner.
50. Suggests new schemes for advances for new Bank Loan.
51. Assists in testing and evaluation of finished products as per BIS.
52. Trains the trade men.
53. Conducts experiments on soil and water

54. Helps in research and extension works to engineers.
55. Supervises flow operation of the manufacture of tractors & other implements.
56. Estimates the cost of materials and equipments.
57. Establishes services & customer hiring service centres for related agricultural deptt.
58. Supervises handling, operation & maintenance of vegetable & fruit storage machines.
59. Prepares ketchup, Jam, Jelly and squash of different fruit & vegetable.
60. Supervises the preservation of different fruit & vegetable

ANALYSIS OF ACTIVITIES INTO KNOWLEDGE AND SKILLS

Sl.No.	Name of Activities	Knowledge	Skill
1	Surveys the land and water resources of command areas.	Civil Engineering Surveying Chain survey, compass survey, plan table survey, area calculation, Theodolite, levelling.	Surveying of land and water resource
2	Supervises Land levelling operations	Surveying, Levelling equipments,	Levelling
3	Prepares plans for surface & sub surface water conveyance	Civil Engineering drawing and hydraulics. Open channel irrigation pipe for thirsty areas. Irrigation & their types and application	Making plans for irrigation in various terrain land
4	Supervises construction of farm structures.	Various materials used for construction work. Masonry work techniques reads Civil Engineering drawings. Labour management	Test of materials as requirement of standards
5	Assists in planning and execution of the schemes for rainfall (i) Rain fall (ii) Run off (iii) Water harvesting and its recycling (iv) Water shed management	Collection of data for rainfall and run - off	Measurement of rainfall & run- off, irrigation.

6	Interprets production drawings.	Basic Engineering drawing, Mech. Engg. drawing. Assembly of farm machinery & tractors materials.	Roads assembly Drawings, Analytical interprets drawing judgement correctly to workers about job
7	Procures raw materials.	Materials, their characteristics and application. Estimating & costing of materials. Purchase procedure. Inventory control.	Selection of suitable & economical Quality material conscientious.
8	Assists in quality control in production process of job in quality product	Work shop processes. Machining processes. standards of quality, supervisory practices.	Quality work
9	Controls labour for optimum production	Layout management	Cooperative
10	Diagnose faults in equipment/machinery, machinery Safety	Form equipment & implements, tractors, their assembly Operation of machinery and equipment. System of fault findings. working of cycles.	Disassemble the equipment & Make correct use of various tools and equipments for diagnosing fault
11	Estimates the repair cost including requirement of spares.	Repair cost estimation, process of repair of various parts, machining processes.	Estimation of Cost and the time required for each work. spare cost, machining and maintenance
12	Tests equipments and machinery for desired performance	Testing procedures, proper use of instruments	Test cycles/equipments methodology
13	Conducts demonstration of various products.	1. Agricultural inputs 2. Construction & working of farm machinery, Operation of farm machinery	uses to these machinery for customers satisfaction
14	Markets the products.	Sales, Marketing & Management principles. Salient features of products	Marketing skill, communication skill
15	Provides costumer hire service.	Agriculture economics procedure of hire purchase	Demonstration skill

16	Assists farmer in arranging finance for land development	Financing agencies & Their term and condition of giving loan/subsidiary	Communication skill & Cooperative work.
17	Supervises the land development work	Civil Engineering Surveying Soil sampling Land development methods Water and soil conservation method Land Development, Machinery operation of land development machinery.	Fault defection i) Civil Survey ii) Land development machinery
18	Perform estimates of soil conservation structure	Preparation of plan for water and soil conservation Drawing, Estimating & costing methods	Prepare plan, section, elevation of soil conservation structure
19	Survey for the feasibility of tube well.	Site selection, spacing & type of tube wells, suitability & availability of good ground water	Conducts survey Identify type, well analysis
20	Installs trial bores for the area where such sources are Installing, testing & Safety are not available	Selection of site for trial bores, procedure of installation, sources of trial bores	procedure of installation
21	Selects bore size for a given situation.	Hydraulics of wells,	selects suitable size, viability of water, ground water table, layout maps,
22	Selects pumps, power units and pipe line for a pump house. Pump specifications	Different types of pumps construction & working of prime mover, electrical distribution system and fittings	Selection of pumps and prime movers
23	Prepare estimates and cost for distribution lines for tube well installation	Estimating and costing of service connection, pumping sets and other accessories	Reads rate schedule, Cost, installation of tube wells, market rate prepare estimate & cost of materials
24	Supervises installation and trial run of a tube well.	Causes of sick wells, principles of rejuvenation of tube well	Diagnose sick well,
25	Supervises rejuvenation of old choked tube wells.	Procedure of Installation of of tube well, trial testing/ and machinery. human relation & management.	Management of persons. Safety precautions

26	Assists in determining aquifer parameters by performing pump tests.	Aquifer parameter, pump test.	Pump Testing
27	Supervises operations, maintenance and repair of irrigation pump sets.	Working of irrigation pumps sincere. Troubles in working of pumps and repair and maintenance & remove defects.	Operates pumps . diagnose and removes fdefects.
28	Guides the farmers for the efficient use of tube wells,	Types of tube well machinery, working principles of pumps and prime mover.	Operation and maintenance of tube wells.
29	Collects data for pry& post monsoon water table of observation well.	Water table fluctuation, rain fall data recording, measurement of water table, Basic metrology.	Measurement of water Initiative in observation well.
30	Supervises installation & maintenance of bio gas plant, solar plant, wind mill etc. Non conventional sources. ,	Feasibility, site selection ,construction& working of non conventional energy. Precaution in use and maintenance.	Installation of non conventional energy equipment and machinery.
31	Guides the farmers for operation and maintenance of tractors	Tractor, working principles & circuits, selection criteria of tractors, operation and maintenance of tractors.	Drive Tractors service & minor repairer and maintenance
32	Supervises the construction of drainage & irrigation system.	Materials & construction tech. Structures of various types & their application, masonry work, RCC & steel structure, construction situation , estimating the cost.	Measure water in varied Quality and situation of field.
33	Plans and constructs soil and water conservation structure	Civil Engg. Drawing, material required work, RCC & steel structure	Measurement of Soil properties, hydraulics
34	Plans the layout of farms.	Basic of farm building ,planning for various requirement as per location of farm	Estimating & costing of Materials & structure
35	Supervises installation, erection and commissioning of seed processing plant	Construction, working & application of processing machine.	Install and grader of seed processing plant
36	Supervises storing of processed seeds.	Storing procedure, precaution standard practice of storage seed treatment.	Supervision of seed, careful storage Careful.

37	Supervises storage of food grains.	Storing procedure and plant ,precaution	Proper storing of seed.
38	Operates and maintains grain handling equipments and storage	Construction and working of grain handling and storage equipment & structures.	Operation of handling equipment
39	Supervises handling operations & maintenance of rice	Construction and working of rice Sheller, operation and maintenance of rice milling	Operate and maintenance of Rice processing machinery
40	Conducts experiments on soil and water.	Soil Science, Testing procedure as per BIS of soil and	Arrangement for testing soil from the soil sample
41	Prepares ketchup, Jam, Jelly and squash of different fruit and vegetables.	Principle of ketchup, jelly, squash & jam manufacture, construction & working of equipment , estimate of cost . precaution in manufacture	Preparation of jam, jelly, Innovative

COURSE OBJECTIVES

(A) To develop capabilities for understanding the engineering principle and techniques required for solving agricultural problem.

- (i) Water Resource Engineering (Include Hydrology, Irrigation and drainage. soil& water conservation)
- (ii) Farm power Land preparation & conservation.
- (iii) Farm equipment and machinery.
- (iv) Soil science and soil Mechanics
- (v) Crop production technology
- (vi) Post harvest technology (Processing of food, feed and fibre)
- (vii) Non conventional sources of energy.

(B) To develop awareness of various activities involved in agricultural engineering.

(C) To develop professional skills in technology for:

- (i) Installation
- (ii) Operation
- (iii) Maintenance

- (iv) Servicing
- (v) Marketing
- (vi) Construction
 - a. Farm Structure
 - b. Irrigation system
 - c. Drainage system
- (vii) Processing of crop.
- (D) To develop capacities for decision making and qualities needed for :
 - (i) Active & intelligent participation in team work.
 - (ii) Leadership at work & in community as whole.
- (E) To develop entrepreneurship traits
 - (i) Decision making innovation.
 - (ii) Calculated risk taking abilities etc.

CURRICULUM AREAS

1. Water Resource Engineering: Hydrology, Conserve soil and water by installation of irrigation system. Drainage, flood and soil erosion system.
2. Farm Power and Machinery:
Equipment including crop processing plant, Machinery maintenance and operation.
3. Farm Structure:
Layouts and supervises construction of farm building and utilities.
4. Rural Electrification and non conventional energy:
Rural electric supply distribution system.
Non conventional energy.
5. Process Engineering :
Processing of farm products.
6. Computer Application : Uses computer for scheduling, estimating and farm related other activities as well as for farm management.
7. Rural & Entrepreneurship Development:
Prepares project for rural development and starting his own enterprise.

1. Course Title–Computer Application & Programming (All Branches)

1. **Course title: Computer Application & Programming**

2: **Course Code –Co-301**

3: **Semester- 3rd**

4: **Aim of the Course :**

- To give basic concepts related to organization of a computer
- To give fundamental terminologies in networking
- To develop simple programs in C.

5: **Course Outcome:**

On completion of the course students will be able to:

- Explain the basics of a computer hardware and software
- Solve problems related to number systems
- Define basics of Operating System
- Familiarize with networking components
- Write simple C programs

6: **Prerequisites for the Course:** Have basic idea about a computer and its functions.

7: **Teaching Scheme (in hours):**

Teaching Scheme			
L	T	P	Total hours per week
3	0	3	6

8: **Examination Scheme :**

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content:

Unit	Topic/Sub-Topics	Intended Learning Outcome	Hours
1	Computer Architecture: Brief history, Charles Babbage Machine, Von Neumann Architecture, block diagram, memory & its different types, I/O devices, Role of O.S., computer languages, translator software, editor. Data, different types of data, information and its characteristics	1. Define a computer and identify its parts. 2. Define computer memory & describe its different types. 3. Define computer languages & translators. 4. Describe the characteristics of information.	8
2	Number System and codes: Different number system- decimal, binary, octal, hexadecimal number system, their conversion, 1's and 2's Complement, subtraction using complements. Different codes- ASCII, BCD, Ex-3, Gray. Conversion from Gray to binary and vice-versa, BCD addition.	5. Define decimal, binary, octal & hexadecimal number systems. 6. Convert between different number systems. 7. Define 1's & 2's complements. 8. Subtract using 1's & 2's complements. 9. Describe some different codes.	8

Unit	Topic/Sub-Topics	Intended Learning Outcome	Hours
3	Introduction to Operating System: Definition, single user and multi-user OS, different function performs by OS, various popular OS like DOS, Windows, UNIX/LINUX. DOS and UNIX commands.	10. Define operating system. 11. Operate different commands of DOS, Windows & UNIX/LINUX.	5
4	Computer Network and the Internet: Definition, necessity of network, different types of network-LAN, MAN, WAN, network topology, transmission media, different network devices like NIC, hub, bridge, switch, gateway. Introduction to the internet, Internet services, browser, search engine.	12. Define network. 13. Describe different types of network. 14. Define network topology. 15. Describe different network devices. 16. Define internet & describe different internet services. 17. Explain use of different browsers & search engines.	6
5	Introduction to C		15

	programming: Fundamentals of programming- Algorithm & Flowchart, source code and object code,, Basic structure of C programs, Executing a C program, Constants, Variables, and data types. Operators and expression, Input Output function like printf, scanf, getchar, putchar, gets, puts, Decision making and branching using IF..Else, Switch, looping using for, while, and do-while, array.	18. algorithm and flow charts for simple programs 19. terminology of C language. 20. programusing C language. 21. diversified solutions using C language. 22. between IF..Else and Switch statement.	Write Define basic Write small Write Differentiate	
	Internal Assessment			3

10: Distribution of Marks:

Unit	Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Computer Architecture	6	5	5	16
2	Number System and codes	4	2	8	14
3	Introduction to Operating System	4	2	4	10
4	Computer Network and the Internet	5	3	6	14
5	Introduction to C programming	6	3	7	16
		25	15	30	70

11: Table of specification :

Unit	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Computer Architecture	8	19	✓			
2	Number Systems & Codes	8	19	✓		✓	
3	Introduction to Operating Systems	5	12	✓			
4	Computer Network & the Internet	6	15	✓		✓	
5	Introduction to C Programming	15	35	✓		✓	
Total		Σ b=42	100				

K = Knowledge C = Comprehension A = Application HA = Higher Than

Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} \times 100$$

Detailed Table of Specifications

Unit	Topics	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Computer Architecture	7			7	5				5	4				4
2	Number Systems & Codes	4			4	2				2	4		4		8
3	Introduction to Operating Systems	4			4	2				2	4				4
4	Computer Network & the Internet	5			5	3				3	3		4		7

5	Introduction to C Programming	5			5	3				3	3		4		7
Total		25			25	15				15	18		12		30

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

10. Intellectual Skills :

- Logical reasoning
- Relating programming concepts in problem solving

11. Motor Skills :

- Learn to use and handle a computer and its peripherals.

List of Lab Exercises :

I. Basic commands for computer system maintenance.

II. Preparation of Documents

Introduction to Word processing, Opening a document, preparing documents, inserting diagrams and tables, Editing document- (a) Character, word and line editing, (b) Margin Setting, Paragraph alignment, (c) Block Operations, (d) Spell Checker, (e) Saving a document, (f) Mailmerge.

III. Information Presentation through Spread Sheet

Application of Spread Sheet, Structure of spreadsheets, preparing table for simple data and numeric operations, using formulae and functions in excel operations, Creation of graphs, Pie charts, bar charts.

IV. Preparation of presentation

Creation of electronic slides on any topic, Practice of animation effect, presentation of slides.

V. Programming in C

Editing a C program, defining variables and assigning values to variables Arithmetic and relational operators, arithmetic expressions and their evaluation Practice on in iput/output function like getchar, putchar, gets, puts, scanf, printf etc. Programming exercise on simple if statement, If..else statement, switch statement Programming exercise on looping with do-while, while, for loop and array.

2. Course Title– Engineering Economics and Accountancy (All Branches)

1. Course Title : **ENGINEERING ECONOMICS AND ACCOUNTANCY**
2. Course Code: **Hu – 302**
3. Semester: 3rd

4. Aim of the Course:

1. To introduce the students to some important economic and accounting terms.
2. To acquaint the students with some economic laws and with the functions of money, bank etc.
3. To make the students capable of recording business transaction under double entry system.
4. To introduce the students about financial statements.

5. Course Outcomes:

On completion of the course on EEA, students will be able to

- CO₁ = Define some important economic and accounting terms.
- CO₂ = explain some basic economic laws.
- CO₃ = Describe overall economic environment.
- CO₄ = explain double entry system of book keeping.
- CO₅ = record business transactions under double entry system of book keeping
- CO₆ = define financial statements.

6. Teaching Scheme (in hours)

Lecture	Tutorial	Practical	Total
42 hrs	3 hrs	--	45 hrs

7. Examination Scheme:

Theory				Practical				Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination		Sessional		
70	30	100	33	--	--	--	--	100

8. Detailed Course Content:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
Part – A : Engineering Economics				21 hrs
1.0	Introduction to Economics :	i) Definition of Economics, its utility and scope of study ii) Definition of Engineering Economics iii) Meaning and concepts of Utility, Consumption, Value, Price, Goods and National Income, inflation iv) Wants – Definition and characteristics v) Wealth & Welfare– Definition, meaning and types	i) explain core economic terms concepts and theories	5
2.0	Demand and Supply :	i) Meaning and types of Demand ii) The Law of Demand, its limitations iii) Preparation of Demand Schedule iv) Meaning of Supply v) The Law of Supply, its limitations vi) Preparation of Supply Schedule	Define the Laws of Demand and Supply	4
3.0	Production :	i) Meaning and factors of production ii) Factors determining efficiency of labour iii) Savings, investment and capital formation iv) Meaning of production function	i) Define factors of production ii) Explain formation of capital	5
4.0	Money:	i) Meaning of money ii) Types of money iii) Functions of money	i) Understand meaning and functions of money	2

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
5.0	Banking Organisation :	i) Central Bank – its functions ii) Commercial banks – its functions	i) Distinguish the functions of different banks	3
6.0	Pricing	i) Objectives of pricing policy ii) price determinants iii) Price discrimination	i) explain pricing policy	2
Part – B : Accountancy				21 hrs
7.0 (A)	Introduction to Book-Keeping and Accounting:	i) Definition & objectives of Book-keeping ii) Need and advantages of Book-keeping iii) Definition of Accounting iv) Difference between Book-keeping and Accounting v) Double Entry System – main features vi) Advantages and disadvantages of Double Entry System	i) Define Double Entry System of Book Keeping ii) State its objectives, features merits and demerits	3
(B)	Introduction to Computerised Accounting System:	i) Components of Computerised Accounting Software ii) Need for Computerised Accounting iii) Difference between Manual Accounting and Computerised Accounting	i) Identify components of computerized accounting software	2
8.0	Transaction:	i) Definition ii) Meaning of Account iii) Classification of Accounts: - Traditional Approach - Modern Approach iv) Meaning of Debit and Credit v) Rules of Debit and Credit	i) State the meaning and rules of Debit and Credit	2

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
9.0	Journal and Ledger	i) Meaning Journal ii) Recording of Transactions in Journal iii) Meaning of Ledger iv) Objectives and utility of Ledger v) Posting and balancing of Ledger vi) Distinction between Journal and Ledger vii) Names of different Books of Accounts	i) Record business transactions under double entry system in books of accounts	4
10.0	Cash Book:	i) Meaning and importance of Cash Book ii) Characteristics and advantages of Cash Book iii) Discount – Trade Discount and Cash Discount iv) Different types of Cash Book: - Single Column Cash Book - Double Column Cash Book - Triple Column Cash Book v) Bank Reconciliation Statement – Basic idea	i) Differentiate different types of Cash Book ii) Record transactions in Cash Book	4
11.0	Trial Balance & Errors in Accounting:	i) Meaning and objects of Trial Balance ii) Main features and advantages of Trial Balance iii) Preparation of Trial Balance iv) Types of errors in Accounting	i) Explain meaning and features of Trial balance	3

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
12.0	Components of Final Accounts:	i) Meaning and objectives of Trading Account ii) Contents of Trading Account iii) Meaning and objectives of Profit and Loss Account iv) Contents of Profit and Loss Account v) Meaning of depreciation, revenue expenditure and capital expenditure vi) Contents of Balance Sheet	i) Identify different components of Financial Statements	3
	Class Test			3 hrs
	Total			45 hrs

9. TABLE OF SPECIFICATIONS for Engineering Economics & Accountancy

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Comprehension	Application	HA
1	Introduction to Economics	5	12	5	3	0	0
2	Demand & Supply	4	9	2	4	0	0
3	Production	5	12	6	2	0	0
4	Money	2	5	4	0	0	0
5	Banking Organisation	3	7	3	2	0	0
6	Pricing	2	5	2	2	0	0

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Comprehension	Application	HA
7	(A) Introduction to Book-Keeping	3	7	5	0	0	0
	(B) Introduction to Computerised Accounting System	2	5	3	0	0	0
8	Transaction	2	5	2	1	0	0
9	Journal & Ledger	4	9.5	2	2	3	0
10	Cash Book	4	9.5	0	5	2	0
11	Trial Balance & Errors in Accy	3	7	5	0	0	0
12	Components of Final Accounts	3	7	2	3	0	0
Total		42 hrs	100	41	24	5	0

K = Knowledge

C = Comprehension A = Application

A = Higher than Application (Analysis, Synthesis, Evaluation)

$$C = \frac{b}{\sum b} \times 100$$

10 Distribution of Marks:**DETAILED TABLE OF SPECIFICATIONS FOR EEA**

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	Total
1	Introduc	3	1	0	4	2	2	0	0	4	0	0	0	0	0	8
2	Demand & Suppl	0	0	0	0	0	0	0	0	0	2	4	0	0	6	6
3	Production	1	0	0	1	2	0	0	0	2	3	2	0	0	5	8
4	Money	2	0	0	2	2	0	0	0	2	0	0	0	0	0	4
5	Banking Organis	1	0	0	1	0	0	0	0	0	2	2	0	0	4	5
6	Pricing	2	2	0	4	0	0	0	0	0	0	0	0	0	0	4
7	Introdu to B K	2	0	0	2	3	0	0	0	3	0	0	0	0	0	5
	Introduc to Comput	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
8	Transact	2	0	0	2	0	1	0	0	1	0	0	0	0	0	3
9	Journal & Ledge	1	0	0	1	0	0	0	0	0	1	2	3	0	6	7
10	Cash Book	0	2	0	2	0	0	0	0	0	0	3	2	0	5	7
11	Trial Balance	3	0	0	3	2	0	0	0	2	0	0	0	0	0	5
12	Compons F/Ac	0	0	0	0	0	0	0	0	0	2	3	0	0	5	5
	Total	20	5	0	25	11	3	0	0	14	10	16	5	0	31	70

K = Knowledge

C = Comprehension A = Application

HA = Higher Than Application **Higher than Application (Analysis, Synthesis, Evaluation)**

T = Total

11 Suggested implementation Strategies: Modified syllabus may be implemented with effect from July, 2018 (Starting with the present batch (2018) of 2nd Semester students)

12 Suggested learning Resource:

a. Book list

Sl. No.	Title of Book	Name of Author(s)	Publisher
1	Introductory Micro Economics	Sandeep Garg	Dhanpat Rai Publication Pvt. Ltd. New Delhi
2	Introductory Macro Economics	Sandeep Garg	Dhanpat Rai Publication Pvt. Ltd. New Delhi
3	Theory and Practice of Accountancy	B. B. Dam R. A. Sarda R. Barman B. Kalita	Capital Publishing Company, Guwahati – 5
4	Book-Keeping & Accountancy	Juneja, Chawla & Saksena	Kalyani Publisher, New Delhi - 110002
5	Tally. ERP 9 For Beginners	Tally Solutions Pvt. Ltd.	Sahaj Enterprises, Bangalore
6			
7			
8			

b. List of Journals

c. Manuals

d. Others

3. Course Title– Fundamental of Electrical & Electronic Engineering

1. Course Code :- El/Et-304
2. Semester :- 3rd (Chemical)
3. Duration of Exam= 3 hrs

4. COURSE OUT COME (CO)

On completion of the course, the student will be able to:

- Define current, voltage, insulator, conductor etc.
- Solve numerical problems using Kirchhoff's law.
- Operate motor and generator.
- Explain briefly the alternating current and transformer
- Explain the use of semiconductor and transistor.
- Guide house wiring
- Explain the fundamental concept of digital electronics correlated to microprocessor with its applications.

CO s and ILOs

CO s	ILO s
CO -1. define current, voltage, insulator, conductor etc	1. Define conductor, insulator, and semiconductor with examples. 2. Define current, voltage, resistance, capacitance 3. Describe the Ohm's law 4. Solve problems related to Ohm's law
CO-2 Solve numerical problems using Kirchhoff's law	1. Explain DC network. 2. Define and explain the Kirchhoff's current and voltage law 3. Solve of critical problems by using Kirchhoff's current and voltage law 4. Use of Wheatstone bridge 5. Determine of unknown resistance by Wheastone bridge

<i>CO s</i>	<i>ILO s</i>
CO-3 operate motor and generator	1. Define DC generator and motor 2. Explain the construction of DC generator and motor 3. Explain the working principle of DC generator and motor 4. Compare the DC motor and generator 5. Enumerate different types of DC motor and generator 6. Explain use of DC generator and motor
CO -4 Explain briefly the alternating current and transformer	1. Define amplitude, time period, frequency, equation of alternating voltage and current, RMS, average value, instantaneous value, peak factor. 2. Explain RLC circuit 3. Explain inductance of AC circuit 4. Solve numerical problems 5. Explain construction of transformer 6. State operating principle of transformer 7. State type and uses of transformer 8. State step up and step down transformer
CO5- Explain the use of semiconductor and transistor	1. Define semi conductor, energy band, intrinsic and extrinsic semi conductor 2. Doping of semi conductor 3. Explain P-type, N-type semiconductor, 4. Define PN junction diode, forward and reverse biased diode, 5. Explain diode characteristics, application of PN junction diode like Half-wave, Full-Wave rectifier. 6. Explain Transistor: Physical construction of bipolar PNP and NPN transistor. 7. biasing circuit configuration 8. Explain different mode of transistor (CE, CB, CC). 9. State the application of transistor as an amplifier. 10. State elementary ideas of display - LED, LCD, Seven segment display.

CO s	ILO s
CO-6 guide house wiring	1. Define house wiring 2. Explain different methods of house wiring 3. State the safety and precautionary measure to be taken for electrical shock.
CO-7 Microprocessor	1. Explain the various symbolic representation of logic gates, combinational logic, basic operation of flip-flops, counters and registers. 2. State the fundamental concept of microprocessor and its application in instrumentation, 8085 microprocessor and its operation.

5. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
3		3	6

6. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA	17/50	150	4
	TA	HA						
70	10	20		25	25			

7. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction	Basics of Electricity: Revision of insulators and conductors and their examples ,Definition and units of voltage, current, resistance, inductance, capacitance, different voltage sources, Ohm's law, series & parallel combination of resistance .	4

Chapter No	Chapter Title	Content	Duration (in hours)
2	DC network	DC network: Kirchhoff's Law, solving network problem to find current and voltage, Wheatstone bridge and Its problem.	5
3	Generator & motor	Faradays laws of electromagnetic induction, Flemings right hand and left hand rule D.C. generator and motor: Construction, operating principle, types, uses.	4
4	AC fundamental	A. C. Fundamentals: Basic terms-cycle, amplitude, time period, frequency, equation of alternating voltage and current, RMS, average value, instantaneous value, peak factor, form factor, simple problem	5
5	AC circuit	R-L-C series circuit: AC through resistance, capacitance, inductance and their combinations, expression for impedance, reactance, current, power factor, simple problem.	4
6	Transformer	Transformer Construction, operating principle, types and uses.	4
7	Semiconductor	Semiconductor: Definition of semiconductor, energy band diagram, intrinsic and extrinsic semiconductor, doping, P-type, N-type semiconductor, PN junction diode, forward and reverse biased diode, diode characteristics, application of PN junction diode like Half-wave, Full-Wave rectifier.	5
8	Transistor	Transistor: Physical construction of bipolar PNP and NPN transistor, biasing circuit configuration (CE, CB, CC). Application of transistor as an amplifier. Elementary ideas of display - LED, LCD, Seven segment display.	5
9	House wiring	9.1 Introduction to house wiring 9.2 Methods of house wiring 9.3 Safety and precautions measures against electrical hazard.	2

Chapter No	Chapter Title	Content	Duration (in hours)
10	Microprocessor	1. Symbolic representation of logic gates, combinational logic, basic operation of flip-flops, counters and registers. 2. Fundamental concept of microprocessor and its application in instrumentation, 8085 microprocessor and its operation.	5
11	Class test	Two class test	2

8. Distribution of Marks/ Table of specifications

Sr. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Introduction	4	9	3	0	0	
2	DC net work	5	11	3	0	4	
3	Generator & motor	4	9	3	0	5	
4	AC fundamental	5	11	4	3	4	
5	AC circuit	4	9	3	1	4	
6	Transformer	4	9	3	3	1	
7	Semiconductor	5	11	3	1	3	
8	Transistor	5	11	3	2	1	
9	House wiring	2	4	2	0	4	
10	Microprocessor	5	11	4	0	3	

Sr. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
11	Class test	2	4				
	Total	$\Sigma b=45$	100	31	10	29	

K = Knowledge

C = Comprehension A = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$C = \frac{b}{\Sigma b} \times 100$$

10. Details Table of Specification for Theory

Sl. no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1			1	2				2
2	DC net work	1		1	2	2		3		5
3	Generator & motor	1		2	3	2		3		5
4	AC fundamental	2	1	1	4	2	2	3		7
5	AC circuit	1	1	1	3	2		3		5
6	Transformer	1		1	2	2	3			5
7	Semiconductor	1	1	1	3	2		2		4
8	Transistor	1	1	1	3	2	1			3
9	House wiring	1		1	2	1		3		4
10	Microprocessor	1		1	2	3		2		5
	Total				25					45

K = Knowledge

C = Comprehension A = Application

HA = Higher

Than Application

T = Total

N.B.:- 1. The question pattern will be as per the instruction of SCTE or as per existing rules.

2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type.

3. Optional question (if any) may be from the same topic in the form of either or type like below

QNo. Explain the properties of conductor

Or

Explain the properties of insulator

11. Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector, Smart board, Video etc for effective teaching learning process .

12. Ref Books:

I. A text book of Electrical Technology Vol – I, B. L. Theraja & A. K. Theraja, S. Chand.

II. Principle of Electronics, V. K. Mehta, S. Chand.

III. Electronic Principle, A.P. Malvino, Tata McGraw-Hill

IV. Electronic Devices & Circuits, Millman & Halkias, Tata McGraw-Hill

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3. Course Title :- Fundamental of Electrical & Electronic Engineering (PRACTICAL)

1.Course Title :- **FUNDAMENTAL OF ELECTRICAL & ELECTRONIC ENGINEERING (PRACTICAL)**

2.Course Code :- El/Et-304

3.Semester :- 3rd (Chemical)

INTELLECTUAL SKILLS

- Identify the properties of generator, ammeter, voltmeter, transformer
- Interpret the working principle of equipment
- Interpret the test results
- Follow the IS procedure of testing

MOTOR SKILLS

- Measure the quantities accurately
- Identify the instruments properly
- Handle the equipment carefully.

LIST OF PRACTICAL

(Students are to perform minimum six experiments)

- Verification of KCL and KVL
- Study of DC shunt generator.
- Milli ammeter as a Voltmeter.
- Milli voltmeter as an ammeter.
- Study of RLC series circuit.
- Study of single phase transformer.
- Determination of semi-conductor diode characteristic.
- Study of transistor configuration (CE,CB.CC) (Project base)
- Study of transistor as an amplifier. (Project base)
- Hands on activity on house wiring (Mini project work on simple house wiring involving one light point, one fan point, one power socket, one MCB on a wooden or ply board

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4. Course Title– Element of Mechanical Engineering.

Subject Title	:	Elements of Mechanical Engineering		
Subject Code	:	Me-302		
Hours Per Week	:	03		
Hours Per Semester	:	45		
Class Test hrs	:	03		
Total hrs	:	48		
Full marks(Theory)	:	70		
Sessional Marks	:	30		
Class hours		L	T	P
		3	0	3

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks	Marks of questions of type		
				Obj	Short	Long
1	Introduction	02	04	2	2	-
2	Properties and Laws of Gases	04	10	3	3	4
3	Properties of Steam	07	15	3	4	8
4	Generation of Steam	06	13	3	3	7
5	Steam Engine	05	12	3	3	6
6	Internal Combustion Engine	07	14	3	5	6
7	Steam Turbines	06	12	3	3	6
8	Gas Turbines	04	09	3	2	4
9	Transmission Of Motion And Power	04	08	2	2	4
Total		45	97	25	27	45

CO : Outcome based Course Objectives

After studying the subject the students will be able to

1. Acquire a brief information of the prime mover
2. Solve problems on ideal gases following Characteristics Gas Equation
3. Explain the thermodynamic process Isothermal, Adiabatic and polytropic.
4. Solve problems of steam using steam table

5. Explain the function of a boiler
6. Identify the Mounting and accessories of a boiler
7. Know the function of a steam engine
8. Know the operation of an Internal Combustion Engine
9. Know the principle of steam turbine
10. Acquire the knowledge of information on power transmission systems

ILO (Intended Learning Objectives)

1. Know the information about the source of power
2. Explain the principle of prime mover
3. Know the conversion of thermal energy to mechanical energy
4. Know the Types of prime mover
5. Define Charles Law
6. Define Boyle's Law
7. Derive Characteristics Gas Equation
8. Define Ideal Gas
9. Solve problems on Characteristics Gas Equation
10. Explain Energy equation
11. Know about thermodynamic system, surrounding and environment
12. Define isothermal, Adiabatic, Polytropic process
13. Describe the properties of Steam
14. Explain sensible heat & latent heat of steam
15. Define the enthalpy of steam
16. Know about wet, dry saturated and superheated steam
17. Know the use of steam table for solving problems
18. Define boiler or steam generator
19. Explain the importance of Mountings
20. Explain the function of accessories
21. Know brief about draught, natural and artificial type
22. Know the working principle of steam engine, its parts and functions in brief
23. Calculate the power developed, efficiency and its related small problems
24. Know about the principle of Internal Combustion engine, its type (SI & CI engine)
25. Explain the thermodynamic cycle (Two stroke and four stroke) in SI and CI engine
26. Know the important parts of engines and its functions
27. Estimate the power developed, efficiency and the work done in IC engine
28. Know the working principle of steam turbine
29. Know the function of condenser
30. Know the working of gas turbine cycle and its types

31. Know the type of fuel used in gas turbine cycle
32. Know the application of gas turbine
33. Know about belt and pulley its uses
34. Know the effect of creep, slip, and centrifugal force in belt
35. Calculate the velocity ratio of belt and pulley
36. Know about the power transmission through gears
37. Determination of size of gears according to the velocity ratio
38. Determine the power transmitted by gear train
39. Solve small problems on simple machine

Course Details

1. Introduction: Sources of power, prime movers, types of prime movers, Heat and temperature, conversion of heat into mechanical power—2 hrs
 2. Properties and laws of gases: Internal energy, enthalpy, specific volume, specific heats, energy equation, isothermal, adiabatic and polytropic processes of gases—4 hrs
 3. Properties of steam: Differences between gas and vapour, sensible heat, latent heat, enthalpy of steam, wet, dry saturated and superheated steam, steam table and its uses, some basic problems---6hrs
 4. Generation of steam: Boilers, different classification of boiler, Mainly study of Cochran, Lancashire, and water tube boilers, Boiler mountings and accessories pressure gauge, water level indicator, safety valve, stop valve, feed check valve, blow off cock, fusible plug, manhole, feed pump, injector, feed water heater , air pre heater, steam separator, steam separator, steam trap, all with brief study, Draught natural and artificial draught---- 8hrs
 5. Steam engine: Working principle of steam engine, and its classification, names of various parts of steam engine and their function, Estimation of power and its efficiency and related problem.
 6. Internal combustion engine: What is I.C. engine , Classification of IC engine, four stroke cycle, two stroke cycle, principle of working of diesel and petrol engine, names and function of the main parts, carburation, ignition , injection, governing, cooling and lubrication , estimation of power and efficiency and its problem, common defects in IC engines and their remedies
 7. Steam Turbines: Classification -impulse and reaction turbine, Cycle and principle of working of a simple steam turbine, Condenser functions and types.
 8. Gas Turbines: Cycle and principle of working, main components, types of fuel used in gas turbine, application of gas turbine.
 9. Transmission of motion and power: Belt and pulley, types of belts, pulleys and drives, velocity ratio, length of belt tension in belts, power transmitted by belt, effect of creep, slip, and centrifugal force, gears, types of gears , elements of spur gear , velocity ratio, determination of sizes of gears, gear trains, power transmitted by gear drive, worm and worm wheel, rack and pinion
-

4. Course Title– Element of Mechanical Engineering (Practical)

Elements of Mechanical Engineering Laboratory

CO-----Outcome based objectives:

After performing the experiments the students will be able to

1. Identify the mountings and accessories of a boiler
2. Know the working principle of a steam engine
3. Explain the working principle of an SI Engine
4. Explain the working principle of an CI Engine
5. Explain the principle of power transmission system

Course Content

Total 48 hrs

1. Study of boilers
 - i) Cochran boiler
 - ii) Lancashire boiler
 - iii) Babcock & Wilcox boiler
 - iv) Locomotive Boiler
2. Study of Steam Engine
 - i) Reciprocating Steam Engine
3. Study of S I & C I Engine
 - i) Two stroke cycle model and valve diagram
 - ii) Four stroke cycle model and valve diagram
4. Study of power transmitting devices
 - i) Belt
 - ii) Gear
 - iii) Pulley
 - iv) Link
5. Viva voce

5. Course Title– Surveying and Leveling.

Surveying and Leveling

L T P

3 0 3

Curri. Ref. No:CV.- 302

Total Contact hrs. 90 (45T+45P)

Total marks: 150

Practical -25

Practical: 50

Credit

Pr. Sess.-25

1. Course Title Surveying and Leveling

2 Course Code CV-302

3 Semester 3rd Semester

4 Rationale of the subject/course - An agricultural Engineering Diploma holder has to operate the tractor, power tiller and Farm equipments by different power sources. The students can learn to overhaul a tractor engine and repairer the same . They can perform the job with quality and with good efficiency

On completion of the course, the students will be able to :

1. Define basic units of measurement, instrument used for taking these measurement, 2.Classify the various method of surveying

3. define the principle of surveying

4. Measure the distance of various components by using chain Survey land ,

5. prepare maps/plans for roads, Irrigation project etc.

5 Teaching Scheme (In Hours)

Lecture	Tutorial	Practical	Total
45		45	90

6.Examination Scheme

Theory				Practical				Total Marks
Examination		Sessional		Practical Viva		Sessional		
Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	Full Marks	Pass Marks	

70	28	30	15	25	12	25	12	150

7. Details of course content

Chapter No.	Chapter Title	Content	HRS
1	Introduction to Surveying	Definition, principles and basic concepts of surveying, classification, basic measurements, units of measurements, plans and maps, types of scales.	8
2	Chain Surveying	i)Principles of chain surveying – definition, selection of survey station and lines, types of ranging and chaining, types of chains, recording the measurements, offset measurements, cross staff, optical square, prism square, obstacles in chaining and ranging chain and tape corrections.	10
3	Compass survey	i)Methods of traversing, prismatic and surveyors compass, angle and bearings, quadrant systems, local attraction, magnetic declination, dip-traversing, plotting, Bowditch rule, transit rule, errors in compass survey, limits of accuracy.	10
4	Plane table	i)Instruments and accessories, methods and principles, two point, three point problems, errors in plane tabling, minor instruments – hand level, abbey level, clinometers, sextant, planimeter, pentameter, computation of areas – methods.	8

5	Levelling	i) Definition, benchmarks types of levels, optical principles, lenses, telescopes, sensitivity of bubble tubes, leveling staves, basic principles of leveling, temporary adjustments, field book entries, reduction of levels, missing entries, types of leveling, simple, differential and profile leveling, cross Sectioning.	8

7.Detail Course Content

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective type(Compulsory)	Short question	Descriptive Question	
1	Introduction to Surveying	5	4	5	
2	Chain Surveying	5	4	5	
3	Compass survey	5	4	5	
4	Plane table	5	4	5	
5	Levelling	5	4	5	
		5	4	5	
		25	20	25	70

9. Suggested Implementation Strategies :

10. Strategies learning Resource :

- 10.1 Book List
1. R. E. Davis. Elementary Plane Surveying. McGraw Hill
 2. A. L. Higgins. Elementary Surveying. McGraw Hill.

3. T.P. Kanetkar & S.V. Kulkarni. Surveying and Levelling. (Part I & II).

10.2 List of Journals : List of journal in civil Engg. website

10.3 Manuals

10.4 Others

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

5. Course Title– Surveying and Leveling Practice

Surveying and Leveling

L T P

3 0 3

Curri. Ref. No:CV.- 302

Total Contact hrs. 90 (45T+45P)

Total marks: 150

Practical -25

Practical: 50

Pr. Sess.-25

Credit-

1. Course Title Surveying And Leveling Practice
2. Course Code Cv-302
3. Semester 3rd Semester
4. Rationale of the subject/course
5. Detailed Course Content

Chapter No.	Chapter Title	Content	Duration(In Hours)

6. Course Title– Farm Power-I

FARM POWER – I

L T PCurri. Ref. No: Ag 301

3 1 3

Total Contact hrs.: 90Total marks: 100Practical: 25

P.A : 25

Theory: 100

Practical: 50

Credit:

1. Course Title FARM POWER – I
2. Course Code Ag-301
3. Semester 3rd Semester
4. Rationale of the subject/course :An agricultural Engineering Diploma holder has to operate the tractor, power tiller and machineries by different power sources. The students can learn to overhauling a tractor engine and repairer the same. They can perform the job with quality and with good efficiency

On completion of the course, the students will be able to :

Understand the basics of Thermodynamics

Familiar with different cycles like, Otto Cycle, Diesel Cycle, IHP, BHP, FHP, MEP, including graph and calculation.

Understand the development of power including Internal Combustion engines.

Interpret the Farm Mechanization in respect of economical, social and technical aspects.

Classify Tractor and Power Tiller including their adaption and uses.

5, Teaching Scheme (In Hours)

Lecture	Tutorial	Practical	Total
34	11	45	90

6.Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100	25	25	17/50	150

7.Detail Course Content

Chapter No.	Chapter Title	Content	Duration(In Hours)
1	Introduction to Farm Engines and Tractors	i) Sources of Farm Power, conventional and Non conventional sources in terms H.P, Their application in Agril. Farm.	4
		ii) Farm mechanization, Role of mechanization and its relationships to productivity, employment, social and technical changes	2
		iii) Construction material- Types, properties, & use.	2
2	Thermodynamics	i) laws of thermodynamics Thermodynamic processes,	2
		ii) Thermodynamic principle of I.C engine, Brief idea of thermo dynamic cycle	2
		iii) Concepts of reversibility cycle,	2
		iv) thermal efficiency and air standard efficiency, v) Carnot cycle efficiency and its implications, vi) Otto, Diesel and dual combustion cycles - Simple problems of their cycles .	2
		Class Test-I	
3	Principles of IC Engines	i) Introduction and classification of IC engines.	4
		ii) Working principle of four stroke and two stroke cycle. Iii) Petrol and Diesel engines, their comparison	2
		iv) location and function of various parts of IC engines and material used for them .	4
		v) Concept of IC engine terms, bore, stroke, dead centre, crank throw, compression ratio, clearance volume, piston displacement and piston speed .	2
		vi) Working principle of rotary (wankle) engine	2
		vii) Explanation and use of term I.H.P, B.H.P and F.H.P,	1
		IHP from basic engine data, measurement of BHP Calculation thermal efficiency, Mean effective pressure, engine efficiency.	
		Class Test –I I	1

4	Tractor and power Tiller Engine systems (Briefly)	i) Classification of tractor and power tiller and its importance in Agril. Field. ii) Tractor and power tiller engine components, their function, piston, connecting rod, crankshaft, camshaft, timing gear, crankcase, cylinder block bearing, different types and their function and use iii) Valves, different types, valve operation	2 2 2
5	Tractor systems	i) Introduction to tractor cooling system, its objectives. ii) lubricants, Types and their properties, iii) Fuel system, carburetors, function and types v) Injection system vi) Repair and maintenance of tractor and power tiller selection of tractor and power tiller	6
		class Test –III	1

8. Distribution of Marks

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective type (Compulsory)	Short question	Descriptive Question	
1	Farm Engines &	4	3	10	
2	Tractors	4	3	8	
3	Thermodynamics	4	3	10	
4	Principles of IC	4	3	9	
5	Engines	4	3	8	
	Tractor and power Tiller Engine systems (Briefly)				
		25	30	15	70

9. Suggested Implementation Strategies :

10. Strategies learning Resource :

- 10.1 Book List
- i) Basic Engg. Thermodynamics , By: T. Roy Choudhary
 - ii) Internal combustion Engines, By: H.B. Keswani
 - iii) Farm Tractors , by S.C. Jain and Rai; Tata Oxford Company.
 - iv) Principle of Agricultural Engineering Volume-I, by AM. Michael
 - v) Elements of Agricultural Engineering , by Dr. Jagdishwar Sahay;

10.2 List of Journals: Journals available at ICAR websites

10.3 Manuals : Manuals available at ICAR websites

10.4 Others

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

6. Course Title– Farm Power-I Laboratory.

FARM POWER – I (PRACTICAL)

L T P. Curri.

Ref. No:Ag.-301

3 1 3

Total Contact hrs.: 90

Total marks: 100

Practical: 25

P.A : 25

Theory: 100

Practical: 50

Credit: 4

1.Course Title FARM POWER – I (LAB.)

2.Course Code Ag-301

3. Semester 3rd Semester

4. Rationale of the subject/course On completion of the course, the students will be able to :

Various tools used for dismantling and assembling of I.C. Engine.

The identification of all parts of an I.C. Engine.

The overhauling of an engine.

The cooling system, lubricating system.

5. The common engine trouble and the remedies

5.Detailed Course Content

Chapter No.	Chapter Title	Content	Duration (In Hours)
1.0	Introduction to IC engine	i)Study of different parts of IC engine with their function & used	4
		ii) Identification of various tools used for dismantling and assembling IC engines	4
		iii)Study the operation of diesel engine	4
		iv)Study the operation of petrol engine	4
		v)Engine dismantling and inspection of various parts, vi)Determination of IHP/BHP and specific fuel consumption measurements	4
		vii)Study and overhauling of carburetor	2
		viii)Performing pre-starting checks on engine	

7. Course Title– Professional Practice-I

PROFESSIONAL PRACTICE I

L T P.Curri. Ref. No:Ag. -310

0 0 0

Total Contact hrs.: 30

Total marks: 50 Practical: 50

P.A : 50

Theory: 0

Practical: 30

Credit:

Rational :

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

Aim The Student will be able to:

- Acquire information from different sources.
- Prepare notes for given topic.
- Present given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture.

Activities 1

INDUSTRIAL VISITS:

1.0 Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work.

Visits to any two of the following:

- Nearby a community agril. field viz Modern / Organic farm, Nursery, Livestock Centre, Tea or Tea Processing Industry
- Automobile (Tractor/Power tiller/ Agril Field equipment's Service Station (Observation of Components / aggregates)
- Dairy Plant / Food processing Plant / Milling Plant

2. GUEST LECTURE (S)

6

Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized from any THREE of the following areas:

- Pollution control.
- Use of Nondestructive plant protective chemicals.
- Safety in use of agrilequipment
- Modern system of agriculture-Multiple cropping Hydro-phona, Azola cultivation, Drip & Sprinkler irrigation.

- Topics related to Agro-Social Awareness such as – Field Irrigation Methods, Career opportunities in Argil Engg, Communication in Industry, Yoga Meditation, Aids awareness and health awareness.

3. GROUP DISCUSSION:

6

The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are -
i. Sports ii. Current news items particular to the field of Agriculture. iii. Agril. Farm Management. iv. Current topics related to Plantation cultivation with special ref to Tea Industry..

4. STUDENT ACTIVITIES:

8

The students in a group of 3 to 4 will perform any one of the following activities (others similar activities may be considered Activity :i) Collect and study IS code for Engineering Drawing.

. ii) Collecting information from Argil Market: - Product details & Pricing.

iii) Specifications of Lubricants and uses

iv) Familiarization of. Useful specifications of materials & Equipment and their application in Argil Field

v) Draw orthographic projections of a given simple machine element using and CAD's.

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Subject Title: Strength of Materials

Subject Title	:Strength of Materials		
Subject Code	: Me-405		
Periods /Week	: 03		
Periods/semester	: 45		
Class Test	:03		
Total class	:48		
Full marks(Theory)	:	70	
Sessional Marks	:	30	
Class hours	L	T	P
	3	0	3

Pre Requisite: Mathematics, Engineering Mechanics

Aim:The aim of the subject is to let the students know the physical meaning of stress and strain, the different types beams and the effect of different type of shear load on beam, Torsion , its effect on shaft and helical spring, thin cylinders , column and struts, different type of columns, effect of load on column and struts

CO -----Outcome Based Course Objectives

After studying the course, the students will be able to

1. Solve problems on simple stress and strain on materials following Hooks' Law
2. Analyze problems on cantilever beam and simply supported beam with overhanging due to point and uniformly distributed load
3. Know simple bending and its related effect on beams
4. Calculate the bending stress on beams based on pure bending

5. Apply the principle of pure torsion on a power transmitting shaft and a helical spring
6. Design a riveted joint

Course Content

1.0 Simple Stresses and strains

- 1.1 Define the strength, Mechanical properties of engineering materials, commonly used.
- 1.2 Identify the nature and effect of tensile, compressive and shear forces.
- 1.3 Define the terms stress, strain, modulus of elasticity, poisson's ratio.
- 1.4 Draw typical stress Vs strain curve for a mild steel specimen under tension indicating salient points on it.
- 1.5 Mention the significant of factor of safety.
- 1.6 Compute stress and strain values in bodies of uniform section and of composite section under the influence of normal stresses.
- 1.7 Calculate thermal stresses, in bodies of uniform section and composite sections.
- 1.8 Find the relations between E, G, and K & Poisson's ratio.
- 1.9 Compute the changes in axial, lateral and volumetric dimensions of uniform sections under the action of normal forces.
- 1.10 Define resilience and Derive an expression for strain energy.
- 1.11 Riveted joint. Failure, Strength, efficiency and design of Rivet.

2.0 Shear force and bending moments.

- 2.1 List the type of beams and type loads.
- 2.2 Definition of shear force and bending moments.
- 2.3 SF and BM diagrams for various loads for simply supported, cantilever and over hanging beam and related problems
- 2.4 Point of contraflexure

3.0 Theory of simple bending and Deflection of beam

- 3.1 State the theory and terms of simple bending.
- 3.2 List the assumptions in theory of simple Bending.
- 3.3 Derive the bending equation $M/I = f/y = E/R$
- 3.4 Calculate Bending stress, modulus of section and Moment of

resistance.

3.5 Calculate the safe load and safe span and dimensions of cross section.

3.6 Define and explain the term deflection.

3.7 Derive the deflection formula for cantilever and simply supported beams

3.8 Calculate the values of deflection in the given beams.

3.9 Solve problems

4.0 Stresses in beams

4.1 Neutral surface and neutral axis

4.2 Bending Equation

4.3 Problems of stress on different beams.

5.0 Torsion in circular shafts and springs

5.1 Function of shaft.

5.2 Explain Polar moment of inertia of solid and hollow shaft.

5.3 Derive the torque equation $T/J = \frac{f_s}{R} = C \frac{\theta}{L}$

5.4 Design of solid and hollow shafts and power transmitted by solid And hollow shaft.

5.5 Definition of spring and types of spring.

5.6 Derivation of deflection equation for helical spring.

5.7 Definition of stiffness of a spring.

5.8 Design of helical spring.

6.0 Columns and Struts

6.1 Definition of columns and struts.

6.2 Failure of a column and a strut.

6.3 Euler's and Rankine formula for finding critical load.

6.4 Problems on various (4) end conditions of column.

7.0 Rivets and riveted joints

7.1 Riveted joint.

7.2 Failure,

7.3 Strength,

7.4 Efficiency

7.5 design of Rivet

Class Test -3 hrs

REFERENCE BOOKS:

1. Strength of Materials by Ramamrutham.
2. Strength of Materials By- M. Chakraborti S.K.Kataria & Sons
3. Strength of Materials ,A.K.Upadhyay S.K.Kataria & Sons
4. Strength of Materials by R. S . Khurmi

Table Of Specification for Strength of Materials																	Total
Sl No	Hrs	Topic	Objective Type				Short Answer Type					Essay Answer Type					
	45		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	97
1	10	Simple Stress & Strain	2	2	2	6	0	4	2	0	6	0	2	6	4	12	24
2	8	SF & BM	2	2	0	4	0	0	4	0	4	0	0	4	4	8	16
3	6	Bending & Deflection of Beams	0	2	2	4	0	2	2	0	4	0	0	4	0	4	12
4	6	Stress in Beams	1	1	0	2	0	2	0	0	2	0	4	4	0	8	12
5	6	Transmission in shafts & Spring	1	1	0	2	1	2	0	0	3	0	4	3	0	7	12
6	5	Columns & Struts	1	2	0	3	0	1	2	0	3	0	0	2	3	5	11
7	4	Rivets and riveted joints	1	1	0	2	0	0	2	0	2	0	0	2	4	6	10

Annexure -I Strength of Materials								
SI No	Topic	Time Allotted(hrs)	Percentage Weightage	K	C	A	HA	Total
1	Simple Stress & Strain	10	22.22	2	8	10	4	24
2	SF & BM	8	17.78	2	2	8	4	16
3	Bending & Deflection of Beams	6	13.33	0	4	8	0	12
4	Stress in Beams	6	13.33	1	7	4		12
5	Transmission in shafts & Spring	6	13.33	2	7	3		12
6	Columns & Struts	5	11.11	1	3	4	3	11
7	Rivets and riveted joints	4	8.89	1	1	4	4	10

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5: Strength of Materials Laboratory

Outcome Based Objective : CO

After the experiment being performed the students will be able to

1. Draw the stress strain diagram of an MS rod showing salient points
2. Perform the compression test of a brick or a timber block
3. Determine the Hardness Number of materials
4. Torsion test on mild steel-relation between torque and angle of twist –determination of shear modulus and shear stress
5. Finding the resistance of materials to impact loads by Izod test and Charpy test.

Course Contents

To understand the various material testing method.

- i) To determine stress strain relation for mild steel rod conducting test on universal testing machine.
- ii) To determine hardness of materials using Brinell and Rockwell Testing Materials.
- iii) To perform tension , bending, impact and shear test.

Exercises:

1. Test on Ductile Materials:

Finding Young's Modulus of Elasticity, Yield Points, Percentage Elongation and Percentage Reduction in Area , Stress Strain Diagram Plotting test on Mild Steel with the help of a Universal Testing machine.

2. Compression test of a brick or a timber block on a Compression Testing Machine

3. Hardness Test:

Determination of Brinell's Hardness Number for metal specimen

4. Torsion Test:

Torsion test on mild steel-relation between torque and angle of twist –

Determination of shear modulus and shear stress.

5. Impact Test:

Finding the resistance of materials to impact loads by Izod test and charpy test..

6. Impact Test: Finding the resistance of materials to impact loads by Izod test and charpy test.

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CIVIL ENGINEERING DRAWING AND ESTIMATING (AGRIL. ENGG.)

L T P Curri. Ref. No:CV(Ag)-. 407

2 0 3

Total Contact hrs.: 30 Total marks: 100 Practical:

P.A :

Theory: 100

Practical:

Credit: 4

1.Course Title : Civil Engineering Drawing And Estimating (Agril. Engg.)

2.Course Code Cv(Ag)-407

3 Semester 4th Semester course

4.Rationale of the subject/course -As we know that drawing is the language of technician. Hence in order to make a technician per he should have the concept of the drawing of farm structure. He should be able to prepare detailed drawing of structures. Through these drawing he will come across during service. The course is designed in such a way so that a Diploma holder can develop the idea of farm structure drawing. He can read, understand and execute the correct Structure drawing.

On completion of the course, the students will be able to :

- 1.Uses of scale and draw the symbols used in C. E. D.
2. Draw plane, elevation and sectional elevation of different parts of residential and farm building
- 3.Draw different road section, canal sections
4. Estimate of simple residential farm ,livestock building, septic tank, farm house etc
5. Estimate of earthwork, rural roads, tube well ,culverts etc.

5Teaching Scheme (In Hours)

Lecture	Tutorial	Practical	Total
34	11		45

6.Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100	25	25	17/50	150

7.Detail course content

Chapter No.	Chapter Title	Content	Duration(In Hours)
		Group-A -Drawing	
1.0	Introduction Building Drawing. Drawing of Dairy farm, poultry farm, roof truss, Storage structure, farm workshop, culvert etc related to farm building structure Related to agric. Engg.	i) Introduction to civil Engineering. Scale, Plane, elevation and Sectional elevation	4
		ii) Plan, elevation and section of a single storey residential building having Bedrooms, Kitchen, Bath, Verandah etc with its foundation detail – one plate	4
		ii) Plan elevation and sectional drawing dairy farm for 50 cows – one plate	2
		iii). Plan elevation and section of a poultry farm for 400 birds – one plate	2
		iii) Plan elevation and section of a godown with inclined roof over truss (span 10m)- one plate	2
		iv). Plan elevation and section of septic tank, and open surface drain – one plate	2
		vi). Plan and detail information regarding Agricultural workshop in 80 hectare land. – one plate	2
		vii). Plan, half elevation and half section of single span R.C.C. slab culvert	2
		viii) Plan, elevation and section of fully paneled and glazed door and window. – one plate	2
		ix) Plan, half elevation and cross section of a siphon Aqueduct – one plate.	2
		X). Section elevation of (a) King post truss, (b) Queen post truss and steel truss – one plate	
		Xi) Plan, elevation and section of a gohar gas plant.	
		Xii). Plan, elevation and section of a rain water harvesting plant.	
2.0		Class Test-II	1
3	Introduction to Estimating and costing.	Group-B -Estimating	
		i) Element of cost in a Farm ii) Principle involve in estimation iii) Unit of measurement of different unit	4
4	Estimating of earthwork, rural road, Farm Building	i) Estimation of earth work in embankment, Canals, Farm ponds etc. Samson Rule, Trapezoidal Rule formula	4
		ii) Estimation of rural road works	4
		iii) Estimation of residential Farm buildings	31
		iv) Estimation of Farm buildings	
		v) Estimation of Canals and drainage system	3
		vi) Estimation of fencing	2
		vii) Analysis of rate of preparation of contract form & tender document	
		Class Test-III	

8. Distribution of Marks

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective type(Compulsory)	Short question	Descriptive Question	
1	Introduction	2	5		
2	Building Drawing	5	8	10	
3	Storage structure	5	5		
4	Sanitary Engineering	5	5		
5	Introduction to Estimating and costing. Estimating of earthwork,rural road,Farm Building		7	5	
		25	30	15	70

9. Suggested Implementation Strategies :

10. Strategies learning Resource :

- 10.1 Book List Civil Engineering Drawing. By Sah and Kale
2. Civil Engineering Drawing. By B.N. Verma.
3. Irrigation and Water power Engg. By B.C. Punmia.
4. Principle of Agriculture Engg. By A.M. Michol& J. P. Ojha.
5. I. S. Code 696 & 062

10.2 List of Journals

10.3 Manuals

10.4 Others

Subject Title: Theory of Machines

Subject Title	:	Theory of Machines		
Subject Code	:	Me-404		
Hours Per Week	:	03		
Hours Per Semester	:	45		
Class Test hrs	:	03		
Total hrs	:	48		
Full marks(Theory)	:	70		
Sessional Marks	:	30		
Class hours	L	T	P	
	3	0	3	

Pre requisite: Engineering Mechanics

Aim: The aim of the subject is toknow the kinematics of machine, their mechanisms, the friction involved. Methods of transmission of power, the role of cams, effect of vibration, balancing, governors.

CO-----Outcome Based Objectives

On completion of the course, the student should be able to

1. Appreciate the importance of Kinematics of Machines, their Mechanisms & Inversions
2. Explain the friction involved in bearings, clutches & brakes
3. Know different methods of transmission of power
4. Analyze different types of cams and their motions and also to draw cam profiles for various motions
5. Know different types of vibration and to understand critical speed of shaft
6. Solve problems on balancing of masses in the sameplane
7. Know the function of different types of governors

Subject Content Details

1.0 Introduction

1.1 Definition of Theory Of Machine(TOM)

1.2 Sub – divisions of TOM

2.0 Basic kinematics of Machines

2.1 Kinematic link or element

2.2 Types of links

2.3 Kinematic pair –types

2.4 Types of constrained Motions

2.5 Kinematic chain

2.6 Machine, Structure and Mechanism

2.7 Difference between Machine and Structure

2.8 Difference between Machine and Mechanism

2.9 Inversions

2.10 Types of Kinematic Chains

2.11 Four Bar Chain

2.11.1 Beam Engine

2.11.2 Coupling Rod of Locomotive

2.11.3 Watt's Indicator Mechanism

2.12 Single Slider Crank Chain

2.12.1 Pendulum Pump

2.12.2 Oscillating cylinder engine

2.12.3 Rotary I.C Engine

2.12.4 Crank and Slotted Lever Quick Return Motion Mechanism

2.12.5 Whitworth Quick Return Motion Mechanism.

2.13 Double Slider Crank Chain

2.13.1 Elliptical trammel

2.13.2 Scotch yoke mechanism

2.13.3 Oldham's coupling

3.0 Friction

3.1. Friction - Friction in Journal Bearing, Friction of Pivot and Collar Bearing, types of Pivot and Collar Bearing (No derivation requires, formulae only). Simple Problems on the above topic.

3.2. Dynamometer- Difference between brake & clutch, difference between brake and Dynamometer. Types of Dynamometer, classification of absorption type dynamometers.

4.0 Transmission of Power

4.1 Types of Belt Drives

4.2 Length of belt –open and cross belt drives

4.3 Velocity Ratio, Ratio of driving Tensions, Centrifugal Tension and Initial Tension

4.4 Power Transmitted by belts (flat and V) and ropes

- 4.5 Maximum power transmitted by belt (without proof)
- 4.6 Problems on belt drives
- 4.7 Introduction to Gears
- 4.8 Classification of Gears
- 4.9 Spur Gear Terminology
- 4.10 Problems on gears
- 4.11 Introduction to Gear Trains
- 4.12 Types of Gear trains –Simple, Compound, Reverted and Epicycle gear trains
- 4.13 Problems on Gear Trains

5.0 Cams

- 5.1 Introduction
- 5.2 Classification of cams
- 5.3 Classification of followers
- 5.4 Terminology of Radial disc cam

6.0 Mechanical Vibrations

- 6.1 Introduction
- 6.2 Terms used in Vibrations
- 6.3 Types of Vibrations
 - 6.31 Free Vibrations
 - 6.32 Forced Vibrations
 - 6.33 Damped Vibrations
- 6.4 Types of Free Vibrations- Longitudinal ,Transverse and Torsional

6.5 Critical or Whirling speed of a shaft

7.0 Balancing

7.1 Introduction

7.2 Static and Dynamic balancing

7.3 Balancing of single rotating mass in the same plane of projection

7.4 Balancing of several masses rotating in the same plane of projection

7.5 Problems on above (Analytical and Graphical methods)

8.0 Governors

8.1 Introduction

8.2 Types of Governors

8.3 Centrifugal Governor

8.4 Terms used in governors

8.5 Watt Governor

8.6 Porter Governor

Reference Books :

1. Kinematics of Machines---J B K Das, Sapna Publication
2. Theory of machines----- R.S. Khurmi&J.K.Gupta , S.Chand publication
- 3 . Theory of machines----- P.L.Ballaney , Khanna publication
4. Theory of machines----- Thomas Bevan ,CBS publication
5. Theory of machines-----Malhotra & Gupta
6. Theory of machines-----S.S .Rattan ,Tata McGraw-Hill publication
7. Theory of machines-----R.K.Bansal ,Laxmi publication

8. Dynamics of Machines---J B K Das, Sapna Publication

Table Of Specification for Theory Of Machine																	
Sl No	Hrs	Topic	Objective Type				Short Answer Type					Essay Answer Type					Total
	45		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	97
1	1	Introduction	1	1	0	2	0	0	0	0	0	0	0	0	0	0	2
		Basic Kinematics Of Machines															
2	8		2	2	0	4	0	2	2	0	4	0	3	4	3	10	18
3	7		Friction	0	2	0	2	1	2	0	0	3	4	4	5	0	9
		Transmission Of Power															
3	8		1	2	0	3	0	2	2	0	4	0	3	3	3	9	16
5	6	Cams	0	2	0	2	0	2	0	0	2	0	4	4	0	8	12
6	6	Balancing	2	0	0	2	4	0	0	0	4	0	4	4	0	8	14
7	3	Mechanical Vibrations	0	2	0	0	0	4	0	0	4	0	0	0	0	0	6
8	6	Governor	0	2	0	2	0	2	2	0	4	0	4	4	0	8	14

Annexure -I Theory of Machine								
Sl No	Topic	Time Allotted(hrs)	Percentage Weightage	K	C	A	HA	Total
1	Introduction	1	2.22	1	1	0	0	2
2	Basic Kinematics of Machines	8	17.78	2	7	6	3	18
3	Friction	7	15.56	5	8	5	0	18
4	Transmission of Power	8	17.78	1	7	5	3	16
5	Cams	6	13.33	0	8	4	0	12
6	Balancing	6	13.33	6	4	4	0	14
7	Mechanical Vibrations	3	6.67	0	6	0	0	6
8	Governors	6	13.33	0	8	6	0	14

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4: Theory Of Machine Lab

Outcome based Course Objectives

After performing the practical, the students will be able to

1. To determine the role of kinematics in machines
2. Calculate the Velocity ratio of components of transmission system like worm and worm wheel , rack and pinion
3. Determine the coefficient of friction of belt drive
4. Calculate the speed of a Porter governor by Instantaneous center method

Course Content:

1. Study of model and working practically on machines by various mechanisms.
 - 1.1. See the models of various mechanism in laboratory and draw the sketches labeling properly.
 - 1.2. Deduce the formula for ratio of cutting stroke to return stroke , stroke length for quick return motion mechanism. Know why it is called quick return motion mechanism?
 - 1.3. Visit the machine shop and observe the functioning of the mechanism on the machine. Know how stroke length is adjusted.
2. Transmission of Power
 - 2.1. Draw the sketches of various belt drive system.
 - 2.2. Determine the length of belts for various type of drives graphically and theoretically and observe the difference. Deduce the formula for the ratio of driving tensions.
 - 2.3. Draw the sketch of a toothed gear and label all the terminology used on it.
 - 2.4. Observe the models of various types of gears and gear trains in laboratory and draw the sketches.
 - 2.5. Deduce the formula for velocity ratio for each type of gear train.
 - 2.6. Observe the transmission of power by belt and gears practically in machine and industry.
3. Study of governors.

3.1. Deduce the relation between height of governor and speed for watt and porter governor.

3.2. Using universal governor apparatus determine characteristic curves for porter governor

i) Sleeve Position Vs Speed. ii) Radius of Rotation Vs Controlling force.

4. Balancing of rotating masses.

4.1. Explain what is balancing and why it is necessary? What is static and dynamic balancing?

4.2. Using static and dynamic balancing apparatus balance the shaft statically and dynamically and observe the effect of unbalance.

5. Mechanical Vibration

5.1 With the help of neat sketch explain the critical or whirling speed of shaft.

5.2. Using whirling of shaft demonstrator study the effect of whirling of shaft with

i) Both ends fixed ii) Both ends supported iii) One end fixed and one end supported

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FARM POWER – II

L T P Curri. Ref. No:Ag.-401

3 0 2

Total Contact hrs.: 30 Total marks: 50 Practical: 25

P.A : 25

Theory: 15 0

Practical: 30

Credit: 4

1. Course Title FARM POWER – II

2. Course Code Ag-401

3. Semester 4th Semester course

4 Rationale of the subject/course An agricultural Engineering Diploma holder has to operate the different machines and machinery by different power sources. The tractor is the most suitable power source for multipurpose operation of field or farm machinery. To perform the job with Quality and with good efficiency

On completion of the course, the students will be able to :

1.To be familiar with Heat Engines systems & Engine power transmission to Ground wheels.

2. To be familiar with tractor & power tiller as prime mover in Agril. Engg. fraternity- introduction to major sub component units of tractor viz. PTO, Hydraulic systems, Hitching Methods & operational cost estimations.

3. Introduction to common engine troubles & handling of remedies, Safety and Maintenance of equipments

5.Teaching Scheme (In Hours)

Lecture	Tutorial	Practical	Total
34	11	45	90

6.Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100	25	25	17/50	150

7.Detailed Course Content

Chapter No.	Chapter Title	Content	Duration (In Hours)
1	Engine system (Link course, Remaining part)	i) Cooling system - Necessity of engine cooling, cooling system, their main features, thermostat, defects in cooling system and their rectification ii) Lubricating system - functions of lubrication, types and properties of engine lubricants, additives for improving the properties, lubrication system of IC engine, oil pumps, oil filters, pressure relief valve, positive crank case ventilation. iii) Fuel supply System - Components of fuel system, description and working of fuel feed pump, types working of fuel injection pump, injector, fuel filters, complete detail and working of micro fuel injection system for a multi cylinder engine, iv) Ignition system-Battery and Magneto Ignition system iv) Governing system v) Air Intake System- Components of air intake system viz. pre-air cleaner, inlet manifold, exhaust manifold, types of air cleaners: wet, dry vi) Introduction to tractor and power tiller transmission system ii) Steering System iii) Clutches iv) Gearboxes v) Differential and final drive	4 4 4 2 2 4 2 3
3			
		Class Test –I	2
4	Power Transmission	Engine power, indicated and brake power, efficiency - mechanical, thermal, relative and volumetric efficiencies, methods of finding indicated and brake horse power, Morse test and heat balance sheet performance and endurance tests of IC	3 1 4 2 2
		Class Test _II	
5	IC Engine Testing	engine specification (according To ISI). Exhaust smoke analysis and pollution control.	2 2
6	Maintenance, repair	Maintenance, repair and overhaul of engines 8. Common engine troubles and their remedies	1
7	Cost estimation	9. Safety Rules	
8		10. Cost estimation of tractor operation	
		Class Test – III	

8. Distribution of Marks

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective type(Compulsory)	Short question	Descriptive Question	
1	Engine system)	2	3	10	
2	Power	2	3	8	
3	Transmission	2	3	10	
4	Engine Testing	2	3	9	
5	Maintenance, repair	2	3	8	
	Cost estimation	10	15	45	70

9. Suggested Implementation Strategies :

10. Strategies learning Resource :

10.1 Book List

- i) Principle of Agricultural Engineering Volume-I by AM. Michael & T.P. Ojha; Jair
- ii) Principle of Agricultural Engineering Volume-II by AM. Michael & T.P. Ojha; Jai
- iii) Element of Farm Machinery by AC. Srivastava

FARM POWER – II (PRACTICAL)

L T P Curri. Ref. No:Ag.-401

3 0 2

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A : 25

Theory: 100

Practical: 50

Credit: 4

Course Title FARM POWER – II (PRACTICAL.)

Course Code Ag-401

Semester 4th Semester

Rationale of the subject/course

On completion of the course, the students will be able to :

1. Identify the different parts and the working of Cooling System, Fuel System, Lubrication System Ignition System and Governing System. Transmission System and Steering System
2. Find out the troubles and their repairing
3. Disassemble and assemble of Clutches, Gear Box, the final Drive.
4. The cause of exhaust black Smoke that effect in Pollution of environment.

5. Details of course content

C	Chapter Title	Content	Duration (In Hours)
1	Engine system (Link course, Remaining part)	i) Study of Cooling system ii) Study of Lubricating system iii) Study of Fuel supply System -, iv) Study of Ignition system-Battery and Magneto Ignition iv) Study of Governing system v) Study of Air Intake System	4 4 3 3 3
2	Tractor & power tiller transmission system	i) Study of transmission system ii) Study of Steering System iii) Study of Clutches iv) Study of Gearboxes v) Study of Differential and final drive vi) Study of exhaust smoke analysis and pollution control. Visit to pollution center.	4 4 4 4 3 3

3	Maintenance, repair	Maintenance, repair and overhaul of engines Common engine troubles and their remedies . Safety Rules	4
4	Cost estimation	Cost estimation of tractor operation	4

Course Title :- HYDRAULICS

1. Course Code :- CV-403

2. Semester :- 4 th (Civil)

3. Course Objectives (CO)

On completion of the course, the student will be able to:

- To define the properties of various fluids .
- To name different types of pressures and various pressure measuring devices.
- To calculate hydrostatic forces and pressure on plane surfaces immersed in water.
- To explain types of forces, energy and application of Bernoulli's theorem.
- To describe different types of Orifices and Mouthpieces and to derive discharge formulae and their practical applications.
- To state the different losses of head of flowing liquids in pipes and their equations.
- To describe different types of Notches and Weirs, and deriving the discharge formulas and their Practical applications.
- To describe different types of Channels and their discharge formulas and to determine the condition for maximum discharge
- To explain the construction details, specifications and efficiencies of Reciprocating Pumps and Centrifugal Pumps.

Course Outcome (CO)	Intended Learning outcome (ILO)
CO-1 To define the properties of various fluids	ILOs 1. Define Mass, force, weight ,volume, specific gravity, specific weight, density, relative density, compressibility, viscosity, cohesion, adhesion, capillarity and surface tension, SI Units for area, volume, velocity, acceleration, density, discharge, force, pressure and power.
CO-2 To name different types of pressures and various pressure measuring devices	1 . List out of different pressure measuring instrument 2. State the relation between atmospheric pressure, gauge pressure and vacuum pressure

CO-3 To calculate hydrostatic forces and pressure on plane surfaces immersed in water	1. State the intensity of pressure 2. Conversion from intensity of pressure to pressure head 3 . Measurement of pressure by pressure measuring instrument 4 . Measuring of pressure in horizontal, vertical and inclined plane.
CO-4 To explain types of forces, energy and application of Bernoulli's theorem.	1 . Define laminar flow, turbulent flow, steady flow, unsteady flow, uniform and non uniform flow. 2 . Define continuity of equation and Bernoulli's theorem 3. State potential, kinetic and pressure energy of liquid 4. Use of venturimeter and pitot tube
CO-5 To describe different types of Orifices and Mouthpieces and to derive discharge formulae and their practical applications	1 . State different types of orifice, vena contracta, hydraulic coefficient. 2 . State the different discharge formula 3. Solving of numerical problems
CO-6 To state the different losses of head of flowing liquids in pipes and their equations	1 . State the different losses in pipe flow 2. Measurement of minor and major losses in pipe flow 3. State Darcy's and Chezy's equation 4. Solving of numerical problems.
CO-7 To describe different types of Notches and Weirs, and deriving the discharge formulas and their Practical applications.	1. Define various types of notches and weirs. 2. Derivation of equation of discharge formula by various notches and weirs 3. Solving of numerical problems.
CO-8 To describe different types of Channels and their discharge	1. Definition and Classification of Rectangular and Trapezoidal channels

formulas and to determine the condition for maximum discharge	2. Discharge by Chezy's formula, Bazin's formula and Manning's formula. 3. Importance of Hydraulic mean depth 4. Condition for maximum discharge 5. Solving of numerical problems

4. Teaching Scheme (in hours/week) Total contact hours : L 45 hrs. T 15 hrs. P 45 hrs.

Lecture	Tutorial	Practical	Total
3		3	6

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	4

6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction	Hydraulics – Definition - Properties of fluids - Mass, force, weight ,volume, specific gravity, specific weight, density, relative density, compressibility, viscosity, cohesion, adhesion, capillarity and surface tension, SI Units for area, volume, velocity, acceleration, density, discharge, force, pressure and power.	4

2	Measurement of Pressure	Pressure of liquid – Intensity of pressure - Pressure head of liquid, Conversion from intensity of pressure to pressure head and vice-versa, Formula and Simple problems. Types of pressures – Atmospheric pressure, Gauge pressure, Vacuum pressure and Absolute pressure . Measurement of pressure - Simple mercury Barometer, Pressure measuring devices, Piezometer tube , Simple U-tube manometer , Differential manometer – Micrometer. Simple numerical problems. Pressure on plane surfaces - Horizontal, vertical and inclined surfaces-Total pressure-Centre of pressure - Depth of centre of pressure – Resultant pressure Numerical Problems	6
3	Flow of fluids	Types of flow – Laminar and turbulent flow - Steady and unsteady flow –Uniform and Non-uniform flow - Equation for continuity of flow (law of conservation of mass) – Energy possessed by a fluid body – Potential energy and Potential Head – Pressure energy and Pressure Head - Kinetic Energy and Kinetic Head - Total Energy and Total Head –Bernoulli's theorem – (Proof not necessary) . Practical applications of Bernoulli's theorem – Venturi meter – Orifice meter (Derivation not necessary) - Simple numerical problems. FLOW THROUGH ORIFICES AND MOUTHPIECES Definitions- Types of orifices - Vena contracta and its significance –Hydraulic coefficients Cd, Cv and Cc and their relationship. Simple problems. Large orifice – Definition and Discharge formula – Simple problems – Practical applications of orifices – Types of mouthpieces - External and internal mouthpieces - Discharge formula - Simple problems. FLOW THROUGH PIPES Losses of head in pipes – Major losses - Minor losses - Sudden enlargement, sudden contraction, obstruction in	16

		pipes (no proof is necessary) -Simple problems – Energy / Head losses of flowing fluid due to friction Darcy's equation - Chezy's equation (No derivation) – Numerical Problems - Transmission of power through pipes – Efficiency - Pipes in parallel connected to reservoir - Discharge formula - Simple problems. FLOW THROUGH NOTCHES Definitions- Types of notches – Rectangular, Triangular and Trapezoidal notches – Derivation of equations for discharges - Simple problems - Comparison of V-Notch and Rectangular Notch. FLOW THROUGH WEIRS Definitions - Classification of weirs - Discharge over a rectangular weir and trapezoidal weir – Derivation – Simple problems – End contractions of a weir – Franci's and Bazin's formula – Simple problems - Cippoletti weir –Problems - Narrow crested weir – Sharp crested weir with free over fall -Broad crested weir - Drowned or Submerged weirs - Suppressed weir -Stepped weir – Problems - Definition of terms - Crest of sill, Nappe or Vein,	
4	Flow through Open channel	Definition - Classification - Rectangular and Trapezoidal channels –Discharge – Chezy's formula, Bazin's formula and Manning's formula. Hydraulic mean depth – Problems Conditions of rectangular/trapezoidal sections - Specific energy, critical depth –Conditions of maximum discharge and maximum velocity - Numerical Problems Methods of measurements of velocities – Channel losses - Lining of canals – Advantages of lining of canals - Types of lining- Cement concrete lining with sketches	6

5	Pumps	8.1 Pumps – Definition and types. Centrifugal pump – component parts and their functions, principle of working, priming. Reciprocating pump – component parts and working. Submersible and Jet pump. Selection and choice of pump. Computation of power required for pumps. Turbines – Definition and types.	5
6	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	8

7. Distribution of Marks/ Table of Specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/ Descriptive Questions	
1	Introduction	3	-	3
2	Measurement of Pressure	6	6	12
3	Flow of fluids	7	24	31
4	Flow through open channel	5	10	15
5	Pumps	4	5	9
Total		25	45	70

9.0 TIME ALLOTMENT TABLE

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	4	9				-
2	Measurement of Pressure	6	13				-
3	Flow of fluids	16	36				-
4	Flow through Open channel	6	13				-
5	Pumps	5	11				-
6	Internal assessment	8	18				-
		$\Sigma b = 45$	100				-

10.0 MARKS DISTRIBUTION TABLE

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1	1	2	4	-	-	-		-
2	Measurement of Pressure	1	2	3	6	2	1	3		6
3	Flow of fluids	2	2	2	6	6	6	12		24
4	Flow through Open channel	1	2	2	5	2	3	5		10
5	Pumps	1	1	2	4	-	2	3		5
6	Internal assessment									
					25					45

K = knowledge; C= comprehension; A= Application; HA= Higher than application

11.0 Suggested Implementation Strategies:- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process .

12.0 Suggested Learning Resource :-

12.1 Book list

1. Dr. JagadishLal - Hydraulics, Fluid Mechanics and Hydraulic Machines-Metropolitan Book Company- New Delhi
2. P.N. Modi& S.M. Sethi - Fluid Mechanics - Standard Publishers – New Delhi
3. S. Ramamirtham-Hydraulics,Fluid Mechanics and Hydraulics Machines- DhanpatRai& Sons, New Delhi
4. K.L.Kumar - Fluid Mechanics – EurasaPublshing House – New Delhi
5. R.K. Bansal - Fluid Mechanics - Lakshmi Publications
6. Prof. S. Nagarathinam - Fluid Mechanics - Khanna Publishers – New Delhi
7. K.R. Arora - Hydraulics, Fluid Mechanics and Hydraulics Machines –Standard Publishers & Distributors, New Delhi
8. B C S Rao, “Fluid Mechanics and Machinery” Tata-McGraw-Hill Pvt. Ltd., New Delhi
9. Different related Journals/ manuals shall be referred.

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

N.B:- Optional question may be of same topic in the form of either or type like below

Q no:- Differentiate between uniform flow and non uniform flow

Or

Differentiate between laminar flow and turbulent flow.

XXXXXXXXXXXXXXXXXXXXXXXXXXXX

Course Title :- HYDRAULICS (PRACTICAL)

Contact hrs:- 45

Practical to be performed: 08 (Any eight)

SKILLS TO BE DEVELOPED

INTELLECTUAL SKILLS:

- a. Identify the different instruments/ equipment
- b. Interpret test results
- c. Calculate quantities of parameters
- d. Draw graphs

MOTOR SKILLS:

- a. Operate different equipment properly.
- b. Measure different parameters accurately
- c. Adjust levels by operating and controlling valves
 1. Measurements of pressure and pressure head by Piezometer, U-tube manometer
 2. Measurement of pressure difference by U-tube differential manometer.
 3. Verification of Bernoulli's theorem
 4. Reynolds experiment to study types of flow.
 5. Determination of Darcy's friction factor for given pipe.
 6. Determination of Minor losses pipes (any two)
 7. Demonstration of Hydraulic jump
 8. Determination of coefficient of discharge for given rectangular or triangular notch.
 9. Determination of coefficient of discharge for a given Venturimeter.
 10. Demonstration and use of Pitot tube and current meter.
 11. Determination of hydraulic coefficients for sharp edge orifice.
 12. Study of a model of centrifugal and reciprocating pump.

Note: video cassettes or cd's of above experiments developed by NITTTR (if available) shall be shown to the students on T. V. / L.C.D. projector prior to the conductance of above experiments.

Soil Science & Soil Mechanics

L T P Curri. Ref. No:Ag.-402

3 0 2

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A : 25

Theory: 100

Practical: 50

Credit: 3

Detailed Course Content

Course Title Soil Science & Soil Mechanics

Course Code Ag-402

Semester 4th Semester

Rationale of the subject/course :- A diploma holder in Agril. Engg. Students has to acquire knowledge about selection of soils to cultivate different crops, nutrients status ,and application of fertilizer and bio-fertilizer for maximum production of crops.

On completion of the course the students will be able to :

Acquire knowledge about soil science and soil mechanics

Identify and classify soil base on physical properties, soil PH, salt affected soil.

Understand about classification of soil in agricultural and construction purpose.

Know about nutrient elements of soil and its relation to plant growth.

Understand and study about deficiency of nutrient elements and artificial supply of fertilizer and manure.

Know about soil phase system and HRB and ISI classification.

Understand about properties of soil and permeability of soil.

5.Teaching Scheme (In Hours)

Lecture	Tutorial	Practical	Total
34	11	45	90

6.Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100	25	25	17/50	150

7.Detailed Course Content

C	Chapter Title	Content	Duration(In Hours)
1	Introduction to Soil Science and soil classification	i) Definition and components of soil, genesis. ii) Physical properties of soil -Soil texture, soil structure, density of soil, porosity of soil, soil colour, soil temperature and their role in soil fertility iii) Classification of Indian soil related to agriculture. Soils types in Assam. Role of soil organic matter in crop. iv) Soil PH – Acid and alkali soil, Their effect on availability of nutrients and plant growth. v) Salt affected soils:- Nature and classification, characteristics, detrimental effects of soil salinity and alkalinity and their reclamation	2 2 2 2 2 2
2	Soil fertility	i) Nutrient elements essential for plant growth, Role of nutrient element, ii) micro and macro organism, types and their rate iii) Different approaches for soil fertility evaluation. iv) Methods, Soil testing - Chemical methods, critical levels of different nutrients in soil. v) Biological method of soil fertility evaluation.	1 2 2 2
3	Fertilizer and Manure	i) Concept of soil productivity and fertility ii) Fertilizer -their types, importance, iii) manures-their types, different group iv) Soil test based fertilizer recommendations to crops. v) Factors influencing nutrient use efficiency (NUE) in respect of N, P, K, S, Fe and Zn fertilizers vi) method and scheduling of nutrients for different soils and crops grown.	2 2 2
		Soil Mechanics	
4	Basic Definition and Relationship	i) Soil as three phase system-void ratio, porosity, degree of saturation, water content, unit weight, specific gravity. ii) Functional relationship and related problem.	5
5	Classification of solid and soil structure	i) Particle size classification, textural classification ii) HRB classification, ISI classification	3
6	Index Properties determination	i) Determination of specific gravity, density index, void ratio. ii) Determination of water content iii) Definition of liquid limit. plastic limit, shrinkage, consistency	4

		index, liquidity index iv) Determination of liquid limit, plastic limit	
7	Permeability	i) Darcy's Law, Discharge and seepage velocity, Validity of darcys Law ii) Factor affecting permeability, field and laboratory, Determination of co-efficient of permeability.	3
8	Seepage flow net	i) Definition, piezometric head, velocity head, critical hydrologic gradient, seepage pressure ii) Concept of flow net and its application.	3
9	Compaction of soil	i) Introduction-Rule of moisture in compaction, Determination of optimum moisture content by proctor compaction field test, field compaction method and control ii) Factor affecting compaction.	3
10	Consolidation	Definition, comparison with compaction, consolidation process	2
11	Strength of soil	Importance of shear strength of soil, Mohr-culomb strength theory.	2

8. Distribution of Marks

Ch	Chapter Title	Type of Question			Total Marks
		Objective type (Compulsory)	Short question	Descriptive Question	
1	Introduction to Soil Science and soil classification				
2	Soil fertility Soil fertility and manure				
3	Basic Definition and Relationship	25	30	15	7
4	Classification of solid and soil structure				
5	Index Properties determination				
6	Permeability				
7	Seepage flow net				
8	Compaction of soil				
9	Consolidation				
10	Strength of soil				
11					

9. Suggested Implementation Strategies:

10. Strategies learning Resource:

10.1 Book List

10.2 List of Journals

10.3 Manuals

10.4 Others

Soil Science & Soil Mechanics (Lab.)

L T P Curri. Ref. No:Ag,-402

3 0 2

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A : 25

Theory: 100

Practical: 50

Credit: 3

Course Title : Soil Science & Soil Mechanics (Lab.)

Course Code Ag-402

Semester 4th Semester

Rationale of the subject/course :- A diploma holder in Agril. Engg. Students has to acquire knowledge about selection of soils to cultivate different crops, nutrients status ,and application of fertilizer and bio-fertilizer for maximum production of crops.

On completion of the course, the students will be able to :

1. Understand about soil farming, rocks and minerals.

Know about physical and chemical properties of soil.

Know about excess and deficiency of nutrients in soil.

Understand about moisture content, grain size, field density, specific gravity etc.

Know about liquid limit, plastic limit, OMC etc

5.Details of course content

Chapter No.	Chapter Title	Content	Duration(In Hrs)
		Soil Science (Group-A)	23
1	Identification of various types of soil	Identification of some important soil forming rock.	3
2	Identification of various types of minerals	Identification of some important soil forming minerals.	2
3	Determination of density of soil	Collection & preparation of soil sample for Lab, analysis.	3
4	Determination of water holding capacity of soil	Determination of Particle & Bulk density of soil.	3
5	Determination of index properties of soil	Determination of water holding capacity of soil. Estimation of PH of soil.	3
6	Determination of microbial properties of soil		3
7	Estimation of available nitrogen in soil.	1Identification of commonly used manure and fertilizer and their characteristics.	3
8	Estimation of available phosphorus & Potassium in soil. Determination of water content by oven drying method.	Determination of indigenous microbial population in field soil.	3
9		Estimation of available nitrogen in soil.	3
		Estimation of available phosphorus & Potassium in soil.	

		Soil Mechanics (Group-B)	
11	Determination of grain size distribution by sieve analysis. .	. Determination of water content by oven drying method.	
12	Determination of field density by core cutter method.	Determination of grain size distribution by sieve analysis. .	4
13	Determination of specific gravity of soil	Determination of field density by core cutter method.	4
14	Determination of liquid limit and plastic limit.	Determination of specific gravity of soil solid.	3
15	Determination of OMC by Procter compaction test.	Determination of liquid limit and plastic limit. Determination of OMC by Procter compaction test.	3
			4
			4

PROFESSIONAL PRACTICE II

Curri. Ref. No: Ag-410

L T P

1 0 2

Total Contact hrs.: 30 Total marks: 50 Practical:

Theory: 0 P.A : 50

Practical: 30

Credit: 2

Rational : To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

Aim Student will be able to:

- Acquire information from different sources.
- Prepare notes for given topic.
- Present given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture

Contents Activities

1. INDUSTRIAL VISITS

Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work.

Two industrial visits may be arranged in the following areas / industries:

- i. Manufacturing organizations for observing various manufacturing processes Viz Milk chilling plant, Bio gas plant, Vermi compost unit, Solar operated unit,
- ii. Material testing laboratories in industries or reputed organizations-soil testing lab, Tea testing labs, Water resource engg lab, Farm Machinery Testing lab
- iii. Tea & Tea Machinery processing units
- iv. Tractor repairing workshop / Garage v. Modern rice & oil processing units

2. Lectures by Professional / Industrial Expert be organized from ANY THREE of the following areas: 6

- i. Use of plastics in automobiles.
- ii. Nonferrous Metals and alloys for engineering applications
- iii. Selection of electric motors.
- iv. Computer aided drafting.
- v. Industrial hygiene. vi. Heat treatment processes.
- vii. Safety Engineering and Waste elimination

3. INDIVIDUAL ASSIGNMENTS:

Any two from the list suggested

- a) Process sequence of any two machine components.

- b) Write material specifications for any two composite jobs.
- c) Collection of samples of different cutting material or cutting tools with properties, specifications and applications.
- d) Preparing models using development of surfaces.
- e) Assignments on bending moment, sheer forces, deflection of beams and torsion chapters of strength of material.
- f) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable.
- g) List the various properties and applications of following materials - i. Ceramics ii. Fiber reinforcement plastics
iii. Thermo plastic plastics
iv. Thermo setting plastics
v. Rubbers.

OR

Conduct any one of the following activities through active participation of students and write report

- i. Rally for energy conservation / tree plantation./Uses of chemical in cultivation
- ii. Survey for local Agro-social problems such as Cultivation practices & status, Soil & water Condition, unemployment, cleanliness, illiteracy etc.
- iii. Conduct aptitude , general knowledge test , IQ test
- iv. Arrange any one training in the following areas :
a) Yoga. b) Use of improved & cost effective agrilequipments c) Maintenance of Domestic appliances.

4. MODULAR COURSES (OPTIONAL): 6

A course module should be designed in the following areas for max. 12 hrs. Batch size - min. 15 students. Course may be organized internally or with the help of external organizations.

- a) Field operation of Agril Equipments
- b) CAD-CAM related software.
- c) Assembly & repair of agril tools & equipment..
- d) Personality development. e) Entrepreneurship development.

5. 3-D DESIGN USING SOFTWARE

Computer screen, coordinate system and planes, definition of HP,VP, reference planes How to create them in 2nd/3rd environment. Selection of drawing site & scale. Commands of creation of Line, coordinate points, Axis, Poly lines, square, rectangle, polygon, sp line, circles, ellipse, text, move, copy, offset, Mirror, Rotate, Trison, Extend, Break, Chamfer, Fillet, Curves, Constraints fit tangency, perpendicularity, dimensioning Line convention, material conventions and lettering.

The Student should draw - different orthographic Views (including sections), Auxiliary views according to first/ Third angle method of projection. (Minimum two sheets, each containing two problems) after learning the contents as above.

POST HARVEST TECHNOLOGY

L T P Curri. Ref. No:Ag.-501

3 1 3

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A : 25

Theory: 100

Practical: 50

Credit: 4

1. Course Title POST HARVEST TECHNOLOGY
2. Course Code Ag-501
3. Semester 5th Semester

Rationale of the subject/course An Agricultural Engineering Diploma holder has to involve in processing works after the harvest of the farm product to the final shape; acceptable to the consumer with the help of

On completion of the course, the students will be able to :

4. Know about physical properties of food grain.
5. Understand the properties of dryers.
6. Know about conventional and modern process and machineries.
4. Understand different conveying equipments and different packaging materials
5. Know about processing of agricultural and food product

Course Objectives :

different processing machines. In the light of modern and scientific agricultural methods of cultivation, modern and mechanized machine operations are essential. Thus, to get the know how of related processing machines, its working and handling is must for quality product. This course is designed to fulfill the objective of maintaining the qualitative and quantitative requirement with time.

5. Teaching Scheme (In Hours/week)

7. Lecture	8. Tutorial	9. Practical	10. Total
11. 3	12. 1	13. 3	14. 7

6.Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100	25	25	17/50	150

7.Detailed Course Content

Chapter No.	Chapter Title	Content	Duration (In Hours)
1	Introduction to Agro Industries and Processing	Introduction to Agro Industries and Processing. Aims and objectives, Agro Industries in India. Scope & prospect of agro industries with particular reference to Assam & N.E. region Role of agro industries in mechanizing agriculture. Post	4
2	Post harvest operations.	Harvest operations. Grain structure, physical and chemical properties of grain.	4
3	Grain drying theory	Grain drying theory and practices. Parameters of drying, Measurement of moisture content, temp., RH, Air flow rate etc. and grain quality as affected by drying. Natural and artificial method of drying.	8
		Class Test -I	4
4	Grain drying	Drier, Its importance and function. Types of drier, Brief, idea of each type. Grain drying theory, Equivalent moisture content, thin layer and deep bed drying.	6
5		Class test-I	1
6	Equipment and Machinery for processing unit	Equipment and Machinery: Processing of major crop in Assam Viz. cereals, pulses, oil seed, Jute, tea, coffee, fruits and vegetables etc Processing of stock feed Processing of dairy milk and milk product Processing of meat and fish Storage and preservation Control of microbial hazards, causes and remedies of food deterioration during Storage. Fruits and Vegetable preservation, Its importance, Principles and methods of fruits Preservation, Method of packaging and quality evaluation. Study of refrigeration and cold storage process, Basic Principle and application in domestic and industrial purpose.	2 2 2 2 2 2 2 2 2 2

		Class Test II	1
7	Material Handling equipment	Handling and conveying equipment & their importance, rope, chain and belt Drive conveyors	4
8	Seed processing	Seed processing technology Utilization of Agricultural by product (Fiber, Paddy, husk etc.)	6
		Class Test-III	1

8. Distribution of Marks

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective type(Compulsory)	Short question	Descriptive Question	
1	Introduction	2	3		
2	to Agro	4	3		
3	Industries	4	3	5	
4	and	4	5	5	
5	Processing	4	5	5	
6	Post harvest	3	3		
7	operations.	2	3		
8	Grain drying	2	2		
	Theory	25	30	15	70
	Grain drying process				
	Equipment and Machinery				
	Material Handling				
	Seed processing				

9. Suggested Implementation Strategies :

10. Strategies learning Resource :

10.1 Book List

- i) Post harvest Technology of cereal, Pulses, oil seeds by Chakraverty; Oxford &
- ii) IBH Publication Co. Principle of Agro Process Engineering, by Dr..K.M. Sahay; Vikas Pub.
- iii) Fruits & Vegetable Processing by Bhatia Suman; Oxford & IBH Publication Co.
- iv) Drying & Storage of Grains & oil Seeds by Brooker D.B.; Oxford & IBH Publication Co.
- v) Principles of agricultural Engineering Vol II by A.M. Michel & T.P. Ojha

10.2 List of Journals

10.3 Manuals

10.4 Other

POST HARVEST TECHNOLOGY (Lab.)

L T P Curri. Ref. No:Ag.-501

3 1 3

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A : 25

Theory: 100

Practical: 50

Credit: 4

15. Course Title POST HARVEST TECHNOLOGY Lab,)

16. Course Code Ag-501

17. Semester 5th Semester

18. Rationale of the subject/course

19.	20. Chapter Title	21. Content	22. Duration(In Hours)
1	physical properties of food grain	Determination of physical properties of food grain e.g. size, shape, density and angle of repose.	3
2	moisture content of grains	Determination of moisture content of grains Study of different types of dryers.	3
3	Classification of paddy and rice	Classification of paddy and rice.	3
4	milling quality	Determination of milling quality and degree of polish	3
5	grain storage structures.	Study of domestic grain storage structures.	3
6	modern process industry	Study of conventional and modern process and machinery. .	3
7	Processing of paddy and by products.	Processing of paddy and by products.	3
8	Processing of livestock feed industry	Processing of livestock feed industry	3

9	Processing of dairy industry	Processing of dairy industry	3
10	Processing of spice industry	Processing of spice industry	3
11	Processing of Bakery industry	Processing of Bakery industry	3
12	Processing of oil seeds and by products.	Processing of oil seeds and by products.	3
12	Processing of tea	Processing of tea	3
13	Processing of coffee	Processing of coffee	3
14	Processing of Jute and other fibers.	Processing of Jute and other fibers.	3
15	Processing of sugarcane.	Processing of sugarcane.	3
16	Study of different packaging materials.	Study of different packaging materials.	2
17	Processing of fruits and vegetables. .	Processing of fruits and vegetables. .	3
18	Study of domestic grain storage structures.	Study of domestic grain storage structures.	2
19	Study of material conveying equipments	Study of material conveying equipments	2
20	Visit to a cold cold storage	Visit to a cold cold storage	
21		Visit to warehouses (bag storage and bulk storage structures). In addition to handling equipments available in the institute, visit may arrange to local small scale/ cottage industries for the required studies.	

FARM MACHINERY AND IMPLEMENTS

L T P Curri. Ref. No:Ag. -502

3 1 3

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A : 25

Theory: 15 0

Practical: 50

Credit: 4

1. Course Title FARM Machinery And Implements
2. Course Code Ag-502
3. Semester 5th Semester
4. Rationale of the subject/course : An Agricultural Engineering Diploma holder has to operate the different machine by different power sources. The tractor and power tillage is the suitable power source for multi purpose operation of field with the aid of different farm equipments and implements. To perform the job with quality and good efficiency.
- 5.
6. Course objectives
7. To have an Technical concept of Mechanical power transmission & devices with ref to Agril. Engg. utility.
8. To learn the basic process of tillage – objective, requirements & methods of operation , introduction to different tillage equipments and their workings
9. To learn, operate & handle seeding, planting ,fertilizer applicators ,intercultural operations , modern technical gadgets,
3. To learn procedural & operational Safety & maintenance of tools & equipment
- 10.

5. Teaching Scheme (In Hours/week)

11. Lecture	12. Tutorial	13. Practical	14. Total
15. 3	16. 1	17. 3	18. 7

6. Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100	25	25	17/50	150

7.Detailed Course Content

Chapter No	Chapte Title	Content	Duration in Hrs
1	Introduction to Farm Machinery & Farm Power	1.1Importance of Farm Mechanization	4
		1.2Classification of farm machineries & implements –	
		1.3indigenous & Modern Machineries	
		1.4Animal drawn, Manual & Mechanized farm machineries & implements	
2	Power transmission	2.1 Power Transmission devices –belt, Pully& gear drive	2
3	Materials of construction	3.1 Materials of construction of farm implements =properties, selection & Uses of implements	2
4	Tillage Primary tillage	4.1Introduction to Tillage :Primary , Secondary & Zero tillage, definition, objective and requirements	3
		4.2Primary tillage implements- Hand tools. Animal drawn indigenous plough, Modern implements.	
		4.3Construction details of Primary tillage implement, uses & power requirements	
5	Tillage Secondary tillage	5.1 Secondary Tillage & Secondary Tillage Implements	8
		5.2Animal drawn & Power operated M B plough -	
		5.3Animal drawn & Power operated Disc plough -	
		5.4Power operated Disc harrow-Construction, Types , Power requirement & uses	
		5.5Power operated cultivator--Construction, Types , Power requirement & uses	
		5.6 Animal drawn & Power operated Disc plough Construction, Types , Power requirement & uses	
		5.6Power operated Disc Harrow- Construction, Types , Power requirement & uses	
		5.7 Power operated Cultivator- Construction, Types , Power requirement & uses,	
		5.8 Power operated Ridger plough - Construction, Types , Power requirement & uses	
		Power operated rotary plough - Construction, Types , Power requirement & uses	
		Sub soiler and Chisel plough - Construction, Types , Power requirement & uses	
		Class Test - I	1
6		Method of ploughing	2
7		Hitching & attachments of power operated implements with tractor	2

8		7.1 Introduction to Seeding planter and fertilizer applicator 7.2 Method of Seeding and Planting 7.3 Broad casting method & implements 7.4 Dibbling& Dibblers	4
9		8.1 Seed Drill & Planters 8.2 Seed cum fertilizer drill 8.3 Calibration of seed cum fertilizer drill	3
		Class Test - II	1
10		9.1 Introduction to Intercultural Operations 9.2 Weed and identification of weeds 9.3 Animal & Power operated implements for intercultural operation 1	3
11		10.1 Flame cultivation 1 10.2 Introduction to plant Physiology of common crops of Assam 1 10.3 Common diseases of crops of Assam 1 10.4 Plant protective chemicals – herbal & commercial chemicals 1 10.5 Implements & uses of plant protective chemicals 1	5
		Class Test-II	1
		9.1Introduction to Intercultural Operations 1 9.2 Weed and identification of weeds 9.3 Animal & Power operated implements for intercultural operation	3
		10.1 Flame cultivation 1 10.2 Introduction to plant Physiology of common crops of Assam 1 10.3 Common diseases of crops of Assam 1 10.4 Plant protective chemicals – herbal & commercial chemicals 1 10.5 Implements & uses of plant protective chemicals 1	5
		Class Test- I	1

8. Distribution of Marks

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective type(Compulsory)	Short question	Descriptive Question	
1	Introduction to F,M	2	3	10	
2	Primary Tillage	2	3	8	
3	Equipment	2	3	10	
4	Secondary Tillage	2	3	9	
5	Implements	2	3	8	
6	Seeding and Planting Equipment seed drills & planters Intercultural Tools, Weeding Tools Fertilizer Manure	10	15	45	70

9. Suggested Implementation Strategies :

10. Strategies learning Resource :

- 10.1 Book List)
- i) Principle of Agricultural Engineering Volume-I by AM. Michael & T.P. Ojha
 - ii) Principle of Agricultural Engineering Volume-II by AM. Michael & T.P. Ojha;
 - iii) Element of Farm Machinery by AC. srivastava
- 10.2 List of Journals

10.3 Manuals

10.4 Others

FARM Machinery And Implements (PRACTICAL)

L T P Curri. Ref. No:Ag. -502

3 1 3

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A : 25

Theory: 15 0

Practical: 50

Credit: 4

19. Course Title FARM Machinery & Equipments – (PRACTICAL.)

20. Course Code Ag-502

21. Semester 5th Semester

22. Rationale of the subject/course

23.

7. Detailed Course Content

Chapter No.	Chapter Title	Content	Duration (In Hours)
1	Farm workshop & Hand tools	i) Study of workshop hand tools - Hammer, punches, files, screwdriver, spanner, drill bit etc ii) Study of manually traditional operated Farm tools & Equipments – spade, khilna, kudali, harrow, sickle, axe, chopper, hoe, hand Hoe, Khurpi, Kodali,) Jobaka, Moi, & other traditional farm tools.	2 2 4
2	Indigenous plough	i) Study of Indigenous plough – i) Kakofodia, ii) Singpho, iii) Mukhphodia Plough,	4
3	Study of animal drawn plough	. i) Study of animal drawn plough a) Mould Board Plough b) Disc Plough c) Improved type	4 4
4	Driving of Power tiller, tractor driving	ii) Practice of Power tiller, tractor driving ii) Field operation a) Without implements b) With implements ii) Operation of Animal drawn tillage implement.	6 2 4

5	Study of power operated plough	i) Study of Power operated plough and tillage implement	2
		a) Mould Board Plough	3
		b) Disc Plough	3
6	seed drill	c) Harrow	3
		d) Cultivators,	
		e) Rotavators	
7	Intercultural tools Safety Plant protection equipments	i) Study of seed drill components	2
		ii) Calibration of seed drill	3
7	Intercultural tools Safety Plant protection equipments	i) Study of different types of intercultural tools	2
		ii) Dismantling, Refitting, adjustment and operation	4
		Safety, Periodic Maintenance of both animal drawn and power operated implement	2
7	Intercultural tools Safety Plant protection equipments	i) Study of plant protection equipments- Sprayer & Dusters, ii) workings and maintenance,	2
		iii) Safety, protection Rules.	

CROP PRODUCTION TECHNOLOGY

L T P Curri. Ref. No:Ag. -503

3 1 3

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A :25

Theory: 100

Practical: 50

Credit: 4

1. Course Title : CROP PRODUCTION TECHNOLOGY.
2. Course Code : Ag-503
3. Semester : 5th
4. Rationale of the subject /Course : To impart the basic knowledge of the technical aspects of Agricultural Science with reference to agricultural crop production Technology.
5. Teaching Scheme (in Hours) :

On completion of the course, the student will be able to:

1. Know about different branches of plant science and their application in agriculture and familiar with the grouping of plant kingdom along with the physiological process of plants.
2. Know about nursery technique as type of nursery, preparation of nursery beds, both seed and vegetative propagation nursery.
3. Understand about the crop health including disease, pest, weeds, and their control in agricultural crops.
4. Know about biotechnology, microbiology and tissue culture in agriculture.

Lecturer	Tutorial	Practical	Total
35	15	45	90

5. Examination Schedule :

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100	25	25	17/50	150

7. Details Course Content :

Chapter No	Chapter Title	Content	Duration (in Hrs)
		PART - A	
1	PLANT SCIENCE	1.1 Defination , scope and importance of crop production technology 1.2 Different branches of plant science and their application to agriculture 1.3 Classification & grouping of plant kingdom 1.4 Morphology and anatomy of plant parts 1.5 Cell structure & inclusions 1.6 Physiological process in plants	5
2	CROP PRODUCTION	2.1 Nursery technique – Types of nursery beds, shading,use of chemicals,vegetationspropagation 2.2 Study of major crops of NE India 2.3 Modern cropping pattern 2.4 Crop Ecology	12
3	DIAGONASIS OF CROP HEALTH PROBLEMS	3.1 Crop health problem, different types of pest, diseases and weed. 3.2 Diagnosis of health problem in inportant crops and control methods. 3.3 Types of agrochemicals – pesticides, fungicides, herbicides etc. 3.4 Manures and fertelizers - principles of manuring doses and methods of application	5
4		CLASS TEST -I	1
5	BIO TECHNOLOGY	5.1 Importance of bio technology in agriculture. 5.2 Industrial microbiology and biotechnology. 5.3 Plant breeding and tissue cutture.	4
6	SEED TECHNOLOGY	6.1 Morphology of Seeds- development & different types of seeds 6.2 Quality analysis of improved seeds – methods of seed production and certifiied seeds 6.3 Seed germination and problem of dorment seeds 6.4 Seed viability and storage of seeds	8
7		CLASS TEST -II	1

8. Distribution of Marks :

Chapter No	Chapter Title	Types of Question			Total Marks
		Objective Type(Compulsory)	Short Question	Descriptive Type	
1	PLANT SCIENCE	✓	✓	✓	70
2	CROP PRODUCTION	✓	✓	✓	
3	DIAGNOSIS OF CROP HEALTH PROBLEM	✓	✓	✓	
4	BIO TECHNOLOGY	✓	✓	✓	
5	SEED TECHNOLOGY	✓	✓	✓	
		25	30	15	

9. Suggested Implementation Strategies:

1. Weekly Class room Lecturers,
- 2 Assignment to students,
- 3 Weekly Practical classes for demonstration & self learning ,
- 4 Visual Description through Projectors & E media
- 5 Field visit to resources.

10. Suggested Learning Resources :

- 10.1 Book List:
 1. An Introduction to seed Technology – J.R
 2. Seed Storage- R.n Agarwal
 3. Techques od Seed scence& Technology – P.K Agarwal & V.P Singh
 4. Indian Minimum SeddertificationStanderd _ N.S Tunwar& V.P Singh
 5. Hand book of Agrilculture _ICAR
 6. Hand book of Agril. Science – S.S Singh.Pgupta& A.K Gupta
 7. Modern Approach to Biology ,Part _i& II - Dr R.N Bhattacharjya& I.K
 - 8 Plant protection,Principles& Practices – S.B Chotopadhyya
- 10.2 List of Journals :
- 10.3 Manuals
- 10.4 Others;

CROP PRODUCTION TECHNOLOGY.(Lab.)

L T P Curri. Ref. No:Ag. -503

3 1 3

Total Contact hrs.: 90Total marks: 150Practical: 25

P.A :25

Theory: 100

Practical: 50

Credit: 4

6. Course Title Crop Production Technology (Lab.)
7. Course Code Ag-503
8. Semester 5th Semester
9. Rationale of the subject/courseThe course will be help for Agri. Engg. Students to acquire knowledge of Botany which provide basic concept of field crops.

7.Detailed Course Content

Chapter No.	Chapter Title	Content	Duration(In Hours)
1.	Simple& compound microscope	Study of simple and compound microscope	3
2	plants parts, modified roots, stem and leaf	Study of plants parts, modified roots, stem and leaf	3
3	slide under microscope	Study of permanent slide under microscope	3
4	typical flower (Dicot & monocot)	Study of typical flower (Dicot & monocot)	3
5	Preparation herbarium of cereal crop, weed and medicinal crops.	Preparation and caring for herbarium of cereal crop, weed and medicinal crops.	3
6	seed and verities of major kharif and Rabi crop	Identification of seed and verities of major kharif and Rabi crop	3
7	photosynthesis process	Demonstration of photosynthesis process.	3
8	transpiration by GanonsPotometer	Demonstration of rate of transpiration by GanonsPotometer	3
9	plant propagation	Study of plant propagation by cutting and layering.	3
10	germination of seed Anatomy and di-cot stem	Study competition between weeds and crops.	3
11	Seed bed preparation	Study the structure of cell as seen in the onion under microscope	3
		Experiment on germination of seed	3
		Anatomical study of dicot stem and root	3
		Anatomical study of monocot stem and root	3
		Field Visit	3
		Seed bed preparation	3
		Visit to a nursey.	3

FARM BUILDING STRUCTURE

L T P Curri. Ref. No:Ag. -504

3 1 0

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A :25

Theory: 100

Practical: 50

Credit: 4

Course Title - Farm Building Structure

Course Code Ag-504

Semester 5th Semester

4. Rationale of the subject/course :- One of the Basic responsibilities of an Agricultural Engineer is to construct the structures needed by farmer, which are mostly made of local available materials, well furnished building structures of various use. Thus know-how of details of structures and its estimation concept is must.

On completion of the course, the student will be able to:

1. draw the layout, drawings and construction details of different livestock farm.
2. understand the different types of fences and cost estimation of farm fencing.
3. know the construction details of storage house for food and feed.
4. prepare the scheme for livestock farm.

5. Teaching Scheme (In Hours/week)

Lecture	Tutorial	Practical	Total
3	1	3	7

6. Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100				100

7.Detailed Course Content

Chapter No.	Chapter Title	Content	Duration(In Hours)
1	Introduction to Farm planning	i)Importance of planning, Improved Farming Practice, Equipment and their Importance. ii)Farm layout selection and acquisition of site measurement of farm, iii)Farm layout -Bum house, Goat Piggery, poultry, sheep & Swine house. iii)Planning of various machineries, supplies, enterprises related to farm structure, their economic aspect and utility.	2 2 2
		Class Test	
2	Farm Building Material	i)Different types of material use in construction ii)Description of engineering material. iii)Bricks- Classification, uses, properties of good brick and testing of brick as per Is3495 iv)Sand-charactersticsof good quality sarend for mortar and concrete work	2 2 2 1
3	Storage house structure.	i)Raw material storage, ii)storage house of agricultural food and feed product iii) Types, construction details farm grains bins and godowns, silos, Bunker (in brief)	2 2
4	Livestock Farm	i)Livestock Farm- Types, construction details, capacity & functionalrequirements ii)Fencing-types ,Estimate of fencing	
5		Class Test-II	
6	Rural Sanitation Agricultural Workshop	. i) Septic Tank, soak pit, PRAI Channels, Bore hole, latrines, trench latrine, PRAI Latrine	2 2 2
5	Rural Road & Drainage	i) Brief idea of machine foundation. ii) Installation of machine on platform. iii)Pump house iv) Bio Gas Plant – Plant and its specification	2 1 hr.

		iv) Threshing floor, Implement sheds i) Construction details of Kacha Road, W.B.M. Road and Pukka Road ,Specification as per B.I.S	
		Class Test -III	

8. Distribution of Marks :

Chapter No	Chapter Title	Types of Question			Total Marks
		Objective Type(Compulsory)	Short Question	Descriptive Type	
1	Introduction to Farm planning	2	2		
2	Farm Building Material	4	5	5	
3	Storage house structure	4	5		
4	Livestock Farm	5	4	5	
5	Rural Sanitation,Agricultural Workshop	4	6	5	
6	Rural Road & Drainage	2	4		
		25	30	15	70

9. Suggested Implementation Strategies:

1. Weekly Class room Lecturers,
- 2 Assignment to students,
3. Visual Description through Projectors & E media

10. Suggested Learning Resources :

- 10.1 Book List: 1. Farm Building Structure
2. Principle of Agricultural Engineering

FARM BUILDING STRUCTURE (PRACTICAL)

L T P Curri. Ref. No:Ag. -504

3 1 0

Total Contact hrs.: 90 Total marks: 150 Practical: 25

P.A :25

Theory: 100

Practical: 50

Credit: 4

Course Title - Farm Building Structure Practical

Course Code Ag-504

Semester 5th Semester

4. Rationale of the subject/course :- One of the Basic responsibilities of an Agricultural Engineer is to construct the structures needed by farmer, which are mostly made of local available materials, well furnished building structures of various use. Thus know-how of details of structures and its estimation concept is must.

7.Detailed Course Content

Chapter No.	Chapter Title	Content	Duration(In Hours)
1.	Introduction to Farm planning	Farm planning: Meaning and procedure for farm planning Planning for land resource Planning the labour use Planning the capital use- durable capital, consumable capital Planning for farm building irrigation facilities dairy equipment Farm budgeting- partial budgeting, cash flow budgeting ,enterprise budgeting, complete budgeting	3 3 3 3
2	Farm Building	Study various types of farm building . Livestock buildings and structure, materials needed	3

	Material		3
3	Storage house structure	Study various types of storage structure for food and feed Drawing of Indigenous and modern food grain storage structure Estimate of storage house	
4	Livestock Farm	Study various types of livestock farm viz poultry, dairy, piggery, goat, swine etc Drawing of livestock farm Preparation of Scheme for livestock farm	3 3
5	Rural Sanitation, Agricultural Workshop	Study of rural sanitation system. Study of water supply scheme Study of farm workshop and implement shed.	3
6	Rural Road & Drainage	Study of rural roads and drainage system	4

RENEWABLE ENERGY RESOURCES

L T P Curri. Ref. No:Ag. -505

3 1 0

Total Contact hrs.: 30 Total marks: 100 Practical:

P.A :

Theory: 100

Practical:

Credit: 4

1. Course Title Renewable Energy Resources
2. Course Code Ag-505
3. Semester 5th Semester
4. Rationale of the subject/course: An Agricultural Engineering Diploma holder involve in operating various farm machineries and agro base processing machineries. For this in remote areas application of renewable energy is necessary to perform farm activities.

On completion of the course, the student will be able to:

- 1 To have an Technical concept of renewable energy .
- 2 To have knowledge of installation of Bio-gas plant and its application to the farm. .
- 3 Understanding of the principle of workings of wind mill and its utilization in crops land.
4. Understanding of technical details of the utilization of solar energy in agricultural sector.
5. Knowledge and concept of tidal energy power plant.
6. Building up of Technical capability to .build modern smokeless chullah

5. Teaching Scheme (In Hours/week)

Lecture	Tutorial	Practical	Total
3	1	3	7

6.Examination Scheme

7.Detailed Course Content

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100				100

Chapter No	Chapte Title	Content	Duration in Hrs
1	Introduction to renewable energy	Conventional and nonconventional source of energy, Need, importance and scope of non conventional energy	4
2	Bio-gas and Bio-mass	Bio-gas, benefit of bio-gas, Technology of bio-gas, Principles, feedstock, types and design of bio-gas plant Digester, gas holder, pressure gauge, gas controlling cocks and meter. Selection of bio-gas model and their sizes. site selection for bio-gas plant. Application of bio-gas plant, operation, troubleshooting and maintenance of bio gas plant ,safety measures in bio-gas plant. Bio mass and farm residues.	8
3	Wind Energy	Introduction, scope and significance Classification of wind mill, construction details of windmill. Vertical and horizontal axis wind mill.and their working. Data required for installation of wind mill. Maintenance and performance of wind mill	8
		Class Test-I	1
4	Solar Energy technology	Introduction, significance of solar energy Solar Radiation at the Earth's Surface, Instruments for measuring solar radiation and sun shine Solar spectral and green house effect. Collectors and their types, Flat and concentrating collector Principle of thermal collection and storage Construction, installation of solar panel	8
5	Solar thermal Energy	Operation, construction details and maintenance of solar cooker,solar water heater, solar pump, solar drier, solar pump etc. Solar Photo Voltaic ,Applications of Solar Photo-Voltaic System in Rural Areas-slar lighting, solar lantern, street lighting etc	8
		Class test -II	1
6	Tidal power	Introduction of tidal power plant Factor effecting suitability of site for tidal power plant Classification and working of different tidal power plant and	4
7	Fuel cells	Introuction to fuel cell Principle and working of ful cell Types of fuel cell	3

8	Modern Chullah	Design and construction of modern smokeless chullah, comparative study on different types of chullah	2
		Class Test-III	

8. Distribution of Marks :

Chapter No	Chapter Title	Types of Question			Total Marks
		Objective Type (Compulsory)	Short Question	Descriptive Type	
1	Introduction to renewable energy	2	2		
2	Bio-gas and Bio-mass	4	5	5	
3	Wind Mill	4	5		
4	Solar Energy technology	5	4	5	
5	Solar Thermal Energy	4	6	5	
6	Tidal Power	2	4		
7	Fuel cell	2	2		
8	Modern chullah	2	2		
		25	30	15	70

9. Suggested Implementation Strategies:

1. Weekly Class room Lecturers,
- 2 Assignment to students,
3. Visual Description through Projectors & E media

10. Suggested Learning Resources :

- 10.1 Book List: 1. An Introduction to Non Conventional Energy

TEA ENGINEERING –I (ELECTIVE)

L T P Curri. Ref. No:Ag. -506

3 0 0

Total Contact hrs.: 45

Total marks: 100 Practical:

P.A :

Theory: 100

Practical:

Credit: 3

1 Course Title Tea Engineering –I(Elective)

2 Course Code Ag-505

3. Semester 5th Semester

4. Rationale of the subject/course

1. Know about biology and anatomy of tea plant.
2. Understand about physiology of tea plant.
3. Know about preparation of land for tea cultivation and transplanting method
4. Understand about nursery technique and shading system.

5. Teaching Scheme (In Hours/week)

Lecture	Tutorial	Practical	Total
3	1	3	7

6.Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100				100

7.Detailed Course Content

Chapter No.	Chapter Title	Content	Duration(In Hours)
1	Introduction to Tea Botany	i)Botanical description of tea: Morphological nature of different plant parts eg. Root, stem, leaves, inflorescence, floral part and fruits, Classifications, Tea agro types, ii)Taxonomical position of tea.	3
2	Biology of tea plant:	i)Vegetative structure, reproductive parts and its structure, i) life cycle and growth pattern of tea, cytology of tea.	3
3	Anatomy of tea	i) Cell wall: Physical and chemical nature, it's origin, structure and function Tissue and tissue systems, structure, location and function, ii)Meristem and meristematic tissues,Anatomical study of different parts of tea plant.	4
		Class Test -I	1
4	Crop development & Growth Characteristic of Tea Plant	i) Factors affecting plant growth and development, ii) Periodicity of flush shoot growth, hormonal regulation of growth periodicity, Abscission of leaves on unplucked bushes, Abscission of leaves on plucked bushes, iii)Depth and spread of root,.Movement of Photosynthates, Starch reserve and pruning time, Dormancy, Leaf are index, Harvest index, iv) Partitioning of photosynthates and productivity, Growth regulation. Photoperiodism&Vernalization.	6

5	Physiology of Growth and Productivity of Tea	i)Tea seed maturation, germination and storage, Maintenance of foliage, winter dormancy, ii) mechanism photosynthesis and movement of photosynthate of tea, growth regulators of tea, iii) physiology of plucking, harvest index, partitioning of photosynthesis and productivity.	5
6	Tea Cultivation:	i)Planning, Site selection, Suitability of land, ii)Land Preparation, Design, Layout and Stacking, Planting Techniques and Replanting.	4
		Class Test-II	4
7	Shade tree	i)Introduction, Classification of shade, Effect of shade tree, Propagation of shade tree, ii)Shade verses tea ecosystem, iii)Shade verses tea nutrition & soil moisture, iv)Orientation of shade,	4
8	Young and Mature Tea Pruning	Selection of shade tree, Maintenance of shade tree. i)Objectives of pruning, Theory of pruning, Planning, ii)Types of pruning, Pruning cycle, Time of pruning, Methods of pruning, Effects of pruning, Mechanical pruning	4
9	Nutrient availability in tea Soils	i)Characteristic of tea soil, soil fertility ii)Nitrogen- occurrence, mineralization, immobilization, mechanisms of N loss, N cycle iii)Phosphorus and potassium-occurrence, fixation and availability iv)Sulphur-occurrence, mineralization, immobilization, oxidation and reduction v)Zinc and boron- occurrence and availability	4
10	Manures and fertilizers Management of Tea	i)Definition, characteristics, classification and nutrient contents. ii)Preparation and preservation of manures. iii)Methods of application of manures and fertilizers; their advantages and disadvantages. . iii)Inorganic fertilizers, time & techniques of fertilizer application, fertilizer requirement of tea, , iii)principles of fertilizer application, balanced fertilizers, fertilizer use efficiency, Storing of Fertilizer iv)soil analysis & fertilizer recommendation, v) classification& composition of manures liquid fertilizers.	4
		Class Test-III	1

Fruits And Vegetables Process Engineering – I (Elective)

L T PCurri. Ref. No:Ag. -506
3 0 0

Total Contact hrs.: 45

Total marks: 100 Practical:

P.A :

Theory: 100

Practical:

Credit: 3

Course Title Fruits And Vegetables Process Engineering – I (Elective)

Course Code Ag-505

Semester 5th Semester

Rationale of the subject/cours

On completion of the course, the students will be able to :

Understand about nursery technique and shading system

Know about method of packing, type of container used in food packaging

Understand about principles of method of fruit preservation

Know about principle of dehydration, quality evaluation, physical quality etc.

5. Teaching Scheme (In Hours/week)

Lecture	Tutorial	Practical	Total
3	1	3	7

6.Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100				100

7.Detailed Course Content

Chapter NO	Chapter Title	Conten	Duration(In Hour
1		1.0Introduction to the subject 1.1 Principle of fruit and vegetable preservtion 1.2Introduction to processing industries and function, prospect in Assam, NE	5Hrs
2		2.0Modern method of assembling, preparation and processing of different fruits and vegetables 2.1Method of packaging and types of container used,legislation of fruit packaging	6Hrs
3		Principle and method of fruit preservation	6Hrs
4		Principl of dehydration,yingetcsundrying,air drying	6Hrs
5		Class Test -I	6Hrs
6		Packaging of dry fruit and vegetables, various methodfruits and vegetables,various methods	6Hrs
7		In plant quality control	6Hrs
8		Quality evaluation,Grading	2 Hrs
9		Transportation of fruits and vegetables	6Hrs
10		Marketing of finish product Domestic and foreign market	4 Hrs
11		Class Test -II	1Hr

PROFESSIONAL PRACTICE II

Curri. Ref. No: Ag. -510

L T P
1 0 2

Total Contact hrs.: 30 Total marks: 50 Practical:25

Theory: 0 P.A : 25

Practical: 30

Credit: 2

Rational :

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

Aim

Student will be able to: • Acquire information from different sources • Prepare notes for given topic • Present given topic in a seminar • Interact with peers to share thoughts • Prepare a report on industrial visit, expert lecture

Contents Activities

1. INDUSTRIAL VISITS

12

Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries: Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant. i. Machine shop having CNC machines. ii. Modern service station dealing in Tractor iii. Minor irrigation projects. iv. Manufacturing unit to observe finishing and super finishing processes.

2. LECTURES BY PROFESSIONAL / INDUSTRIAL EXPERT LECTURES TO BE ORGANIZED FROM ANY TWO OF THE FOLLOWING AREAS:

10

i) Interview Techniques. ii) Modern Argil Equipment such as combine harvester, Concept of Genetic engineering iii) Applications of Sensors and Transducers in Auto & allied Industry iv) Alternate fuels - CNG /

LPG, Biodiesel, Non conventional energy, Ethanol, hydrogen v) Modern irrigation methods of Drip & Sprinkler

Sl No	Code NO	Subject	Student Evaluation Scheme										Total Marks(Theory+Practical) 1	Credit	
			Study Scheme (Contact hours/week)			Theory					Practical				
			L	T	P	ESE	TA	HA	Total(TA+HA)	Pass(ESE+SS)	Practical Test (PT)	Practical Assessment(PA)@			Pass (PT+PA)

technology 3. INFORMATION SEARCH: 10

Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic. Following topics are suggested: i. Engine lubricants & additives ii. Automotive gaskets and sealants iii. Engine coolants and additives iv. Two and Four wheeler carburetor. v. Power steering vi. Filters vii. Different drives/Transmission systems in two wheelers. viii. Types of bearings - applications and suppliers. ix. Air conditioning & Cold storages for agricultural products. x. Maintenance procedure for solar equipment. xi. Tools holder on general & special purpose machines and uses.. 4. SEMINAR: 13

Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes) Mini Project / Activities: (any one) a) Prepare one model out of card board paper / acrylic / wood / thermocol / metal such as: i) Indigenous Plough ii) M.B Plough iii) Gang of Disc Plough & Harrow iv) Cams and Followers v) Vermi compost Tank, vi) Azola tank b) Dismantling of assembly (e.g. jig / fixtures, tool post, valves etc.) Take measurement and prepare drawings / sketches of different parts. c) Make a small decorative water fountain unit, Model of Soil Erosions,. d) Wall mounting Figure, Sketch, drawing & Photograph of plant & Machineries related to agricultural..

COURSE STRUCTURE 6th SEMESTER, AGRICULTURAL ENGINEERING

											#				
1	Ag-601	Advance Farm Machinery	3	2	0	70	10	20	30	33/100	-	-	-	100	3
2	Ag-602	Water Resource Engineering	3	1	3	70	10	20	30	33/100	25	25	17/50	150	4
3	Ag-603	Hydraulic Machine	3	0	3	70	10	20	30	33/100	25	25	17/50	150	4
4	Ag-604	Refrigeration & Cold Storage	3	1	0	70	10	20	30	33/100				100	4
	Ag-612	General Viva		2	0						50		17/50	50	2
5	Ag-611	Project & Seminar	0	1	6						100	50	50/150	150	4
7	Ag-610	Professional Practice-IV	1	0	2						25	25	17/50	50	3
Optional (Any one)													Total	750	
6 A	Ag-605	Tea Engineering-II	3	-	-	70	10	20	30	33/100	-	-		100	3
6 B	Ag-606	Fruits And Vegetables Process Engineering-II	3	-	-	70	10	20	30	33/100	-	-	-	100	3
														850	25
Grand Total															

Advance FARM Machinery

L T PCurri. Ref. No:Ag. -601

3 2 0

Total Contact hrs.: 45Total marks: 100Practical:

P.A :

Theory: 100

Practical: 0

Credit: 3

1. Course Title Advance FARM Machinery
2. Course Code Ag- 601
3. Semester 6th Semester
4. Rationale of the subject/course

5. Teaching Scheme (In Hours/week)

5. Lecture	6. Tutorial	7. Practical	8. Total
9. 3	10. 2	11.	12. 5

6.Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100				100

7.Detailed Course Content

Chapter No.	Chapter Title	Content	Duration (In Hours)
1	Plant protection equipments:	i)Sprayer, different types. Function,uses ii)Duster, different types,function,uses iii)Safety Rules	2

2	Power Transmission Devices	i)Transmission of power in farm machinery ii)Flat and V -belt drives, length of belt, ratio of tensions, iii)Horse power transmitted, effect of centrifugal tension, condition for maximum power transmission, iV)belt dynamometer. (No derivation), Simple problems	2 2 2
3		Class Test	
4	Harvesting and Threshing	i)Harvesting and Threshing Machinery Familiarization with the harvesting machines for various crops e. g. hay harvesters, forage harvesters, vertical conveyer reapers, cotton pickers, com harvester, potato diggers, ground nut diggers. ii) Constructional details &principles of working. Study of power thresher including axial flow thresher - main components, function and constructional details. ii)Safety requirements in threshing operations. Iii)Introduction to combine harvesters and straw combines and study of their operation. iv) Losses during harvesting and threshing operations and their management.	4 4 2 4
5		Class Test	
6	Land Development Equipments:	i) Land Development Machinery Familiarization with various land development implements e.g. leveler, planer, scraper, ridger. Study of their functions and adaptability. ii) Dozer, its adjustment of blade operation and output. iii)Concept of land leveling, cutting and filling. iv)Scraper, construction and output. v)ExcavatingEquipments, construction and working. vi) Power Shovel, drag outs and draft line and its working.	2 4 4 2
7	Economic and Management of Farm Equipments: 04	i) Matching equipments to farm needs. Calculation of cost of operation of machines. ii)Field Capacity and Field efficiency. iii) Repairing and maintenance of farm machinery. iv)Customer use of farm equipments, advantages and disadvantages	2 1
8		Class Test-III	

8. Distribution of Marks

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective type(Compulsory)	Short question	Descriptive Question	
1	Plant protection equipments: Power Transmission	2	3	10	
2		2	3	8	
3		2	3	10	
4		2	3	9	
5		2	3	8	

	Devices Harvesting and Threshing Land Development Equipments: Economic and Management of Farm Equipments	25	30	15	70

9. Suggested Implementation Strategies :

10. Strategies learning Resource :

10.1 Book List

- i) Principle of Agricultural Engineering Volume-I by AM. Michael & T.P. Ojha; Jain brother
- ii) Principle of Agricultural Engineering Volume-II by AM. Michael & T.P. Ojha; Jain brother
- iii) Element of Farm Machinery by AC. Srivastava

10.2 List of Journals 10.3 Manual

WATER RESOURCE ENGINEERING

L T PCurri. Ref. No: Ag. -602

3 1 3

Total Contact hrs.: 45

P.A : 25

Total marks: 150 Practical: 25

Theory: 150

Practical: 50

Credit: 4

1. Course Title Water Resource Engineering
2. Course Code Ag-602
3. Semester 6th Semester

Rationale of the subject/course: Diploma holders are first line supervisor. He/she has to plan the water resource engineering project as well as have to execute the plan mainly at field, so that objective of the project can be fulfilled. He/she has the skill to adopt and execute the actual plan of the water resource project.

5. Teaching Scheme (In Hours/week)

Lecture	Tutorial	Practical	Total
3	1	3	7

6. Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100	25	25	17/50	150

7. Detailed Course Content

Chapter No.	Chapter Title	Content	Duration(In Hours)
1	Introduction to water Resource engineering	1.1 Hydrology - Definition, Hydrologic cycle, Precipitation forms and types of PPT 1.2 Evaporation, Transpiration & Consumptives use of water. Estimation of evaporation 1.3 Measurement of rainfall and analysis of rainfall chart, Graphical measurement of rainfall. 1.4 Estimate of missing data & adjustment of record. 1.5 Mean areal depth of ppt	2 2 2 2
2	Run off	i) Factor effecting run off & its measurement ii) Rainfall & runoff relationship iii) Hydrograph, unit hydrograph	2
		Class Test-I	1
	Steam flow	i) Steam flow measurement, ii) Estimation of peak flow	4

	Irrigation Technology Conveyance of irrigation water	i)Irrigation - Definition, Necessary, Advantages, Disadvantages, function of irrigation water sources of water ii)Types of irrigation, brief description of each types. iii)Methods of irrigation & Irrigation efficiencies	8
	Canal irrigation	i)Canals and their classification (brief description only), ii)seepage from canals and field channels. iii)Canal lining-various types. Their merit & demerit iv)Introduction to various water conveyance structure and their functions e.g. flumes, tunnels	4
	Drainage	i)Drainage – types,planning&d esign of field drainage, ii)Sub-surface drainage system, Miscellanies works.	4
	Water logging	i)Water logging definition effect & cause, ii) anti water logging measure .	2
	Water requirement of Crop	i)Definition of duty, delta & base period, their relationship Factor effecting duty,Improvement of duty, ii)definition of G.C.A, CCA, crop ratio, etc. I)Crop quality of irrigation water, plant response .rotation, its merit & demerit, Irrigation requirement of major crops,	4
		Class Test-II	1
	soil & water conservation	i) Types, causes of erosion, damage causes by erosion. Ii)Gully erosion – Bio-logical & engineering method of control.	4
	Reclamation of saline alkaine soil	i)Salt affected soils and their reclamation ii)Saline, alkaline and acid soils, Reasons and factors of iii)their formation. Effect of salinity, alkalinity and acidity on plant growth. iv)Reclamation of these soils and their management	2
	Agricultural Dam	Earthen Dams - Hydraulic consideration, failure & structural stability of earthen dams culverts in earthen dams.	2
		Class Test-H	1

9. SugestedImplementation Strategies :

10. Strategies learning Resource :

10.1Book List

- i)Soil and water conservation Engineering By Schwab, GP, Fravert, R.K., Edminister T.W. andBarners K.K., Pub.
- ii). Soil Water Conservation Engineering By R. Suresh, Publisher: Standard Publishers DistributorsNew Delhi
- iii). Principles of Agrill. Engg. Vol. I & II By A.M. Michel & T.P. Ojha, Publisher : Jain Brothers,New Delhi.
- iv). Land and water management By V.V.N. Mruty, Kalyani, Publisher.

10.3 Manuals

10.4 Other

WATER RESOURCE ENGINEERING (Lab.)

L T PCurri. Ref. No:Ag. -602

3 1 3

Total Contact hrs.: 45

P.A :25

Total marks: 150 Practical: 25

Theory: 150

Practical: 50

Credit: 4

4. Course Title Water Resource Engineering (Lab.)

5. Course Code Ag-601

6. Semester 6th Semester

4.Rationale of the subject/courseDiploma holder is a first line supervisor. He/she has to plan water Resource engineering project as well as have to execute the plan mainly at field, so that objective of the project can be fulfill. He/she has the skill to adopt and can execute the actual plan of the soil and water conservation measures. Technical know how is must for the successful implementation.

7.Detailed Course Content

Chapt er No.	Chapter Title	Content	Durati on(In Hours)
1	Average depth ofrain fall	i)Study of Rain gauge - both recording and non recording type and measurement of rainfall.	2
		ii)Rainfall analysis - analysis of point rainfall and its intensity,	2
		iii)Determination of rainfall, characteristics, iv)Determination of climatic characteristics of a region,	2
2	Average depth ofrain fall	i)Determination of average depth ofrain fall over an area- a) Arithmetic mean method, b) Theissen polygamy method, c) isohyetal method. d) To draw a hydrograph and unit hydrograph, Base flow separation method	8
4	Evaporati on and water requireme nt	i) Determination of evaporation by pan evoporimeter.	2
		ii)Consumptive use and water requirement of crops	2
		iv)Determination of consumptive Use & water requirement of crop by blancycriddle method,.	2
5	Water flow Measure ment:	i)Discharge by Weir (triangular, rectangular, trapezoidal), V-notch, Parshal etc.	6
		ii)Discharge through open channel - determination of velocity and discharge through and open channel by —	2
6	Soil Erosion	i)Float Method,ii)Current Meter, ii)Manning's formula, iii)Determination of discharge of a tube well.	6
		i)Field survey of different kind of erosion	4
		ii)Planning and alignment of Bunds and terraces. earthen dam	2
		iii)Study of gully control structures. Field visit to soil and water conservation project ,irrigation project	2

HYDRAULIC MACHINE

L T P Curri. Ref. No:Ag. -603
3 0 3

Total Contact hrs.: 45

P.A :25

Theory: 100

Total marks: 150 Practical: 25

Practical: 50

Credit: 4

1. Course Title : HYDRAULIC MACHINE
2. Course Code : Ag-603
3. Semester : 6th semester
4. Rationale of the subject/course : An Agricultural Engineering Diploma holder has to operate the various types of pump in Agril. Field. The student can learn to overhauling a pump and **repaire** the same. They can performed the job with quality and good efficiency.
5. Teaching Scheme (In Hours/week)

	Lecture	Tutorial	Practical	Total
	3		3	6

Chapter No.	Chapter Title	Content	Duration(In
	Theory	Practical	Total Hours)
			Marks
Examination	Ground Water	Pass(ESE+SS)	4
	Sessional	1.1 Origin of ground water 1.2 Prospect and testing of ground water	
2	Wells	2.1 Hydraulics of well	4
	Full Marks, ESE	Practical Test (PT)	
	Trial(TA+HA)	Practical Assessment(PA)@	
		Pass (PT+PA)	
70	30	33/100	25
			25
			17/50
			150

6.ExaminationSchem

		2.2 Types of wells, construction details of wells.	
3		Class Test-I	1
4	Water lifting devices for Agril. use	3.1 Classification of water lifting devices 3.2 Construction, working principle, 3.3 Installation, limitation, scope for development	6
5		Class Test-II	1
6	Tube well Engineering	5.1 Selection of site for tube well 5.2 Rigs, types of rotary and percussion for drilling 5.3 Tube well construction, Installation and working 5.4 Drilling of tube wells and construction of open wells 5.5 Preparation of well logs, types of strainer and its advantages 5.6 Cavity tube well and bamboo tube well	2 4 4 4 2 2
6	Pumps Maintenance	6.1 Reciprocating pump, Principle and operation 6.2 Centrifugal pumps, principle and operation 6.3 Types of impeller, Installation of centrifugal pump 6.4 Pumps characteristics, performance curve, 6.5 Effect of speed and impeller diameter on pump performance, trouble shooting and remedies 6.6 Turbine pump, deep well submersible jet pump 6.7 Operation, Maintenance, trouble shooting and remedies.	2 2 2 2 2 2
7	Pump testing	Testing and selection of pump	2
8		Class Test - III	1

7. Detailed course content :

8. Marks Distribution

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective type(Compulsory)	Short question	Descriptive Question	
1	Ground Water	4	2		
2	Wells	4	4	6	
3	Water lifting devices	6	6	6	
4	Tube well	6	8	4	
5	Engineering Pumps	3	6		
6	Maintenance Pump testing	2	4		
		25	30	15	70

9. Suggested:Implementation Strategies :

10. Strategies learning Resource :

10.1Book List

- i) Soil and water conservation Engineering By Schwab, GP, Fravert, R.K., Edminister T.W. and Barners K.K., Pub.
 - ii). Soil Water Conservation Engineering By R. Suresh, Publisher: Standard Publishers Distributors New Delhi
 - iii). Principles of Agrill. Engg. Vol. II By A.M. Michel & T.P. Ojha, Publisher : Jain Brothers, New Delhi.
 - iv). Water well and pump Engineering by AM Michal.
- 10.2 Journals : Journals available at ICAR websites.
- 10.3 Manuals : Manuals available at ICAR websites.
- 10.4 Others

Course Title : HYDRAULIC MACHINE LAB

5. Course Code : Ag-603
6. Semester : 6th semester
7. Rationale of the subject/course :
8. Detailed course content :

Sl. No.	Chapter Title	Content
01	Study of indigenous water lifting devices	Study of different parts of reciprocating pump
02	Study of different irrigation pump use in agril. Field. Brief discussion on each type.	Study and operation of reciprocating pump
03	Reciprocating pump	
04	Centrifugal pump	Determination of discharge of imprecating pump
05	Submersible pump	
06	Common pump troubles, remedies and regular maintenance of pump	Study of different parts C.F. pump Study and operation of C.F. pump
07	Study the criteria for selection of pump	Study the discharge of C.F. pump Study of different parts of Submersible pump Jet pumpFloat Method, i. Current Meter, ii. Manning's forn iii. Determination of discharge of a tube well. i. Field survey of different kind of erosion ii. Planning and alignment of Bunds and terraces, n dam iii.Study of gully control structures. iv.Field visit to soil and water conservation project,Irrigation project.

Course Title : REFRIGERATION AND COLD STORAGE

Course Code : Ag-604

Semester : 6th semester

Rationale of the subject/course : To impart the basic engineering principles of heat transfer and refrigeration technology for the basic agril. Need as freezer, cooler and cold storage for fruit vegetable, meat etc as much storage for civic amenities, research and preservation of perishable agricultural commodities.

5. Teaching Scheme (In Hours/week)

Lecture	Tutorial	Practical	Total
3	1	0	9. 4

6. Examination Scheme

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100	25	25	17/50	100

7. Detailed course content :

Chapter No	Chapter title	Content	Duration (in Hrs)
1	Introduction to Refrigeration & Cold storage	1.1 Introduction to Refrigeration & Cold storage- details of syllabus, Reference books etc 1.2 Definition of Heat, Heat transfer process, Units & Dimension- calorie, specific heat	
2	Definitions of some common terms	Isotropic & adiabatic processes ,heat transfer related to ref. and cold storage	
3	Heat transfer theory	Definitions & terminology of refrigeration, refrigerants & desired properties	
4	Refrigeration terminology and the refrigeration cycle	Refrigerating system- air cycle, vapour compression, vapour absorption, Thermo electric cooling, Joule Thomson effect	
5	Refrigeration system cycles	Vapour compression system-operational cycle ,compressor, expansion valve, fans, evaporator pipe fitting, and accessories	
6	Vapor compression system	Types of compressor, evaporator, condensure, Thermostat ,application, types of thermostat	
		Class Test-I	

7	Vapour absorption system	PV diagram – theoretical & actual, super heating & sub cooling	
8	Analysis of psychometric chart	Vapour absorption system-operational cycle & components	
9	Refrigerant	Introduction to Psychometric chart and analysis	
		Class Test-II	
10	Cooling load	Cooling load estimation, determination of U factor and COP	
11	Application of refrigeration	Analysis of cold storage condition for fruits & vegetables Analysis of cold storage condition for Cereals & pulses Analysis of cold storage condition for Meat & Fish Analysis of cold storage condition for Dairy products Analysis of cold storage condition for refrigerated products for transit	
		Class Test -Iii	

8.Distribution of marks

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective type(Compulsory)	Short question	Descriptive Question	
1	Introduction to Refriger& Cold storage				70
2	Definitions of common terms	2	2		
3	Heat transfer theory		4		
4	Refrigeration terminology and the refrigeration cycle	3	4	6	
5	Refrigeration system cycles	4	6	4	
6	Vapor compression system		4	5	
7	Vapour absorption system	2	4		
8	Analysis of psychometric chart		4		
9	Refrigerant	2			
10	Cooling load		4		
11		2			

		2			
		2			
		25	30	15	

10. 9. Suggested:Implementation Strategies :

10. Strategies learning Resource :

10.1Book List

- i) Soil and water conservation Engineering By Schwab, GP, Fravert, R.K., Edminister T.W. and Barners K.K., Pub.
- ii). Soil Water Conservation Engineering By R. Suresh, Publisher: Standard Publishers Distributors New Delhi
- iii). Principles of Agrill. Engg. Vol. II By A.M. Michel & T.P. Ojha, Publisher : Jain Brothers, New Delhi.
- iv). Water well and pump Engineering by AM Michal.

10.2 Journals : Journals available at ICAR websites.

Course Title :Project work and its presentation in seminar

Course Code : Ag 611

Semester : 6th semester

Rationale of the subject/course : Project are intended to provide student of agril. Engg, diploma with the ability to tackle new problem with inquisitiveness. The project work is included in the course to develop skill to plan, organize, survey, investigation, to collect relevant data, analysis of them and take appropriate decision by the students. The course is designed with the above mentioned objectives.

5. Teaching Scheme (In Hours/week)

Lecture	Tutorial	Practical	Total
	1	6	7

6.ExaminationSchem

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
			100	50	50/150	150

7. Details of course content

Chapter No	Chapter title	Content	Duration (in Hrs)
	Project Planning ,preparation of report	1.1Selection of project 1.2Objective of project report 1.3Need of preliminary project report 1.4Scheduling the activities involved in project work 1.5 Project selection 1.6 Model format of project report 1.5Preparaton of action plan for implementation1.6	15

		Preparation of project report	
	Project planning ,innovative technology	2.1 Innovative technology based on landscape and gardening project in a big infrastructure company. 2.2 Innovative technology need analysis based on community development project.	15
	Project planning related to Agril. Engg.	3.1New technology based on design and construction of machinery project of post harvest technology 3.21New technology based on design and construction of machinery project of farm machinery and equipments 3.3Innovative technology based on irrigation project.{Dam.canal,tubewell project) 3.4 Non conventional energy based innovative project	15
	Presentation of project work by seminar		

Tea Engineering –II(Elective)

L T PCurri. Ref. No:Ag. -605

3 0 0

Total Contact hrs.: 45

Total marks: 100 Practical:

P.A :

Theory: 100

Practical:

Credit: 3

1. Course Title Tea Engineering –II(Elective)
2. Course Code Ag-505
3. Semester 4th Semester
4. Rationale of the subject/course: A diploma holder in Agril. Engg.student has to acquire knowledge about selection and working of tea machinery, various types of tea processing and their application that is necessary for working in tea industry.

5. Teaching Scheme (In Hours/week)

Lecture	Tutorial	Practical	Total
3			3

6.ExaminationSchem

Theory			Practical			Total Marks
Examination	Sessional	Pass(ESE+SS)	Practical Viva	Sessional		
Full Marks, ESE	Total(TA+HA)		Practical Test (PT)	Practical Assessment(PA)@	Pass (PT+PA)	
70	30	33/100				100

7.Details of course content

Chapt er No.	Chapter Title	Content	Duration (In Hours)

1	Tipping: Plucking	i)Definition, Time of tipping, objectives and importance. ii)Introduction, Objectives of plucking, Effect of plucking, iii) Theory of plucking, Shoot growth, Leaf and bud dynamics, iv)Plucking system, Plucking height and length, Plucking standard, v)Plucking interval, Plucking and maintenance foliage.	4
2			
3	Withering Trough	i)Principles of withering trough, Open,enclosed,Hot air type trough iii)Trough design and analysis (Design criteria, trough area, no of trough, power requirement and capacity).	6
	Rolling:	i)Rolling machine, Rotorvane: Principles of Rotorvane,Specification. ii)Cryovane,B.L.C,TableRoller,Gren leaf shifter, Specification.Working,designcriteria,performance and capacity iii)performance of Rotorvane, Development of Rotorvane.	6
		Class Test -I	1
4	CTC Machine	:i) Principles of CTC machine, ii)Machine specification: Tilt cone, Sharpening, Chasing, Milling, Special specification I & II. iii) CTC Roller: Size, Types, Speed, Capacity, Power requirement. i)Introduction, Objectives of fermentation, Biochemical changes during	4
	Fermentation:	fermentation, factors affecting fermentation, ii)Fermenting room, Methods of fermentation, Hygienic control.	4
5	Drying: Dryer:i)	i)Objectives of drying, theory of drying, i)Types of dryer, factors considering during drying, drying time, ii)Principles of drying, Fluid Bed Dryer,iii)CTD,ECD, VFBD, Solar dryer, dryer modification.	8
		Class Test-II	1
6	i)Manufacture of Black Tea, ORTHODOX, GREEN,ORGANIC TEA	i). Quality analysis of green leaf, Ballmeter method, Principle Stages of Processing, Process Engg consideration ii)Orthodox ANDUn-orthodox manufacture: Leaf conditioning, CTC Process, iii)Manufacture of green tea, organic tea, semi-fermented tea. IV)Characteristics of Black tea, Green tea & semi-fermented tea,	4
7	Sorting and Grading	i)Sorting and Grading, Various grade. Definition, Principles of sorting machine, types of sorting machine, Development of sorting machine ii) Storage &Packaging.	3
		Class Test-III	

PROFESSIONAL PRACTICE IV

Curri. Ref. No: Ag-610

L T P

0 0 2

Total Contact hrs.: 30 Total marks: 50 Practical:

Theory: 0 P.A : 50

Practical: 30

Credit: 1

Rational :

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

Aim

- Student will be able to:
- Acquire information from different sources.
- Prepare notes for given topic.
- Present given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture

Contents Activities

1. INDUSTRIAL VISITS 8

Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. (2 visits)

Following are the suggested types of Industries/ Fields –

- i. Automobile manufacturing / auto component manufacturing units to observe the working of SPM ii. Refrigeration and air conditioning manufacturing / servicing units / industries / workshops iii. Automobile service stations for four wheelers
- iv. Co-ordinate measuring machine to observe its construction working specifications and applications.
- v. Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc. vi. Wheel Balancing unit for light and / or heavy motor vehicles. vii. Food processing unit.
- viii. Argil tools & machinery manufacturing / servicing units. ix. Heavy Irrigation projects like Bhakra-Nangal, Damodor valley. x. Argil Machinery Testing & Research Association of India, Budni, MP, Vehicle Research and Development establishment ,Ahmednagar. xi. Engine testing, exhaust gas analysis and vehicle testing xii. Safety museum at Central Labour Institute, Sion, Mumbai

2. THE GUEST LECTURE/S 8

From field/industry experts, professionals to be arranged (2 Hrs duration), minimum 4 nos. from the following or alike topics.

The brief report to be submitted on the guest lecture by each student as a part of Term work

- a) Electronic fuel injection systems
- b) Exhaust gas analysis. c) Vehicle testing.
- d) Transducer application in automobiles.
- e) Environmental pollution & control.
- f) Study, designing & fabrication of Argil Equipment for more users comfort.
- g) Earth moving & Land reclamation machines.
- h) Automobile pollution, norms of pollution control.
- i) Biotechnology j) Rapid prototyping
- k) MPFI l) Packaging technology m) Cold storage technology

3. GROUP DISCUSSION: 4

The students should discuss in group of six to eight students and write a brief report on the same, as a part of term work. The topic of group discussions may be selected by the faculty members.

Some of the suggested topics are (any one) –

- i. CNG versus LPG as a fuel.
- ii. Petrol versus Diesel as a fuel for cars.
- iii. Trends in automobile market.
- iv. Trends in use of Non conventional energy resources.
- v. Rain water harvesting.
- vi. Trends in refrigeration Technology.
- vii. Disaster management.
- viii. Safety in day to day life.
- ix. Energy Saving in Institute.
- x. Nano technology.

4. SEMINAR: (ANY 2 TOPICS) 8

Seminar topic should be related to the subjects of fifth semester / topics from guest lectures. Students shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes for a group of 2 students)

5. MINI PROJECTS: (IN A GROUP OF 4-5 STUDENTS) 6

1. Design / drawing of simple jigs & fixtures, agril machinery components
2. Thermocouple based gauge & controller.
3. Models (working / semi working type) using simple mechanism or fabrication of cut model from unserviceable components
4. Layout design of SSI units / factory / workshop of the institute

6. MODELS OF MATERIAL HANDLING ROUTE SYSTEMS OR MODULAR COURSE ON ANY ONE OF THE SUGGESTED OR ALIKE RELEVANT TOPIC BE UNDERTAKEN BY A GROUP OF STUDENTS (MIN 10): 9

- a) LPG/CNG conversion of vehicles
- b) Bio fuel kits
- c) Designing of land leveling for Drip / Sprinkler irrigation laying
- d) Prototype design of Argil Implements & Structures
- e) Nontraditional manufacturing methods
- f) maintenance of home appliances

7. STUDENT ACTIVITIES: 5

Students in a group of 3 to 4 shall perform any two of the following activities (Other similar activities may be considered) and write a report as a part of term work. ACTIVITIES:-

1. Collection of data regarding loan facilities or other facilities available through different organizations / banks to budding entrepreneurs
2. Survey and interviews of successful entrepreneurs in nearby areas
3. Survey of opportunities available in thrust areas identified by Government or DIC..
4. Survey of data regarding different types of pumps with specifications from manufacturers catalogue, local markets, end users (any other engineering products may be considered for survey)
5. Survey of farm implements used by farmers

Text Books:

1. Mark Ratner and Daniel Ratner: Nanotechnology -Pearson Educatuion, New Delhi
2. YoramKorem:Computer Control of Manufacrtng System- Mcgraw Hill Publication
3. Sunil Chopra, Peter Meindl:Supply Chain Management - Pearson Educatuion, New Delhi.

GOVERNMENT OF ASSAM
STATE COUNCIL FOR TECHNICAL EDUCATION
DIRECTORATE OF TECHNICAL EDUCATION, ASSAM



FINAL SYLLABUS OF 2nd SEMESTER

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Inclusion of National Education Policy, 2020:

As envisioned in the NEP 2020 the State Council for Technical Education, Assam will be responsible for mentoring its affiliated Polytechnics so that they develop capabilities and achieve minimum benchmarks in academic and curricular matters, teaching and assessment.

State Council for Technical Education (SCTE), Assam will notify the pool of MOOCs courses duly approved by its statutory bodies and map them in Academic Bank of Credits (ABC). Affiliated Polytechnics may opt for any of these courses as required. State Council for Technical Education (SCTE) will take suitable action for preparation of syllabus for these courses including learning objective and learning outcome.

The State Council for Technical Education (SCTE) may fix the minimum number of credits to be earned by the students from a parent institution.

All the affiliating institutions will complete Academic Bank of Credits registration through SCTE. Institute will monitor the opening of ABC account by all the students.

Salient features

Salient features that are to be considered for developing the curriculum aligned to NEP 2020 are as follows:

- Reduced number of credits.
- Introduction of Student Induction Program.
- Well defined learning objectives & outcomes for each course.
- Inclusion of courses on socially relevant topics.
- Built-in flexibility to the students in terms of professional elective and open Elective courses.
- Mandatory internship to equip the students with practical knowledge and provide them exposure to real time industrial environments.
- Virtual Labs.
- Mapping of Courses to its equivalent NPTEL/SWAYAM Course.
- Course on 'Entrepreneurship and Startups' to encourage entrepreneurial mindset.
- Introduction of Design Thinking and Universal Human Value course.

Basic Guidelines:

The existing Credit System is revised as Choice Based Credit System (CBCS) in line with NEP guidelines, to infuse innovation and flexibility. No hard separation between streams, between curricular and extra-curricular, between Vocational and Academic, Multidisciplinary and holistic education across the disciplines, Ethics and Human & Constitutional values, Life skills, use of technology as part of all curriculum.

- An academic year is divided into two semesters as per AICTE guidelines.
- A semester consists of approximately 90 working days. One working week will have approximately 40 hours of instructional time.
- There shall also be a Winter Internship Program for duration of 4 weeks/one month from 1st January to -31st January.
- Summer term courses may be offered on a fast-track mode to enable students to complete arrears/special courses.

- Teachers may avail semester end vacations after the end of each semester. Subject to completion all kinds of examination related work.
- The Polytechnics under the Directorate of Technical Education can decide on the kind of courses to be offered in the summer term, based on the requirements and also based on the availability of teaching faculty.
- Internship/apprenticeship can be carried out during the winter term, mandatorily for regular student.
- Students who wish to exit after 1st year or 2nd year of study, have to undergo mandatory bridge courses as defined in the course structure.

Induction Program:

The Essence and Details of Induction program can be find from the ‘Detailed Guide on Student Induction program’, as available on AICTE Portal,

(Link: <https://www.aicteindia.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf>),

The Induction program for students to be offered right at the start of the first year for three-week duration.

- Physical activity
- Creative Arts
- Universal Human Values
- Literary
- Proficiency Modules
- Lectures by Eminent People
- Visits to local Areas

Mandatory Visits/ Workshop/Expert Lectures:

- a) It is mandatory to arrange one industrial visit every semester for the students of each branch.
- b) It is mandatory to conduct a One-week workshop during the winter break after fifth semester on professional/ industry/ entrepreneurial orientation.
- c) It is mandatory to organize at least one expert lecture per semester for each branch by inviting resource persons from domain specific industry

GENERAL COURSE STRUCTURE & CREDIT DISTRIBUTION

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credit
2 Hours Practical (P) per week	1 credit

B. Range of Credits:

In the light of the fact that a typical Model Four-year Under Graduate degree program in Engineering has about 160 credits, the total number of credits proposed for the three-year Diploma program in Engineering & Technology is 120.

C. Structure of Diploma Engineering program:

The structure of Diploma Engineering program shall have essentially the following categories of courses with the breakup of credits as given:

Sr. No.	Category	Suggested Breakup of Credits
1.	Humanities & Social Sciences courses	8*
2.	Basic Science courses	19*
3.	Engineering Science courses	15*
4.	Program Core courses (Branch specific)	45*
5.	Program Elective courses (Branch specific)	12*
6.	Open Elective courses (from other technical and /or emerging subjects)	9*
7.	Project work, seminar and internship in industry or elsewhere	12*
8.	Audit Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge etc.]	(non-credit)
	Total	120*

*Minor variation is allowed as per need of the respective disciplines.

D. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
HS	Humanities & Social Sciences Courses
BS	Basic Science Courses
ES	Engineering Science Courses
PC	Program Core Courses
PE	Program Elective Courses
OE	Open Elective Courses
AU	Audit Courses
SI	Summer Internship
PR	Project
SE	Seminar

E. Course level coding scheme:

Three-digit number (odd numbers are for the odd semester courses and even numbers are for even semester courses) used as suffix with the Course Code for identifying the level of the course e.g.

101, 102 ... etc. for first year

201, 202 Etc. for second year

301, 302 ... for third year

F. Evaluation Scheme for 2nd Semester of Diploma in Engineering courses under State Council for Technical Education (SCTE), Assam

For Theory Courses:

(The weightage of Internal assessment is 40% and for End Semester Exam is 60%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

For Practical Courses:

(The weightage of Internal assessment is 60% and for End Semester Exam is 40%) The student has to obtain at least 40% marks individually both in internal assessment and end semester exams to pass.

For Summer Internship / Projects / Seminar etc.

Evaluation is based on work done, quality of report, performance in viva-voce, presentation etc.

Note: The internal assessment is based on the student's performance in mid semester tests (two best out of three), quizzes, assignments, class performance, attendance, viva-voce in practical, lab record etc.

G. Mapping of Marks to Grades

Each course (Theory/Practical) is to be assigned 100 marks, irrespective of the number of credits, and the mapping of marks to grades may be done as per the following table:

Range of Marks	Assigned Grade	Grade Point	Remarks
91-100	A ⁺	10	Outstanding
81-90	A	9	Excellent
71-80	B ⁺	8	Very Good
61-70	B	7	Good
51-60	C ⁺	6	Average
46-50	C	5	Below Average
40-45	D	4	Pass
< 40	F (Fail due to less marks)	-	Fail
-	F ^R (Fail due to shortage of attendance and therefore, to repeat the course)	-	-

H.Credit Distribution, Mark Distribution and Break up of Internal Assessment Marks as per following table:

a) Credit Distribution:

Semester-II

S. No.	Course Code	Course Title	L	T	P	Credit
1	BS-201	Mathematics-II	3	1	0	4
2	BS-202	Applied Physics-II	2	1	0	3
3	ES-202	Introduction to IT Systems	2	0	0	2
4	ES-204	Fundamentals of Electrical and Electronics Engineering	2	1	0	3
5	ES-206	Engineering Mechanics	2	1	0	3
6	BS-207	Applied Physics Lab– II	0	0	2	1
7	ES-208	Introduction to IT Systems lab	0	0	4	2
8	ES-209	Fundamentals of Electrical and Electronics Engineering lab	0	0	2	1
9	ES-210	Engineering Mechanics lab	0	0	2	1
10	AU-201	Environmental Science	2	0	0	0
TOTAL CREDIT=						20
Total Hours per week = 27 [L=13; T=4; P=10]						

b) Marks Distribution

Semester – II

S. No.	Course Code	Course Title	Internal Assessment (Theory)		ESE		Internal Assessment (Practical)		Practical Test		Total Marks (Course)	Pass Marks (Course)
			Total Marks	Pass Marks	Total Marks	Pass Marks	Total Marks	Pass Marks	Total Marks	Pass Marks		
1	BS-201	Mathematics-II	40	16	60	24	-	-	-	-	100	40
2	BS-202	Applied Physics-II	40	16	60	24	-	-	-	-	100	40
3	ES-202	Introduction to IT Systems	40	16	60	24	-	-	-	-	100	40
4	ES-204	Fundamentals of Electrical and Electronics Engineering	40	16	60	24	-	-	-	-	100	40
5	ES-206	Engineering Mechanics	40	16	60	24	-	-	-	-	100	40
6	BS-207	Applied Physics Lab– II	-	-	-	-	60	24	40	16	100	40
7	ES-208	Introduction to IT Systems lab	-	-	-	-	90	36	60	24	150	60
8	ES-209	Fundamentals of Electrical and Electronics Engineering lab	-	-	-	-	90	36	60	24	150	60
9	ES-210	Engineering Mechanics lab	-	-	-	-	60	24	40	16	100	40
10	AU-201	Environmental Science	40	16	60	24	-	-	-	-	100	40
Total											1000	

N.B: The marks of Audit Course is not included in total marks.

c) Break Up of Internal Assessment Marks

Internal Assessment for Theory (TA+HA&CT)

Component	Teacher's Assessment (TA)			Home Assignment & Class Test (HA&CT)				Total
	Attendance	Discipline	Class Participation	Home Assignment	Presentation / Seminar	Quiz	Class Test	
Maximum Marks	5	1	2	4	6	2	20	40
Note: Three (3) class tests must be conducted for each course. For calculation of Internal Assessment, best two (2) class tests out of the three (3) conducted is to be considered.								

Internal Assessment for Practical (PA)

(i). For 60 marks

Component	Maximum Marks
Teacher's Assessment (TA)	
Attendance	10
Discipline	2
Practical Assignment	
Practical Work and/or Laboratory Report	30
Presentation	10
Viva	8
Total	60

(ii). For 90 marks(IT System Lab/FEEE Lab)

Component	Maximum Marks
Teacher's Assessment (TA)	
Attendance	10
Discipline	5
Practical Assignment	
Practical Work and/or Laboratory Report	45
Presentation	15
Viva	15
Total	90

Note: Student must pass in Internal Assessment (Theory & Practical). If a student fails in Internal Assessment, he/she will not be allowed to appear in the End Semester Examination.

d) Grading System proposed is Absolute Grading System.

e) Conversion factor from Cumulative Grade Point Average (CGPA) to Percentage (%) is 10.

Range of Attendance with Marks (for Theory):

Sl No.	Range of Attendance	Marks
1	96% and above	5 Mark
2	91% to 95%	4 Mark
3	86% to 90%	3 Mark
4	81% to 85%	2 Mark
5	76% to 80%	1 Mark
6	75%	Only permitted to appear in the exam
7	Between 60% to 75%	NC: May appear in the exam if there are genuine reasons
8	Below 60%	DC: Cannot appear in the exam

Range of Attendance with Marks (for Practical):

Sl No.	Range of Attendance	Marks
1	96% and above	10 Mark
2	91% to 95%	9 Mark
3	86% to 90%	8 Mark
4	81% to 85%	7 Mark
5	76% to 80%	5 Mark
6	75%	Only permitted to appear in the exam
7	Between 60% to 75%	NC: May appear in the exam if there are genuine reasons
8	Below 60%	DC: Cannot appear in the exam

Valid Ground for Non-collegiate students:

1. Medical grounds.
2. Participation in a state/national level competition, including the journey period as approved by the Head of Institution.
3. Participation in a seminar of national/international level, workshop or conference, including the journey period as approved by the Head of Institution.
4. Participation in voluntary programmes conducted by the Institute/Directorate as per Government notification.
5. Any other grounds which the Examination Committee, in consultation with the Secretary, SCTE may approve.

Current Examination Fee structure:

- Non Collegiate Fees: Rs. 300/- (per subject)
 - Examination Fee: Rs. 500/-
 - Retest Fee: Rs. 200/- (per subject)
- N.B: The rates may be changed subject to Government order.

Conditions for Dis-Collegiate (DC) student:

- (i) Any candidate who is an internal student but has attended less than 60% of classes in any one or more subjects on theory and/ or practical shall not be eligible to appear in the respective semester examination and termed as Dis-collegiate student.
- (ii) Dis-collegiate students will have to repeat the semester by taking admission in the next session.

Note: The above guidelines may be changed/modified as per AICTE and Government of Assam notification from time to time.

Detailed Second Semester Curriculum Contents (Common to all Branches)

1. Course Title: Mathematics-II

1. **SUBJECT/ COURSE CODE: BS-201**

2. **Semester: Second semester**

3. **Objectives:** The main objectives of this course are:

- i) To learn about the circle and conic section.
- ii) To learn about the three dimensional Co-ordinate geometry.
- iii) To learn about measures of central tendency of statistical Data.
- iv) To learn about relations and functions of variables and their derivatives.
- v) To learn about integration methods and its applications for measuring areas.

4. **Course Outcome:** On completion of the course, students will be able to

CO -1. Recognise and differentiate between closed and open curves under different conditions

CO -2. Locate and object in space and calculate its distance with reference to other objects.

CO - 3. Understand several numerical methods belonging to measure of central tendency to describe the characteristics of a data set.

CO -4. Obtain Derivative of a function and its application.

CO- 5. Obtain Integration of a function and its application using properties of Definite Integral.

5. **Teaching scheme(in hours):**

Teaching scheme(in hours)		
Lecture	Tutorial	Total per week
3	1	4

6. **Detailed course content:**

Chapter No	Chapter Title	contents	Intended learning outcomes	Hour (Theory) 45
Group - A : CO-ORDINATE GEOMETRY (TWO and three DIMENSION) Hours: 8 Marks: 10				
A1	Co-Ordinate geometry of two dimensions	1.1 Circle: Standard equation , Equation of a circle under different conditions. Introduction to the concepts of Parabola , Ellipse and hyperbola (related simple problems)	1.Define and explain the concept of a circle. 2.Define conic section.	5

A2	Co-Ordinate geometry of three dimensions	2.1 Three dimensions Co- Ordinate system . Distance formulae, Section formulae, direction cosines, direction ratios.	Locate a point in space , find its locus, distance from other points , objects(linear as well as angular)	3
GROUP- B Statistics HOURS : 4 MARKS : 5				
B1	Measure of Central Tendency .	Mean, Median and Mode. (simple problems.) Relation between mean median and Mode.	Understand Basic measures of Central Tendency.	4
GROUP- C DIFFERENTIAL CALCULUS HOURS : 19 MARKS : 25				
C1	Function	1.1. Definition of Function and type of functions. Odd and even function, Periodic, composite, explicit, implicit and Parametric functions 1.2. Domain , Range, and co- domain of function .	Understand the different type of functions and their Domain and Range.	3
C2	Limit of a function	2.1. Definition , standard limits . 2.2. Evaluation of limits.	Understand Limit of a function under different conditions.	3
C3	Continuity of a function .	3.1. Definition , testing of continuity problems .	Learn behaviour of continuous and discontinuous functions .	2
C4	Differentiation or Derivative of a function.	4.1.Differentiation of some Standard functions using first Principle of derivative.	1. Understand the meaning of differentiation.	3
		4.2. Derivative of Function of a function, implicit function and Parametric Functions. Engineering application problems.	Learn to obtain derivatives of different type of functions.	3

		4.3. Geometrical interpretation of first order derivative Equation of Tangent, normal.	Understand the Geometrical significance of derivatives.	2
		4.4. Second order derivative. Maxima, Minima, Engineering application of Second order derivative .	Learn to find higher order Derivative and their application.	3
GROUP- D INTEGRAL CALCULUS HOURS : 14 MARKS : 20				
D1	INTEGRATION	1.1 Integration as inverse process of differentiation. List of formulae .	Understand the meaning of integration .	2
D2	Method of Integration	Integration by method of substitution. Integration by parts. Integration by algebraic fractions.	Learn the different methods of integration.	5
D3	Definite Integral	3.1 Definition, Fundamental theorem on Definite Integral Properties of Definite Integral 3.2. Evaluation of Definite Integrals using fundamental laws and properties.	Learn and apply different properties of Definite Integral to solve problems .	5
D4	Application of Integration	4.1. Area under curve.	Know the application of Definite Integral.	2

7. Distribution of Marks :

Chapter no.	Chapter Title	Type of question			Total
		Objective Type	Short questions	Descriptive questions	
A1	Co-Ordinate geometry of two dimensions	1	2	3	
A2	Co-Ordinate geometry of three dimensions	1		3	
B1	Measure of Central Tendency .	2		3	
C1	Functions	2	2		
C2	Limit of a function	2		3+3	
C3	Continuity of a function .	1	2		
C4	Differentiation or Derivative of a function.	2	2	3+3+3	
D1	Integration	1			
D2	Method of Integration	2	2	3	
D3	Definite Integral	1	2	3	
D4	Application of Integration			3	
		15	12	33	60

9. Suggested implementation strategies: The syllabus can be completed by taking regular classes along with tutorial classes. Audio-Visual aids also can be used.

10. Suggested learning resources:

Text Books (T1, T2):

1. An Introduction to Polytechnic Mathematics Vol- II by Geetali Das , Ajanta Choudhury, Parbin Ahmed.
2. Engineering mathematics by H.K Das .
3. Applied Mathematics (Vol I & II) by RD Sharma.
4. Calculus for beginners by R.K Chakravorty .

Annexure – 1

TABLE OF SPECIFICATION FOR THEORY:

Sr. no	Topic (a)	Time allotted in hours (b)	Percentage weightage(c)	k	C	A	HA
1	CO-ORDINATE GEOMETRY (TWO and	8	17.8%	2	2	6	

	three DIMENSION)						
2	Statistics	4	8.9%	2	...	3	
3	DIFFERENTIAL CALCULUS	19	42.2%	7	6	15	
4	INTEGRAL CALCULUS	14	31.1%	4	4	9	
	Total	45	100	15	12	33	

K = knowledge C = Comprehension A = application

HA = Higher than application (Analysis , Synthesis , Evaluation).

$$C = \frac{b}{\sum b} \times 100$$

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

2. Course Title: Applied Physics-II

1.Course Title: Applied Physics - II

2.Course code: BS-202

3. Prerequisites: High School Level Physics

4. Rationale of the subject: Physics is a foundation of all core technology subjects. Study of Physics is essential for Diploma holders in engineering and technology to develop in them proper understanding of physical phenomenon, scientific temper and engineering aptitude. Curriculum of Applied Physics includes fundamental concepts used in industrial applications. So, physics is taught in the 1st and 2nd semester in all disciplines of Diploma Engineering.

5. LEARNERS OBJECTIVES: After completion of the course learners will be able to:

- learn and understand different physical quantities.
- learn and understand different laws of light, magnetism,
- understand about properties of matter, transmission of heat, wave and oscillation.
- learn about photo electric effect, radioactivity, X-ray and laser.
- tackle engineering problems in their chosen area of application.

6. Course outcome: After completion of the course, students will be able to:

C.O.1: apply core concept in materials like properties of matter, heat transmission etc. for different engineering tasks.

C.O.2: identify different factors affecting acoustical planning of buildings

C.O.3. Develop a comprehensive understanding of the fundamental laws of light, including reflection, refraction, total internal reflection and their applications in optical fibre.

C.O.4. apply the core concept of magnetism.

C.O.5: use the properties of laser, X-rays, Becquerel rays and photoelectric effect for various Engineering applications.

7. Teaching Scheme (in hours):

Theory			Practical	Total
Lectures	Tutorial	Class Test	30	93
30	30	3		

8. Teaching scheme (in hours)/ week

Lectures	Tutorial	Practical	Credit point
2	1	0	3

9. Examination Scheme:

Theory				Total Marks
Examination		Internal Assessment		100
Full Marks	Pass Marks	Full Marks	Pass Marks	
60	24	40	16	

10. DETAILED COURSE CONTENTS:

Chapter	Title of Chapter	Topics and Sub-topics	Teaching Hours	Marks
1	PROPERTIES OF MATTER	1.1 Elasticity, definition of deforming force, restoring force, Elastic and plastic body stress and strain and their types, modulus of elasticity (Young's modulus, Bulk modulus and Rigidity modulus) and their units; Hooke's law, significance of stress-strain curve. (numerical problems) 1.2 Definition of thrust, pressure and their units, pressure inside a liquid, Pascal's law of transmission of liquid pressure and its application to Hydraulic press and Hydraulic brakes. Buoyancy, Archimedes principle, density and specific gravity (relative density) their relation. Determination of Specific gravity, numerical problems. 1.3 Surface Tension: Definition and its units, Viscosity: Definition, coefficient of viscosity and its unit.	4	9
2	WAVE AND OSCILLATION	2.1: Periodic motion, oscillatory motion, Definition of Simple harmonic Motion, Its geometrical representations, Expression for amplitude, velocity, acceleration, time period, frequency etc. Simple Pendulum, expression for its time (derivation not required), second's pendulum. Free and forced vibrations, Resonance. 2.2: Wave motion, Characteristics, Types of wave motions (longitudinal and transverse waves) with examples, Definitions of parameters related to wave motion (time period, frequency, amplitude, wavelength, wave velocity) and their relations. Stationary wave, properties of stationary wave, Difference between progressive and stationary wave. 2.3. Propagation of sound, Newton's formula velocity of sound in air and Laplace's correction, factors affecting velocity of sound in air. 2.4. Audible range, ultrasonic and	6	10

		infrasonic sound, application of ultrasonic to calculate the depth of an ocean. 2.5. Reflection of sound, echo, minimum distance of the reflector to produce echo, reverberation, reverberation time, Sabine's law, acoustic requirements of a good auditorium. Doppler's effect (details not required)		
3	LIGHT	3.1: Recapitulation of laws of light (Reflection and refraction of light), idea of real and virtual image, reflection from plane mirror and spherical mirror, mirror formula, (mirror formula to be assumed), sign convention, ray diagram, nature, position and size of images for different positions of object. Applications of mirrors. Refractive index, apparent depth, critical angle, total internal reflection, relation between critical angle and refractive index, 3.2: Optical Fiber: Introduction, Basic principle of optical fibre, structure and classification, acceptance angle and numerical aperture, applications of optical fibres. 3.3: Refraction through prism, minimum deviation. Relation between R.I. and angle of minimum deviation, numerical. 3.4: Refraction through lens, lens formula (to be assumed), sign convention, magnification, nature, position and size of images for different positions of object, power of a lens, numerical. Optical instruments: Telescope (Terrestrial and Astronomical), magnifying power.	6	10
4	MAGNETISM	4.1: Recapitulation of magnetism, properties of magnet, magnetic field, and magnetic lines of force, theory of magnetism, induced magnetism, properties of magnetic lines of force. 4.2: Inverse Square law of magnetism, its explanation with mathematical expression, permeability, types of		

		substances (paramagnetic, diamagnetic and ferromagnetic), magnetic potential & magnetic intensity, calculation of magnetic intensity due to a dipole on end-on & broad-side on position, magnetic moment, couple on a magnet in a uniform magnetic field, Tangent law and its mathematical expression, Deflection Magnetometer. 4.3: Terrestrial magnetism, elements of terrestrial magnetism, explanation of declination, dip/inclination, and horizontal component of earth's magnetic field.	3	8
5	MODERN PHYSICS	5.1. Photo Electric Emission: Planks quantum theory, photo electric effect, Characteristics of photoelectrons, Einstein Photo Electric equation, Photo electric cells (Photo emissive cell, Photo-Conductive cell and photo voltaic cell) and its applications 5.2. Radioactivity, Becquerel Rays, Binding Energy and Mass Defect, natural and artificial radioactivity, Radioactive Disintegration, Applications of radioactivity (nuclear fission, nuclear fusion, and nuclear fuel) 5.3.X-rays, properties, application in industry and medical field (Production apparatus not necessary). 5.4. LASER, Stimulated or induced absorption, spontaneous and stimulated or induced emission, principle of laser, metastable state, population inversion and pumping, components of laser, Properties of laser, different types of lasers (details not required), applications of laser.	4	9
		6.1: Concept of heat and temperature and their units, heat capacity, specific heat, water equivalent; Principle of calorimetry, measurement of specific heat of a substance. (numerical problems) 6.2: Different scales of temperature measurement, their relationship and numerical examples, thermometers (Mercury thermometer, Platinum resistance thermometer &		

6	HEAT AND THERMODYNAMICS	Pyrometer) basic idea. 6.3: Modes of heat transfer (conduction, convection, and radiation with examples), thermal conductivity, its unit. 6.4: Change of state of a body, Fusion/melting, laws of fusion, effect of pressure on melting point, Regelation, Vaporization, boiling point, Laws of ebullition, latent heat, numerical problems. Evaporation, difference between vaporization and evaporation, factors on which rate of evaporation depend. 6.5: Expansion of solids, liquids and gases; coefficient of linear, areal and cubical expansions and relation amongst them (deduction not required), expansion of liquid, coefficient of real and apparent expansion, Anomalous expansion of water (experiment determination not necessary). Expansion of gases, gas laws, Boyle's law, verification of Boyle's law 6.6: Thermodynamic system, Zeroth law of thermodynamics, Thermal equilibrium, Concept of heat; internal energy, First and Second law of thermodynamics significances and limitations, basic idea of heat engines.	6	12
7	Nano physics	7.1. Introduction to nanomaterial, nature and types of nanomaterials and their applications.	1	2

11. Distribution of Marks:

Chapter No.	Chapter Title	Hours	Type of Question			Total Marks
			Objective type Compulsory	Short Question	Descriptive Question/numerical	
1	Properties of matter	4	3	2	4	9
2	Wave and Oscillations	6	3	1	6	10

3	LIGHT	6	2	2	6	10
4	MAGNETISM	3	2	2	4	8
5	MODERN PHYSICS	4	2	2	5	9
6	Heat and Thermodynamics	6	2	3	7	12
7	Nano physics	1	1	1	-	2
TOTAL:		30	15	13	32	60

12. DETAILED TABLE OF SPECIFICATIONS FOR THEORY

N O. Sr.	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Properties of matter	1	1	1	3	1	1	-	-	2	1	1	2	-	4
2	Wave and Oscillations	1	1	1	3	-	-	1	-	1	2	1	3	-	6
3	LIGHT	1	1	-	2	1	-	1	-	2	1	2	3	-	6
4	MAGNETISM	1	1	-	2	1	-	1	-	2	1	1	2	-	4
5	MODERN PHYSICS	1	-	1	2	1	1	-	-	2	2	1	2	-	5
6	Heat and Thermodynamics	1	-	1	2	1	1	1	-	3	2	2	3	-	7
7	Nano physics	1	-	-	1	-	-	1	-	1	-	-	-	-	-

K=Knowledge, C= Comprehension, A= Application, HA= Higher than application ((analysis, synthesis, Evaluation) and T=Total.

13. TABLE OF SPECIFICATIONS FOR THEORY

Sl. No:	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c) %	K	C	A	HA
1	Properties of matter	4	13.33	4	3	3	
2	Wave and Oscillations	6	20	2	2	5	
3	LIGHT	6	20	3	3	4	
4	MAGNETISM	3	10	3	2	3	
5	MODERN PHYSICS	4	13.33	3	3	3	
6	Heat and Thermodynamics	6	20	4	3	5	

7	Nano physics	1	3.33	1	-	1	
TOTAL		30 □ b	100%	20	16	24	

K=Knowledge, C= Comprehension, A= Application, HA= Higher than application
(analysis, synthesis, Evaluation)

Suggested learning Resource:

A. Book list:

Sl. No.	Title	Author	Publisher
1	Modern Approach to Physics Part I & II	Dilip Sarma, N G Chakraborty, K N Sharma	Kalyani Publishers- New Delhi
2	Applied Physics Part I	Manpreet Singh, Dr. Major Singh, Mrs. Hitashi Gupta	S K Kataria & Sons- New Delhi
3	Applied Physics Part II	Manpreet Singh, Dr. Major Singh, Mrs. Hitashi Gupta	S K Kataria & Sons- New Delhi
4	Basic Applied Physics	R K Gaur	Dhanpat Rai Publication- New Delhi
5	Physics- Std XI, Std XII	-	HSC board/CBSE Board
6	Concept of physics Part I & II	H.C Verma	Bharati Bhawan-New Delhi
7	Introduction to nano technology	C. P. Poole, Jr., and Frank. J. Owens,	Wiley- Interscience.

B. Websites:

I.<http://hyperphysics.phy-astr.gsu.edu/>
C:\Users\HP\Downloads\II.<http://physics.info>

C. By using Models, Video etc.

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3. Course Title: Introduction to IT Systems

Course Code : ES – 202
Credits- 2 (L: 2, T: 0, P: 0)

Course Objectives:

- This course is intended to make new students comfortable with computing environment
- Learning basic computer skills
- Learning basic application software tools
- Understanding Computer Hard-ware and Cyber security awareness

Course outcomes (Theory):

At the end of the course student will be able to

- CO 1 Explain the basic components and functions of computer hardware and software.
 CO 2 Solve problems related to number systems.
 CO 3 Design static web pages using HTML and CSS .
 CO-4 Familiarize with Open office writer, calc and Impress.
 CO-5 Explain the different threats and security measures related to protection of computer systems.

Detailed Course Content

Unit	Unit Title	Content	Hours
I	Introduction to computer systems:	Definition of Computer System, Block Diagram of Computer System. Component of Computer System - Hardware and Software. Hardware components – CPU, Memory (types), Display Units (types), Key-board, Mouse, HDD, SSD and other Peripheral Devices. Software: Types of Software – Application Software, System Software and Utilities Software. Overview of Operating Systems - What is an OS? OS Functions, Brief history on Evolution of OS. Types of OS. OS Processing – (Batch, Multi-programming, Multitasking, Real-time, Timesharing), Operating System Structures.	7
II	Basics of Number system and codes	Binary, octal, hexadecimal and decimal Number systems and their inter conversion, Different types of Codes - BCD Code, Gray Code, ASCII Code, EBCDIC Code, Unicode, ISCII.	4
III	Basic Internet skills	Understanding browser, types and efficient use of search engines, IP address, http, https, Cookies, how to delete browser data, downloads, emails and Awareness about Digital India portals (state and national portals) and college portals.	3

IV	HTML 4, CSS basics	HTML – Introduction □ HTML – Elements □ HTML – Tags □ HTML – Text □ HTML – Formatting □ HTML – Pre □ HTML – Attributes □ HTML – Font □ HTML – Text Links □ HTML – Comments □ HTML – Lists □ HTML – Images □ HTML – Image Links □ HTML – Tables □ HTML – Bgcolor □ HTML – Color Codes □ HTML – Color Chart □ HTML – Background □ Web Forms □ HTML – Forms □ HTML – Input □ HTML – Text Fields □ Hidden Fields □ HTML – Password □ HTML – Reset • HTML – Submit □ HTML – Checkboxes □ HTML – Radio □ HTML – Select □ HTML – Hidden Fields □ HTML – Upload □ HTML – Textarea □ Special Tags □ HTML – Body □ HTML – Meta □ HTML – Style □ HTML – Div □ HTML – Layouts □ HTML – Frames □ Formatting Tags □ HTML – Bold □ HTML – Paragraphs □ HTML – Headings □ HTML – Line Breaks CSS: CSS Introduction □ CSS Syntax □ CSS Id & Class □ CSS Styling □ Styling Backgrounds □ Styling Text □ Styling Fonts □ Styling Links □ Styling Lists • Styling Tables □ CSS Border □ CSS Margin □ CSS Display □ CSS Positioning □ CSS Align □ CSS Types - Inline, Internal and External.	7
V	Office Tools	OpenOffice Writer, OpenOffice Spreadsheet (Calc), OpenOffice Impress. Open Office Tools: Writer – Page setup, Table, Insertion of Pictures, Page Layout, Bullets, Insertion of objects and symbols, Header, Footer, Page Number, etc., Calc-format cell properties, formula, sort and filters, chart. Impress – Addition and Deletion of Slides, Design, Animation, Slide Show etc.	3
VI	Information security best practices	What is Information Security & Why do you need it? – Basics Principles of Confidentiality, Integrity and Availability Concepts, Policies, procedures, Guidelines, Standards Administrative Measures and Technical Measures, People, Process, Technology. Threats to Cybersecurity - Viruses, Worms, Phishing, Malware, Trojans, Spyware, Adware, Rootkits, Email hijacking. Methods to protect your personal computers – What is Antivirus? Types of Antivirus. Firewalls.	6

Teaching Scheme

Teaching Scheme		
Lecture	Tutorial	Total
2	-	2

Total No. Of classes	30
Lecture	30
Tutorial	-

Assessment Scheme

	Internal	ESE	Total
Full Marks	40	60	100
Pass Marks	16	24	40

Distribution of marks

Unit No.	Unit Title	Type of Question			Total marks
		Objective	Short	Descriptive	
I	Introduction to computer systems	4	5	5	14
II	Basics of Number system and codes	2	2	4	08
III	Basic Internet skills	1	2	3	06
IV	HTML 4, CSS basics	4	5	5	14
V	Office Tools	1	2	3	06
VI	Information security best practices	3	4	5	12
	Total	15	20	25	60

References:

- R.S. Salaria, Computer Fundamentals, Khanna Publishing House
- Introduction to IT Systems (with Lab Manual) – By Prashant Joshi.
- Introduction to IT Systems – By P. Mondal (Bhagabati Publication)
- Web Design With HTML & CSS - by [Prem Kumar](#)
- HTML & CSS Easy learn in 7 Days Paperback – by [Albert Irudaya Raj](#)
- Mastering HTML, CSS & JavaScript Web Publishing - by [Laura Lemay](#)
- HTML and CSS: Design and Build Websites - by Jon Duckett

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4. Course Title: Fundamentals of Electrical and Electronics Engineering

Course Code	:	ES 204
Course Title	:	Fundamentals of Electrical and Electronics Engineering
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	NIL
Course Category	:	ES

Aim:

To equip students with fundamental knowledge of electrical and electronic concepts, necessary parts, and circuit analysis methods so they can comprehend and know how basic systems work and get ready for more complex engineering coursework.

Course Objectives:

- To give students a foundational understanding of the various electrical and electronic engineering concepts and elements,
- To provide information on active and passive electronic components, signals, digital electronics, and their uses,
- To assist them in navigating the principles and applications of electrical and electronics engineering in various industrial processes.

COURSE OUTCOME (CO):

On completion of the course, the student will be able to:

CO1- Understand the different electrical and electronics circuit elements, signal waveform, logic gates.

CO2- Classify different electrical and electronic circuits.

CO3- Solve basic problems related to electrical circuits and digital electronics.

CO4- Compare the various types of wiring systems and analyze different digital logic gates.

Course Content:

ELECTRICAL ENGINEERING			
Chapter No.	Chapter Title	Course Content	Duration Hours
1.	Fundamentals of Power generation Sources	A brief idea on: Conventional Power- Hydro, Thermal and Nuclear power generation Non-Conventional Power- Solar, Wind, Ocean Energy, Bio-Mass and Geo-thermal	02
2	Electric and Magnetic Circuits	Ohm's Law, Definition of EMF, Current, Potential Difference, Power and Energy; M.M.F, magnetic force, permeability, Idea on hysteresis loop, reluctance, leakage factor and BH curve; Analogy between electric and magnetic circuits.	05
3	AC circuits	Introduction to Cycle, Frequency, Periodic time, Amplitude, Angular velocity, RMS value, Average value, Form Factor, Peak Factor, impedance, phase angle, and power factor; j-	08

		operator; Mathematical and phasor representation of alternating emf and current; Basics of A.C circuits (purely R, L, C, R-L series, R-C series, R-L-C series and parallel circuits); Power in A. C. Circuits, Power, Voltage and Impedance triangle.	
4	Transformer and Electrical Machines	General construction and working principle of transformer; Core and Shell type transformers; Transformation ratio; Auto- transformers; Construction and Working principles of DC & AC machines	06
5	House wiring	Introduction to Internal House Wiring; Methods of house wiring and comparison; Wires and Cables; Electrical hazards and Safety measures.	04
ELECTRONICS ENGINEERING			
6	Basics of Electronics	Energy band diagram, intrinsic and extrinsic semiconductor, doping, P- type & N-type semiconductor, PN junction diode, forward bias & reverse bias characteristics of PN junction diode, introduction to half and full wave rectifier circuits, filter circuits. Transistor: Physical construction of bipolar PNP and NPN transistor, biasing circuit configuration (CE, CB, CC) and comparison. Elementary idea of LED, LCD, 7-segment display	08
7	Fundamentals of Digital Electronics	Difference between Analog and Digital signals, Introduction to Boolean Algebra, Electronic Implementation of Boolean Operations, Logic Gates, Introduction to Combinational circuit, Sequential circuit and Storage elements (Flip Flops & Counters)	05
8	Micro-electronic Technology	Introduction to Integrated Circuits – advantages and disadvantages, Uses of IC. Types of ICs-Linear and Digital, Monolithic and Hybrid. Overview of IC manufacturing process – Wafer processing, Photolithography, Etching, Ion Implementation, Doping, Testing, Packaging, packaging types	04
9	Class Test		03

Distribution of Marks/ Table of specifications

TABLE OF SPECIFICATIONS FOR THEORY

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	T
1	Fundamentals of Power generation Sources	02	01	2	-	2
2	Electric and Magnetic Circuits	05	11	5	3	8
3	AC circuit	08	18	8	4	12

4	Transformer and Machines	06	13	5	3	8
5	House wiring	04	9	3	3	6
6	Basics of Electronics	08	18	8	3	11
7	Fundamentals of Digital Electronics	05	11	6	2	8
8	Micro-electronic Technology	04	09	4	1	5
9	Class test	3	7	-	-	-
	Total	45	100	41	19	60

K = Knowledge C = Comprehension

A = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation)

Details Table of Specification for Theory

Sr. No	Topic (a)	Objective Type			Short Answer Type			Long Answer Type		
		K	C	T	K	C	T	K	C	T
1	Fundamentals of Power generation Sources	-	-	-	2	-	2	-	-	-
2	Electric and Magnetic Circuits	2	-	2	2	-	2	-	4	4
3	AC circuit	2	-	2	4	2	6	-	4	4
4	Transformer and Machines	2	-	2	-	2	2	4	-	4
5	House wiring	2	-	2	2	2	4	4	-	4
6	Basics of Electronics	2	-	2	4	-	4	-	5	5
7	Fundamentals of Digital Electronics	2	-	2	2	-	2	-	4	4
8	Micro-electronic Technology	3	-	3	-	2	2	-	-	-
	Total	15	00	15	16	08	24	08	17	25

K = Knowledge C = Comprehension

A = Application

T = Total

N.B.:- 1. The question pattern will be as per the instruction of SCTE or as per existing rules.

2. The objective type questions may be in the form of multiple choice, fill up the blanks, write in one sentence and match the following type.

Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector, Smart board, Video etc for effective teaching learning process .

References:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House
2. Mittal and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand Publications, New Delhi, 2015, ISBN: 9788121924375
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
7. Sedha, R.S., A text book of Applied Electronics, S.Chand, New Delhi, 2008, ISBN-13: 978-8121927833
8. Malvino, Albert Paul, David, Electronics Principles, McGraw Hill Education, New Delhi, 2015, ISBN-13: 0070634244-978
9. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504

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5. Course Title: Engineering Mechanics

Course Code	ES - 206				
Category	Engineering Science Course				
Course Title	Engineering Mechanics				
Scheme and Credits	L	T	P	Credits, C	Semester-II
	2	1	0	3	
Pre-requisites (if any)	Physics, Mathematics, Engineering Drawing				

LEARNING OBJECTIVES:

At the end of the lessons the students will be able to:

LO1	Calculate magnitude and direction of the resultant of coplanar concurrent and non-concurrent forces applying parallelogram law, method of resolution of force.
LO2	Establish triangle law of force, polygon law of force by the aid of Bow's notation, space diagram, vector diagram for calculating graphically magnitude and direction of coplanar concurrent and non concurrent forces.
LO3	Compute moment, couple and find the position of the resultant force analytically by applying Varignon's theorem for coplanar concurrent and non-concurrent forces and graphically for parallel forces.
LO4	Construct free body diagram of a body to compute equilibrant, individual forces for a system of coplanar concurrent and non-concurrent forces analytically and graphically by applying the Lami's theorem, algebraic conditions of equilibrium
LO5	Determine support reactions of simply supported beam with vertical point load, inclined point load, uniformly distributed load and uniformly varying load by analytical and graphical methods.
LO6	Examine truss with the aid of method of section, method of joints and graphical method.
LO7	Compute centroid and centre of gravity of plane lamina, composite sections of not more than three geometrical figures and composite solids of not more than two simple solids.
LO8	Compute moment of inertia of simple geometrical figure and composite sections, section modulus, radius of gyration by applying general formula, method of integration, theorem of parallel and perpendicular axis.
LO9	Determine friction, co-efficient of friction and employ Coulomb's law of friction to study equilibrium of a body on a rough horizontal plane, rough inclined plane, ladder friction and wedge friction
LO10	Establish the law of machine and compute reversibility, irreversibility, M.A, V.R and efficiency of various simple lifting machines.

COURSE OUTCOMES:

On successful completion of the course the students will be able to:

CO1	Solve simple engineering problems by making use of the concepts and principles of statics as applied to coplanar concurrent, non-concurrent and parallel forces and force system.
CO2	Solve simple problems on equilibrium of a body, static friction, ladder friction and wedge friction under the influence of coplanar concurrent and non-concurrent forces as applicable by utilizing the concepts of free body diagram, Lami's theorem, algebraic conditions of equilibrium, Coulomb's law of friction or suitable principles of statics.
CO3	Analyze a truss by applying method of joints and section and also calculate support reactions of a beam subjected to various load conditions.
CO4	Identify the centroid or centre of gravity of simple and composite plane lamina or solids and calculate the moment of inertia of simple and composite plane lamina by applying suitable methods, law, principles and theorems.
CO5	Apply the concepts and principles of lifting machine in solving problems related to simple machines, law of machine and simple lifting machines.

Detailed Syllabus:

Units	Detailed Contents	Contact Hour
UNIT-I	Force vector representation, System of a force, Principle of Transmissibility, Resolution and compounding of forces, Resultant of coplanar-concurrent forces (Parallelogram law of forces, Principle of resolved parts, Triangle law of forces and Polygon law of forces), Resultant of coplanar non-concurrent forces and parallel forces (analytical and graphical method), Bow's notation, Space diagram, Vector diagram, Funicular polygon or string polygon, Moment of force, graphical representation of moment, Varignon's theorem-law of moments, Principle of moments, Simple lever, Couple, Properties of couple (simple numerical problems from UNIT-I)	5
UNIT-II	Equilibrium, Free body diagram, equilibrant, Relation between resultant and equilibrant, Algebraic conditions of equilibrium (force law of equilibrium and moment law of equilibrium), Principles of force equilibrium- Two force, Three force and Four force principle, Equilibrium of coplanar concurrent and non concurrent force system- analytical and graphical method of analysing equilibrium, Lami's theorem and its application for various engineering problems,	4

UNIT-III	Types of beams (Simple, Cantilever, Propped cantilever, Fixed or Encastre, Continuous and Overhanging beam), Statically determinate and indeterminate beams- definitions only, Supports (Simple, Hinged, Roller and Fixed support), Loads acting on beam (vertical and inclined point load, uniformly distributed load, uniformly varying load), Beam reactions for simply supported beam with or without overhang- engineering problems subjected to point load and combination of point load and uniformly distributed load, Beam reactions graphically for simply supported beam with vertical point load- simple numerical problems on analytical and graphical methods, Plane truss and Space truss (definition only), Assumptions in plane truss analysis, Relationship between number of joints and members in simple truss, External and internal redundancy, Method of joints analysis, Method of sections analysis, Graphical methods of truss analysis- simple numerical problems by method of joints and section only.	13
UNIT-IV	Centroid and Centre of Gravity, Centroid of geometrical plane figure (square, triangular, rectangular, circle, semicircle lamina and composite figure composed of not more than three geometrical figure, Centre of gravity of simple solids (cube, cuboid, cone, cylinder, sphere, hemisphere) and composite solids composed of not more than two simple solids, Moment of Inertia, Derivation of general formula for determination of moment of inertia for area and mass, Section modulus, Radius of gyration, Theorem of Parallel and perpendicular axes, Moment of inertia of simple geometrical figure (square, rectangle, circle, triangle) and composite sections .	8
UNIT-V	Definition of friction, Static and dynamic friction, Coulomb's Laws of friction , Types of friction, , Limiting friction, Coefficient of friction, Angle of friction, Angle of repose, Cone of friction, Equilibrium of bodies on level surface subjected to a force parallel and inclined to the plane, Equilibrium of bodies on an inclined plane subjected to a force parallel to the plane only, Simple engineering problems on ladder friction and wedge friction.	8
UNIT-VI	Machine, Simple machine and compound machine, Basic concepts and definition, Derivation of relation between M.A, V.R and efficiency, Ideal machine, Derivation of relation between M.A and V.R in ideal machine, Reversible and irreversible machine, Derivation of conditions for a machine to be reversible and irreversible, Maximum mechanical advantage and efficiency, Compound efficiency, Simple numerical problems on the concepts and topics on lifting machine, Velocity ratio of Simple wheel and axle, differential wheel and axle , worm and worm wheel, Simple screw jack, Single purchase and double purchase crab winch, Weston's differential pulley block, First system of pulleys- simple numerical problems	7
Total Contact Hours		45

Table of Specification for Engineering Mechanics

Sl No	Contact Hours	Units	Objective			Short Answer Type				Long Answers Type						Total Marks
			R	U	A P	R	U	A P	A N	R	U	A P	A N	E	C	
1	3	Unit I	0	1	1	0	2	0	0	0	0	5	0	0	0	9
2	3	Unit II	0	1	0	2	2	0	0	0	0	4	0	0	0	9
3	7	Unit III	0	1	1	0	2	2	0	0	0	6	0	0	0	12
4	7	Unit IV	0	1	1	0	2	0	0	0	0	6	0	0	0	10
5	4	Unit V	0	1	0	0	2	0	0	0	0	5	0	0	0	8
6	6	Unit VI	0	1	1	0	2	2	0	0	0	6	0	0	0	12
Total Marks			0	6	4	2	12	4	0	0	0	32	0	0	0	60

NB:R: Remember, **U:** Understand, **AP:** Apply, **AN:**Analyze, **E:** Evaluate, **C:** Create

Annexure-I (Engineering Mechanics)

Sl No.	Units	Time Allotted (Hrs)	Percentage Weightage	R	U	AP	AN	E	C	Total Marks
1	Unit I	5	15.00%	0	3	6	0	0	0	9
2	Unit II	4	15.00%	2	3	4	0	0	0	9
3	Unit III	13	20.00%	0	3	9	0	0	0	12
4	Unit IV	8	16.66%	0	3	7	0	0	0	10
5	Unit V	8	13.33%	0	3	5	0	0	0	8
6	Unit VI	7	20.00%	0	3	9	0	0	0	12
Total Marks				2	18	40	0	0	0	60

NB:R: Remember, **U:** Understand, **AP:** Apply, **AN:**Analyze, **E:** Evaluate, **C:** Create

Reference Book List:

Sl No.	Book Name	Author Name	Publishing House, Volume, ISBN
1	Engineering Mechanics, Statics and Dynamics	J.L. Meriam and L.G. Kraige	John Wiley & Sons, Inc., 7 th edition, Vol I & II, 2012, ISBN: 978-0-470-61473-0 and 9780470614815
2	Engineering Mechanics	S.P. Timoshenko, D.H. Young and J.V. Rao	Tata McGraw Hill, New Delhi, 5 th edition, 2017, ISBN 9781259062667
3	Engineering Mechanics: Statics and Dynamics	R.C. Hibbler	Pearson publication, 14 th edition, 2015, ISBN 978-0133915426
4	Engineering Mechanics	K.L. Kumar and Veenu Kumar	Tata McGraw Hill, New Delhi, 4 th edition, 2017, ISBN 978-0070681811
5	Engineering Mechanics: Statics and Dynamics	I.H. Shames and G.K.M. Rao	Pearson publication, 4 th edition, 2011, ISBN 978-8177581232
6	A Text Book of Engineering Applied Mechanics	Dr S.N. Saluja	Satya Prakashan, New Delhi
7	A Text Book of Applied Mechanics	R.K. Rajput	Laxmi Publications (P) Ltd., New Delhi
8	Engineering Mechanics	S. Ramamrutham	Dhanpat Rai Publishing Company (P) Ltd., New Delhi
9	A Text Book of Engineering Mechanics	R.S. Khurmi	S. Chand & Company Limited, New Delhi

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6. Course Title: Applied Physics Lab-II

COURSE TITLE: APPLIED PHYSICS LAB-II

COURSE CODE: BS-207

Total Marks:100

Practical Examination:40

Practical Sessional Marks:60

Learning Objectives: The main objectives are:

- (i) To provide an experimental foundation for the theoretical concepts introduced in the theory class.
- (ii) Demonstrate the principles taught in the class.
- (iii) Develop the habit of honesty, patience and teamwork.

Course Outcomes: On completion of this practical course, the students will be able to:

CO1: demonstrate the laws of light, find refractive index of material and focal length of lense.

CO2: find out magnetic poles and draw magnetic lines of force of bar magnet.

CO3: apply different apparatuses to find the values of different physical quantities (acceleration due to gravity, specific gravity, atmospheric pressure, water equivalent, velocity of sound and frequency of tuning fork).

Examination scheme:

Practical				Total Marks
Practical Test		Internal Assessment		100
Full Marks	Pass marks	Full Marks	Pass Marks	
40	16	60	24	

Chapter Title	Content
Properties of Liquid	1.Measurement of Specific gravity of solid, liquid, using Nicolson hydrometer, Hare's apparatus and specific gravity bottles etc.
Simple Harmonic Motion	2.To determine the value of acceleration due to gravity (g) of a place with Simple pendulum.
Wave & Sound	3. To measure the velocity of sound in Resonance tube. 4. To determine the frequency of a tuning fork using a Sonometer.
Light	5.0 To verify the laws of reflection using a plane mirror and to study the characteristics of image formed.
	6.0 To determine the refractive index of the material of the glass slab by pin method.
	7.0 To determine the focal length of a convex lens by U-V method.
	8.0 To determine the focal length of a convex lens by plane mirror method.

	9.0 To draw I-D curve and to determine the refractive index of the material of a prism.
MAGNETISM	10.0 To locate the poles of a bar magnet and to measure the magnetic length.
	11. To plot magnetic lines of force of a bar magnet with north pole pointing north and to locate the neutral point/to plot magnetic lines of force of a bar magnet with south pole pointing north and to locate the neutral point.
Heat	12. To determine the atmospheric pressure by using Boyle's law apparatus.
	13. To determine water equivalent of a calorimeter by method of mixture.

Suggested learning Resource:

D. Book list:

Sl. No.	Title	Author	Publisher
1	Modern Approach to Physics Part I & II	Dilip Sarma, N G Chakraborty, K N Sharma	Kalyani Publishers- New Delhi
2	Applied Physics Part I	Manpreet Singh, Dr. Major Singh, Mrs. Hitashi Gupta	S K Kataria & Sons- New Delhi
3	Applied Physics Part II	Manpreet Singh, Dr. Major Singh, Mrs. Hitashi Gupta	S K Kataria & Sons- New Delhi
4	Basic Applied Physics	R K Gaur	Dhanpat Rai Publication- New Delhi
5	Physics- Std XI, Std XII	-	HSC board/CBSE Board
6	Concept of physics Part I & II	H.C Verma	Bharati Bhawan-New Delhi
7	Introduction to nano technology	C. P. Poole, Jr., and Frank. J. Owens,	Wiley- Interscience.

E. Websites:

I. <http://hyperphysics.phy-astr.gsu.edu/>
 C:\Users\HP\Downloads\II. <http://physics.info>

F. By using Models, Video etc.

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7. Course Title: Introduction to IT Systems Lab

Course : Introduction to IT Systems Lab

Course Code: ES-208

Credits -2 (L: 0, T: 0, P: 4)

Course outcomes:

At the end of the course student will be able to

- 1: Search information effectively.
- 2: Connect peripherals and install device drivers.
- 3: Create static web pages using HTML and CSS
- 4: Create documents, spreadsheets and presentations.
- 5: Implement basic security measures to protect computer system.

Course Content:

Sl. No.	Topics for Practice
1	Browser features, browsing, using various search engines, writing search queries
2	Visit various e-governance/Digital India portals, understand their features, services offered
3	Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognize various ports/interfaces and related cables, etc.
4	Install Linux and Windows operating system on identified lab machines, explore various options.
5	Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6	Practice HTML tags-(HTML, HEAD, TITLE, BODY, TABLE, UL, OL, FORM, IMG, A, FONT etc. and their attributes). CSS Syntax □ CSS Id & Class □ CSS Styling □ Styling Backgrounds □ Styling Text □ Styling Fonts □ Styling Links □ Styling Lists Styling Tables □ CSS Border □ CSS Margin □ CSS Display □ CSS Positioning □ CSS Align □ CSS Types - Inline, Internal and External. Make your own Webpage.
7	Open Office Tools: Writer – Page setup, Table, Insertion of Pictures, Page Layout, Bullets, Insertion of objects and symbols, Header, Footer, Page Number, etc., Calc-format cell properties, formula, sort and filters, chart. Impress – Addition and Deletion of Slides, Design, Animation, Slide Show etc.
8	Explore security features of Operating Systems and Tools, try using them and see what happens. Explore the setting of Antiviruses and Firewalls.

This is a skill course. More you practice, better it will be.

References:

- R.S. Salaria, Computer Fundamentals, Khanna Publishing House
- Introduction to IT Systems (with Lab Manual) – By Prashant Joshi.
- Introduction to IT Systems – By P. Mondal (Bhagabati Publication)
- Web Design With HTML & CSS - by [Prem Kumar](#)
- HTML & CSS Easy learn in 7 Days Paperback – by [Albert Irudaya Raj](#)
- Mastering HTML, CSS & JavaScript Web Publishing - by [Laura Lemay](#)
- HTML and CSS: Design and Build Websites - by Jon Duckett

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8.Course Title: Fundamentals of Electrical and Electronics Engineering Lab

Course Code	:	ES 209
Course Title	:	Fundamentals of Electrical and Electronics Engineering Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	ES

Learning Objective:

The main objectives are:

- To provide an experimental foundation for the theoretical concepts introduced in theory classes.
- Demonstrate the principles taught in the classes.

Course (Practical) Outcomes:

After successful completion of this course students will able to

CO1: Identify and use different electrical and electronics instruments

CO2: Apply and examine the theoretical knowledge to perform basic electrical and electronics experiments

S. No.	Name of Experiments	Approx. Hrs.	Electrical (EL) / Electronics (ET)	COs
1	Measure voltage, current and power in 1-phase circuit with resistive load.	02	EL	CO1, CO2
2	Measure voltage, current and power in R-L series circuit.	02	EL	CO1, CO2
3	Determine the transformation ratio (K) of 1-phase transformer.	02	EL	CO1, CO2
4	Connect single phase transformer and measure input and output quantities.	02	EL	CO1, CO2
5	Study the different parts of DC machines	02	EL	CO1
6	Identify and draw the figure of various wiring materials	02	EL	CO1, CO2
7	Identify various active and passive electronic components in the given circuit	02	EL	CO1
8	Connect resistors in series and parallel combination on bread board and measure its value using digital multimeter	02	ET	CO1, CO2
9	Connect capacitors in series and parallel combination on bread board and measure its value using multimeter	02	ET	CO1, CO2
10	Determine the value of a given resistor using digital multimeter and calculate the value with colour code.	02	ET	CO1, CO2

11	Test the PN-junction diode using digital multimeter.	02	ET	CO1, CO2
12	Identify three terminals of a transistor using digital multimeter	02	ET	CO1, CO2
13	Familiarization of different types of PCB and Soldering / Desoldering Practice	02	ET	CO1, CO2
Total		28		

References:

1. Ritu Sahdev, Basic Electrical Engineering, Khanna Publishing House, 2018
2. Mittle and Mittal, Basic Electrical Engineering, McGraw Education, New Delhi, 2015, ISBN : 978-0-07-0088572-5
3. Saxena, S. B. Lal, Fundamentals of Electrical Engineering, Cambridge University Press, latest edition ISBN : 9781107464353
4. Theraja, B. L., Electrical Technology Vol – I, S. Chand publications, New Delhi, 2015, ISBN: 9788121924405
5. Theraja, B. L., Electrical Technology Vol – II, S. Chand publications, New Delhi, 2015, ISBN: 9788121924375
6. Jegathesan, V., Basic Electrical and Electronics Engineering, Wiley India, New Delhi, 2015, ISBN : 97881236529513
7. Sedha, R.S., A text book of Applied Electronics, S.Chand ,New Delhi, 2008, ISBN-13: 978-8121927833
8. Mehta, V.K., Mehta, Rohit, Principles of Electronics, S. Chand and Company, New Delhi, 2014, ISBN-13-9788121924504

Suggested software/ Learning Websites:

- a. en.wikipedia.org/wiki/Transformer
- b. www.animations.physics.unsw.edu.au/~jw/AC.html
- c. www.alpharubicon.com/altenergy/understandingAC.htm
- d. www.electronics-tutorials
- e. learn.sparkfun.com/tutorials/transistors
- f. www.pitt.edu/~qiw4/Academic/ME2082/Transistor%20Basics.pdf
- g. www.technologystudent.com/elec1/transis1.htm
- h. www.learningaboutelectronics.com
- i. www.electrical4u.com

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9. Course Title: Engineering Mechanics Lab

Course Code	ES - 210				
Category	Engineering Science Course				
Course Title	Engineering Mechanics Laboratory				
Scheme and Credits	L	T	P	Credits	Semester-II
	0	0	2	1	
Pre-requisites (if any)	Physics, mathematics				

Learning Objectives:

Students will be able to:

LO1	Examine triangle law of forces graphically and calculate resultant, percentage error with the aid of Gravesand's apparatus.
LO2	Examine polygon law of forces graphically and calculate resultant, percentage error with the aid of Gravesand's apparatus or Universal Force Table.
LO3	Compare actual, analytical and graphical values of support reactions at the two ends of a simply supported beam on a Beam apparatus.
LO4	Calculate co-efficient of friction between two contact surfaces on a rough horizontal plane.
LO5	Calculate co-efficient of friction, angle of repose, mechanical advantage and efficiency of an inclined plane.
LO6	Examine the law of moments with the aid of Bell Crank Lever.
LO6	Calculate mechanical advantage, velocity ratio and efficiency of simple screw jack, worm and worm wheel, single purchase crab winch and first system of pulleys.

Course Outcomes:

On successful completion students will be able to:

CO1	Examine triangle law of forces, parallelogram law of forces and polygon law of forces with the aid of Gravesand's apparatus and Universal Force Table.

CO2	Compare actual values of support reaction with analytical and graphical values of support reactions at two ends of a simply supported beam.
CO3	Calculate co-efficient of friction, angle of repose, mechanical advantage, velocity ratio of a body lying on horizontal and vertical plane.
CO4	Examine law of moment with the aid of Bell Crank Lever.
CO5	Calculate mechanical advantage, velocity ratio and efficiency of a simple lifting machine.

List of Practices:

Sl. No.	Topics For Practices	Periods (Hrs)
1	To verify triangle law of forces and parallelogram law of forces with the help of Gravesand's apparatus.	3
2	To verify the polygon law of forces with either Gravesand's apparatus or Universal Force Table.	3
3	To verify the reactions at the support of a simply supported beam	3
4	To find co-efficient of friction between two surfaces on a rough horizontal plane.	3
5	To find co-efficient of friction, angle of repose, M.A and efficiency of an inclined plane.	3
6	To verify the Law of Moments using a bell crank lever.	2
7	To find the mechanical advantage, velocity ratio and efficiency of a simple screw jack.	3
8	To find the mechanical advantage, velocity ratio and efficiency of a worm and worm wheel.	3
9	To find the mechanical advantage, velocity ratio and efficiency of a single purchase crab winch.	3
10	To find the mechanical advantage, velocity ratio and efficiency of the first system of pulleys.	3
Total Practices in Hrs		29

Reference Book Lists:

Sl No.	Book Name	Author Name	Publishing House, Volume, ISBN
1	Engineering Mechanics, Statics and Dynamics	J.L. Meriam and L.G. Kraige	John Wiley & Sons, Inc., 7 th edition, Vol I & II, 2012, ISBN: 978-0-470-61473-0 and 9780470614815
2	Engineering Mechanics	S.P. Timoshenko, D.H. Young and J.V. Rao	Tata McGraw Hill, New Delhi, 5 th edition, 2017, ISBN 9781259062667
3	A Text Book of Applied Mechanics	R.K.Rajput	Laxmi Publications (P) Ltd., New Delhi
4	Engineering Mechanics	K.L. Kumar and Veenu Kumar	Tata McGraw Hill, New Delhi, 4 th edition, 2017, ISBN 978-0070681811
5	Engineering Mechanics: Statics and Dynamics	I.H. Shames and G.K.M. Rao	Pearson publication, 4 th edition, 2011, ISBN 978-8177581232

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10.Course Title: Environmental Science

Course Code	AU-201				
Course Title	Environmental Science				
Scheme and Credits	L	T	P	Credits, C	Semester- II
	2	0	0	0	
Pre-requisites	High School Chemistry/Basic science				

Learning Objectives:

LO-1	Acquire knowledge for solving various engineering problems by applying ecosystem to produce eco – friendly products.
LO-2	Gain fundamental knowledge of air, noise, radiation, water and soil pollution control methods for solving domestic and industrial problems.
LO-3	To recognize relevant energy sources required for domestic and industrial applications.
LO-4	Gain skills for solving local solid and e-waste problems.

Course Outcomes: After the completion of the course the student will be able to understand:

CO-1	The ecosystem and terminology for solving various engineering problems applying ecosystem knowledge to produce eco – friendly products.
CO-2	The air, radiation and noise pollution along with their control measures and acts for solving domestic and industrial problems.
CO-3	The water and soil pollution along with their control measures and acts for solving domestic and industrial problems.
CO-4	Different renewable energy resources and efficient process of harvesting.
CO-5	Solid Waste Management, ISO 14000 & Environmental Management.

Detailed Course Content:

Unit	Topic/Sub-Topics	Hours
UNIT-I	1.0. Introduction to Environmental Studies and Ecosystems 1.1. Scope and importance of Environmental Science, environmental components. 1.2. Definition, principle and scope of ecology, definition and concept of Ecosystem, Structure of ecosystem, Biotic & Abiotic components. 1.3. Functions of Ecosystem: Physical (energy flow), Biological	5

	(food chains, food web, ecological succession), and Biogeochemical (nutrient cycling) processes. 1.4. Types of Ecosystems - Freshwater ecosystem (Lentic and Lotic) and terrestrial ecosystem (Forest, Grassland, Desert and Mountain Ecosystem)	
UNIT-II	2.0. Air, Noise and Radiation Pollution 2.1. Air Pollutions: Definition, types and sources of air pollution, air pollutant and its types, impact of air pollution on human health, environment and assets. 2.2. Global warming and greenhouse effect, ozone layer depletion and acid rain. 2.3. Air quality standards – NAAQS, AQI, Bharat Stage - VI Emission standards, Air pollution control measures. Air quality standards – NAAQS, AQI, Bharat Stage - VI Emission standards. Air pollution control measures. 2.4. Radiation pollution: Definition and types of radiation, sources, effects and control of radiation pollution. 2.5 Noise pollution: Definition, types, sources of pollution, measurement of pollution level, Effects of Noise pollution.	6
UNIT-III	3.0. Water and Soil Pollution 3.1. Definition, properties and Sources of freshwater. 3.2. Definition, Sources of water pollution, Types of water pollutants. 3.3. Characteristics of water pollutants, Physical, chemical and biological parameters for assessment of water quality. 3.4. Effect of water pollution on human health and environment. 3.5. Control of water pollution 3.6. Waste water treatment – Primary, secondary and tertiary methods. 3.7. Soil pollution - Causes, Effects and Preventive measures of Soil Pollution.	7

UNIT-IV	4.0. Renewable sources of Energy 4.1. Definition and type of renewable energy sources. 4.2. Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. 4.3. Solar pond, Solar water heater, solar dryer, Solar stills. 4.4. Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel, Anaerobic digestion. Biogas production mechanism. Utilization and storage of bio-gas. 4.5. Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy. 4.6. New Energy Sources: Need of new sources. Different types new energy sources. 4.7. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) 4.8. Concept, origin and power plants of geothermal energy.	7
UNIT-V	5.0. Solid Waste Management, ISO 14000 & Environmental Management 5.1. Definition and type of waste. 5.2. Solid waste generation- Sources and characteristics of: Municipal and domestic solid waste, electronic waste (E-waste): Sources and types, constituents of e-wastes, recycling of e-waste and its environmental consequences, biomedical waste. Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. 5.3. Collection and disposal of different types of solid wastes. 5.4. Waste Air quality act 2004, air pollution control act 1981, water pollution and control act 1996. Noise pollution (Regulation and Control) Rules, 2000. 5.5. Environmental management in fabrication industry. ISO14000: Implementation in industries, Benefits.	5
	Total contact Hours	30

Table of Specification for Environmental science (Theory)																
Sl No	Contact Hours	Units	Objective			Short Answer Type				Long Answers Type						Total Marks
			R	U	A P	R	U	A P	A N	R	U	A P	A N	E	C	
1	5	Unit I	1	1	1	2	1	0	0	0	2	2	0	0	0	10
2	6	Unit II	1	1	1	2	1	0	0	0	2	2	0	0	0	10
3	7	Unit III	1	1	0	0	3	2	1	0	3	3	0	0	0	14
4	7	Unit IV	1	1	0	0	0	2	1	3	3	3	0	0	0	14
5	5	Unit V	1	1	1	0	2	0	1	0	3	3	0	0	0	12
	30	Total marks	5	5	3	4	7	4	3	3	13	13	0	0	0	60

NB: R: Remember, **U:** Understand, **AP:** Apply, **AN:** Analyze, **E:** Evaluate, **C:** Create

Annexure-I: Environmental science (Theory)										
Sl No.	Units	Time Allotted (Hrs)	Percentage Weightage	R	U	AP	AN	E	C	Total Marks
1	I	5	16.67	3	4	3	0	0	0	10
2	II	6	20.00	3	4	3	0	0	0	10
3	III	7	23.33	1	7	5	1	0	0	14
4	IV	7	23.33	4	4	5	1	0	0	14
5	V	5	16.67	1	6	4	1	0	0	12
Total		30	100.00	12	25	20	03	00	00	60

Reference Book List:

Sl No	Book Name	Author Name	Publisher
1	Environmental Studies	S.C. Sharma & M.P. Poonia	Khanna Publishing House, New Delhi
2	Understanding Chemistry	C.N. R. Rao	Universities Press (India) Pvt. Ltd., 2011
3	Elements of	O.P. Gupta,	Khanna Publishing House, New

	Environmental Pollution Control		Delhi
4	Air Pollution & Control	Keshav Kant	Khanna Publishing House, New Delhi (Edition 2018)
5	Waste Water Treatment for Pollution Control and Re-use	Arceivala, Soli Asolekar, Shyam	Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099
6	Environmental Engineering Science	Nazaroff, William, Cohen, Lisa	Willy, New York, 2000, ISBN 10: 0471144940.
7	Environmental Pollution Control and Engineering	Rao, C. S.,	New Age International Publication, 2007, ISBN: 81-224-1835-X.
8	Air Pollution	Rao, M. N. Rao	Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07-451871-8.
9	Principles of Solar Engineering	Frank Kreith, Jan F Kreider	McGraw-Hill, New York ; 1978, ISBN: 9780070354760.
10	Fundamentals of renewable energy processes	Aldo Vieira, Da Rosa	Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
11	Industrial Solid Waste	Patvardhan, A. D	Teri Press, New Delhi, 2013, ISBN:978-81-7993-502-6
12	Waste Water Engineering	Metcalf & Eddy	Mc-Graw Hill, New York, 2013, ISBN: 077441206
13	Perspective in Environmental Studies	Anubha Kaushik and C P Kaushik	New Age International Publisher, New Delhi ISBN: 978-93-86418-63-0
14	National Environmental Policy 2006	Govt. of India, Ministry of Environment and Forest.	Approved by the Union Cabinet on 18 May, 2006
15	National Green Tribunal Act, 2010	Ministry of Law and Justice (Legislative Dept.),	The Gazette of India New Delhi, Wednesday, June 2, 2010.

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Curriculum Development cell, State Council for Technical Education, **Directorate of Technical Education, Assam**

Sl. No.	Name	Designation
1	Shri Dhrubajyoti Borah, ACS	Director of Technical Education, Assam
2	Dr. Indrani Gogoi	Joint Director, DTE, Assam
3	Dr. Mrinalini Das	Controller of Examinations, State Council for Technical Education, DTE, Assam
4	Shri Ankush Borgohain	Training cum Placement Officer, DTE, Assam
5	Shri Ashok Das	Principal, Assam Textile Institute
6	Dr. Utpal Baruah	Principal, Kamrup Polytechnic
7	Shri Boobool Sarma	Assistant Controller of Examinations, SCTE, DTE, Assam

Subject-wise Committees for Curriculum of Diploma in Engineering & Technology (2nd Semester)

Mathematics:

Sl No.	Name	Institute	Designation
1	Dr. Geetali Das, Lecturer(SG)	Assam Engineering Institute, Guwahati	Member Secretary
2	Dr. Parbin Ahmed, Lecturer(SG)	Assam Textile Institute, Guwahati	Member
3	Dr. Sampa Das, Lecturer (SG)	Dibrugarh Polytechnic, Dibrugarh	Member
4	Mrs. Gayatree Kakati Boruah.	PCPS Girls' Polytechnic, Guwahati	Member

Physics:

Sl No.	Name	Institute	Designation
1	Dr. Tulika Tamuly, Lecturer	Dibrugarh Polytechnic, Dibrugarh	Member Secretary
2	Dr. Snigdha Bhattacharjee, Lecturer	Karimganj Polytechnic, Karimganj	Member
3	Mr. Monzurul Kader Ahmed, Lecturer	Goalpara Polytechnic, Goalpara	Member
4	Mr. Prokash Pegu, Lecturer	Dibrugarh Polytechnic, Dibrugarh	Member

Sub-Committee for Applied Physics:

Sl No.	Name	Institute	Designation
1	Dr. Purabi Gogoi, Assistant Professor	DUIET, Dibrugarh University	Member
2	Mr. Jyotirav Mudiar, Assistant Manager	IOCL, Bongaigaon Refinery	Member
3	Dr. Samiran Hazarika, Lecturer	Bongaigaon Polytechnic	Member
4	Mr. Sanjeeb Kalita, Lecturer	Baksa Polytechnic	Member
5.	Himanshu Sharma Pathok, Lecturer	POWIET, Jorhat	Member

Introduction to IT Systems:

Sl No.	Name	Institute	Designation
1	Smt. Plabita Borbora, HoD, Computer Engineering	Assam Engineering Institute	Member Secretary
2	Maushumi Lahon, Lecturer (SG)	Assam Engineering Institute	Member
3	Sankha Pani Bharali, Lecturer (SG)	PCPS Girls Polytechnic	Member

Fundamentals of Electrical and Electronics Engineering:

Sl No.	Name	Institute	Designation
1	Shri Bhupati Das, Principal (i/c)	Nalbari Polytechnic	Member Secretary
2	Dr. Mitali Chakravorty, HOD (i/c)	Assam Engineering Institute	Member
3	Shri Bubumani Kalita, Lecturer (PT)	Nalbari Polytechnic	Member

Engineering Mechanics:

Sl No.	Name	Institute	Designation
1	Dr. Krishna Kamal Das, Member Secretary of Civil Engg Syllabus Committee	Bongaigaon Polytechnic	Member Secretary
2	Shri Ram Krishna Pathak, Member Secretary of Mechanical Engg Syllabus Committee	Dibrugarh Polytechnic	
3	Dr. Dimbalita Deka, Assistant Professor	Golaghat Engineering College	Member
4	Zeenat Arman, Lecturer	Barpeta Polytechnic	Member
5	Chiranjeeb Barua, Lecturer	Barpeta Polytechnic	Member
6	Anusuya Gowami, Lecturer	Sonitpur Polytechnic	Member
7	Bidisha borthakur, Lecturer	Golaghat polytechnic	Member

Environmental Science:

Sl No.	Name	Institute	Designation
1	Smt. Anita Saikia, Lecturer (SG)	Assam Engineering Institute	Member Secretary
2	Shri Ramen Bharali, Lecturer (SG)	Nowgong Polytechnic	Member
3	Shri Bedanta Barhoi, Lecturer (PT)	Lakhimpur Polytechnic	Member
4	Shri Pankaj Goswami, Lecturer (SG)	Silchar Polytechnic	Member
5	Mr. Tayab Ali, Lecturer (SS)	POWIET, Jorhat	Member
6	Shri Debabrata Talukdar, Lecturer (SG)	Silchar Polytechnic	Member

REVIEWERS:

1. Md. Sabikur Rahman, Jorhat Engineering College.
2. Dr. Afazuddin Ahmed, Assam Engineering College.
3. Dr. Gitanjali Mazumdar, Assam Engineering College.
4. Mr. Kishor Kumar Das, Assam Engineering College.
5. Dr. Pankaja Das, Assam Engineering College.
6. Ms. Anakshi Das, Assam Engineering College.
7. Dr. Parasa Hazarika, Jorhat Institute of Science & Technology.
8. Dr. Monisa Rajkhowa, Jorhat Institute of Science & Technology.
9. Dr. Chandra Chutia, Jorhat Institute of Science & Technology.
10. Dr. Diganta Goswami, Barak Valley Engineering College.
11. Dr. Satyajit Paul, Golaghat Engineering College.
12. Smt. Saheera Azmi Hazarika, Dhemaji Engineering College.
13. Mr. Jameson Mushahary, Jorhat Institute of Science & Technology.
14. Smt. Dibyajyoti Saikia, Bineswar Brahma Engineering College.
15. Mr. Anjan Kr. Kakati, Bineswar Brahma Engineering College.
16. Dr. Medalsen Ronghang, Bineswar Brahma Engineering College.
17. Dr. Kamaljyoti Talukdar, Bineswar Brahma Engineering College.

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PROGRAMME OUTCOMES OF ELECTRICAL ENGINEERING

List	POs description
PO-1 Basic Knowledge	Competence to apply basic knowledge of mathematics, applied Sciences, engineering drawing for the solution of electrical engineering problems.
PO-2 Discipline Knowledge	Ability to formulate , analysis, problems of electrical engineering with the leverage of core and elective subjects of electrical engineering relevant to present engineering and technical national as well as global scenario.
PO-3 Practical Knowledge	Sufficient to conduct experiments, testing, and measurements to analysis and interpret data, installation and stewardship of various electrical equipments and machines.
PO-4 Use of Engineering tools and develop co-curricular Skill activities	Ability to use to days state of art engineering techniques and tools for co- curricular skills activity in house wiring installation, testing, estimating and repairing of electrical machines and also monitoring, control and acquisition of data .
PO-5 Life -long learning	Competency in application of computer, recognize the need for and have the preparation and ability to engage in independent life- long learning in the context of changing technological scenarios.
PO-6 Extra Curricular activities	Appreciate for enhancement of literary , cultural ,ritual and social instincts in real sense by allowing to be involved in departmental wall magazine , institute week celebration, teachers day celebration etc. and also participate in NCC camp ,inter polytechnic meet etc.
PO-7 Effective communication	Ability to apply written, oral and graphical communication in both technical and non technical environments and ability to use appropriate technical literature, entrepreneurship development, knowledge and understanding principle of management.
PO-8 Ethical responsibility	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO-9 Individual and team works	Inter disciplinary Subjects, individual and group project, individual seminar, industrial visits, industrial training and ability to take part as a team leader.
PO-10 Environment and sustainability	Ability to consider the impact of engineering solution on environment and the need of sustainable development to ensure optimal survival of the nature.

COURSE STRUCTURE OF 3RD SEMESTER (ELECTRICAL)

Sl no	Code no	Subject	Contact hours /week			Evaluation scheme									
						Theory (Th)					Practical (Pr)			Total Marks (Th+Pr)	Credit
			L	T	P	ESE	Sessional(SS)			Pass (ESE+SS)	Practical Test(PT)	Practical Assessment (PA)	Pass (PT+PA)		
							TA	HA	Total (TA+HA)						
1	CO-301	Computer application and programming	3		3	70	10	20	30	33/100	25	25	17/50	150	4
2	Hu-302	Engineering Economics & accountancy	3			70	10	20	30	33/100				100	3
3	SC-303	Mathematics –III	3	1		70	10	20	30	33/100				100	3
4	El – 305	Elements of electronics and Devices	3		3	70	10	20	30	33/100	25	25	17/50	150	5
5	El - 301	Principles of Electrical engineering	3	1	3	70	10	20	30	33/100	25	25	17/50	150	4
6	Me-304	Elements of mechanical engineering	3		3	70	10	20	30	33/100	25	25	17/50	150	4
7	El - 310	Professional practice –I	1		2						25	25	17/50	50	2

Interdiscipline branches subjects:

8	EL/ET-304 OR EL-304	Fundamentals of electrical and electronics engg. OR Elements of electrical engg.	3			3	70	10	20	30	33/100	25	25	17/50	150	4

1. Course Title–Computer Application& Programming.

1: **Course Title–Computer Application & Programming (All Branches)**

2: **Course Code – Co-301**

3: **Semester- 3rd**

4: **Aim of the Course :**

- To give basic concepts related to organisation of a computer
- To give fundamental terminologies in networking
- To develop simple programs in C.

5: **Course Outcome:**

- 1.On completion of the course students will be able to:
- 2.Explain the basics of a computer hardware and software
- 3.Solve problems related to number systems
- 4.Define basics of Operating System
- 5.Familiarize with networking components
- 6.Write simple C programs

6: **Prerequisites for the Course:** Have basic idea about a computer and its functions.

7: **Teaching Scheme (in hours):**

Teaching Scheme			
L	T	P	Total hours per week
3	0	3	6

8: **Examination Scheme :**

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

9: Detailed Course Content:

Unit	Topic/Sub-Topics	Intended Learning Outcome	Hours
1	Computer Architecture: Brief history, Charles Babbage Machine, Von Neuman Architecture, block diagram, memory & its different types, I/O devices, Role of O.S., computer languages, translator software, editor. Data, different types of data, information and its characteristics	1. Define a computer and identify its parts. 2. Define computer memory & describe its different types. 3. Define computer languages & translators. 4. Describe the characteristics of information.	8
2	Number System and codes: Different number system- decimal, binary, octal, hexadecimal number system, their conversion, 1's and 2's Complement, subtraction using complements. Different codes- ASCII, BCD, Ex-3, Gray. Conversion from Gray to binary and vice-versa, BCD addition.	1. Define decimal, binary, octal & hexadecimal number systems. 2. Convert between different number systems. 3. Define 1's & 2's complements. 4. Subtract using 1's & 2's complements. 5. Describe some different codes.	8
3	Introduction to Operating System: Definition, single user and multi-user OS, different function performs by OS, various popular OS like DOS, Windows, UNIX/LINUX. DOS and UNIX commands.	1. Define operating system. 2. Operate different commands of DOS, Windows & UNIX/ LINUX.	5
4	Computer Network and the Internet: Definition, necessity of network, different		6

	types of network-LAN, MAN, WAN, network topology, transmission media, different network devices like NIC, hub, bridge, switch, gateway. Introduction to the internet, Internet services, browser, search engine.	1 Define network. 2 Describe different types of network. 3 Define network topology. 4. Describe different network devices. 5. Define internet & describe different internet services. 6. Explain use of different browsers & search engines.	
5	Introduction to C programming: Fundamentals of programming-Algorithm & Flowchart, source code and object code, Basic structure of C programs, Executing a C program, Constants, Variables, and data types. Operators and expression, Input Output function like printf, scanf, getchar, putchar, gets, puts, Decision making and branching using IF..Else, Switch, looping using for, while, and do-while, array.	1. Write algorithm and flow charts for simple programs. 2 Define basic terminology of C language. 3 Write small program using C language. 4 Write diversified solutions using C language. 5 Differentiate between IF..Else and Switch statement.	15
	Internal Assessment		3

Intellectual Skills :

Logical reasoning

Relating programming concepts in problem solving

Motor Skills :

Learn to use and handle a computer and its peripherals.

List of Lab Exercises :

I. Basic commands for computer system maintenance.

II. Preparation of Documents

Introduction to Word processing, Opening a document, preparing documents, inserting diagrams and tables, Editing document- (a) Character, word and line editing, (b) Margin Setting, Paragraph alignment, (c) Block Operations, (d) Spell Checker, (e) Saving a document, (f) Mailmerge.

III. Information Presentation through Spread Sheet

Application of Spread Sheet, Structure of spreadsheets, Preparing table for simple data and numeric operations, Using formulae and functions in excel operations, Creation of graphs, Pie charts, bar charts.

IV. Preparation of presentation

Creation of electronic slides on any topic, Practice of animation effect, presentation of slides.

V. Programming in C

Editing a C program, defining variables and assigning values to variables

Arithmetic and relational operators, arithmetic expressions and their evaluation

Practice on input/output function like getchar, putchar, gets, puts, scanf, printf etc.

Programming exercise on simple if statement, If..else statement, switch statement

Programming exercise on looping with do-while, while, for loop and array.

10: Distribution of Marks:

Unit	Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Computer Architecture	6	5	5	16
2	Number System and codes	4	2	8	14
3	Introduction to Operating System	4	2	4	10
4	Computer Network and the Internet	5	3	6	14
5	Introduction to C programming	6	3	7	16
		25	15	30	70

11: Table of specification :

Unit	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Computer Architecture	8	19	✓			
2	Number Systems & Codes	8	19	✓		✓	
3	Introduction to Operating Systems	5	12	✓			
4	Computer Network & the Internet	6	15	✓		✓	
5	Introduction to C Programming	15	35	✓		✓	
Total		Σ b=42	100				

K = Knowledge C = Comprehension A =Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} * 100$$

Detailed Table Of Specifications

Unit	Topics	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Computer Architecture	7			7	5				5	4				4
2	Number Systems & Codes	4			4	2				2	4		4		8
3	Introduction to Operating Systems	4			4	2				2	4				4
4	Computer Network & the Internet	5			5	3				3	3		4		7
5	Introduction to C Programming	5			5	3				3	3		4		7
Total		25			25	15				15	18		12		30

K = Knowledge C = Comprehension A = Application HA = Higher Than Application T = Total

12: Suggested Implementation Strategies:

- 1: As the subject is taught to the students of all branches, basic knowledge required to understand the computer hardware and software needs to be emphasised.
- 2: Too much of hardware details could be avoided.
- 3: Programming section theory could be taught side by side in the lab.

13: Suggested Learning Resources :

1. Fundamentals of Computer, Rajaraman, PHI
 2. It Tools and Applications, DOEACC "O" Level, Firewall Media
 3. Let us C by Y. Kanetkar, BPB
 4. Programming in ANSI C / E. Balagurusamy / Tata McGraw-Hill
-
-

2.Course Title– Engineering Economics and Accountancy (All Branches)

1.Course Title : ENGINEERING ECONOMICS AND ACCOUNTANCY

2.Course Code: **Hu – 302**

3.Semester: 3rd

4.Aim of the Course:

1. To introduce the students to some important economic and accounting terms.
2. To acquaint the students with some economic laws and with the functions of money, bank etc.
3. To make the students capable of recording business transaction under double entry system.
4. To introduce the students about financial statements.

5. Course Outcomes:

On completion of the course on EEA, students will be able to

- CO₁ = Define some important economic and accounting terms.
- CO₂ = explain some basic economic laws.
- CO₃ = Describe overall economic environment.
- CO₄ = explain double entry system of book keeping.
- CO₅ = record business transactions under double entry system of book keeping
- CO₆ = define financial statements.

6. Teaching Scheme (in hours)

Lecture	Tutorial	Practical	Total
42 hrs	3 hrs	--	45 rs

7.Examination Scheme:

Theory				Practical				Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination		Sessional		
70	30	100	33	--	--	--	--	100

8.Detailed Course Content:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
Part – A : Engineering Economics				21 hrs
1.0	Introduction to Economics :	i) Definition of Economics, its utility and scope of study ii) Definition of Engineering Economics ii) Meaning and concepts of Utility, Consumption, Value, Price, Goods and National Income, inflation iii) Wants – Definition and characteristics iv) Wealth & Welfare– Definition, meaning and types	i) explain core economic terms concepts and theories	5
2.0	Demand and Supply :	i) Meaning and types of Demand ii) The Law of Demand, its limitations iii) Preparation of Demand Schedule iv) Meaning of Supply ii) The Law of Supply, its limitations iii) Preparation of Supply Schedule	Define the Laws of Demand and Supply	4
3.0	Production :	i) Meaning and factors of production ii) Factors determining efficiency of labour	i) Define factors of production ii) Explain formation of	5

		iii) Savings, investment and capital formation iv) Meaning of production function	capital	
4.0	Money:	i) Meaning of money ii) Types of money iii) Functions of money	i) Understand meaning and functions of money	2
Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
5.0	Banking Organisation :	i) Central Bank – its functions ii) Commercial banks – its functions	i) Distinguish the functions of different banks	3
6.0	Pricing	i) Objectives of pricing policy ii) price determinants iii) Price discrimination	i) explain pricing policy	2
Part – B : Accountancy				21 hrs
7.0 (A)	Introduction to Book-Keeping and Accounting:	i) Definition & objectives of Book-keeping ii) Need and advantages of Book-keeping iii) Definition of Accounting iv) Difference between Book-keeping and Accounting v) Double Entry System – main features	i) Define Double Entry System of Book Keeping ii) State its objectives, features merits and demerits	3

		vi) Advantages and disadvantages of Double Entry System		
(B)	Introduction to Computerised Accounting System:	i) Components of Computerised Accounting Software ii) Need for Computerised Accounting iii) Difference between Manual Accounting and Computerised Accounting	i) Identify components of computerized accounting software	2
8.0	Transaction:	i) Definition ii) Meaning of Account iii) Classification of Accounts: Traditional Approach Modern Approach iv) Meaning of Debit and Credit v) Rules of Debit and Credit	i) State the meaning and rules of Debit and Credit	2

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
9.0	Journal and Ledger	i) Meaning Journal ii) Recording of Transactions in Journal iii) Meaning of Ledger iv) Objectives and utility of Ledger v) Posting and balancing of Ledger vi) Distinction between Journal and Ledger vii) Names of different Books of Accounts	i) Record business transactions under double entry system in books of accounts	4
10.0	Cash Book:	i) Meaning and importance of Cash Book ii) Characteristics and advantages of Cash Book iii) Discount – Trade Discount and Cash Discount iv) Different types of Cash Book: Single Column Cash Book Double Column Cash Book Triple Column Cash Book v) Bank Reconciliation Statement – Basic idea	i) Differentiate different types of Cash Book ii) Record transactions in Cash Book	4
11.0	Trial Balance & Errors in Accounting:	i) Meaning and objects of Trial Balance ii) Main features and advantages	i) Explain meaning and features of	3

		of Trial Balance iii) Preparation of Trial Balance iv) Types of errors in Accounting	Trial balance	
Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
12.0	Components of Final Accounts:	i) Meaning and objectives of Trading Account ii) Contents of Trading Account iii) Meaning and objectives of Profit and Loss Account iv) Contents of Profit and Loss Account v) Meaning of depreciation, revenue expenditure and capital expenditure vi) Contents of Balance Sheet	i) Identify different components of Financial Statements	3
	Class Test			3 hrs
	Total			45 hrs

9. TABLE OF SPECIFICATIONS for Engineering Economics & Accountancy

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Comprehension	Application	HA

1	Introduction to Economics	5	12	5	3	0	0
2	Demand & Supply	4	9	2	4	0	0
3	Production	5	12	6	2	0	0
4	Money	2	5	4	0	0	0
5	Banking Organisation	3	7	3	2	0	0
6	Pricing	2	5	2	2	0	0
Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Compre-hension	Application	HA
7	(A) Introduction to Book-Keeping	3	7	5	0	0	0
	(B) Introduction to Computerised Accounting System	2	5	3	0	0	0
8	Transaction	2	5	2	1	0	0
9	Journal & Ledger	4	9.5	2	2	3	0
10	Cash Book	4	9.5	0	5	2	0
11	Trial Balance & Errors in Accy	3	7	5	0	0	0
12	Components of Final Accounts	3	7	2	3	0	0
Total		42hrs	100	41	24	5	0

K = Knowledge C = Comprehension A = Application A = Higher than Application
(Analysis, Synthesis, Evaluation)

$$C = \frac{b}{\Sigma b} \times 100$$

10 Distribution of Marks:

DETAILED TABLE OF SPECIFICATIONS FOR EEA

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	Total
1	Introduc	3	1	0	4	2	2	0	0	4	0	0	0	0	0	8
2	Demand & Suppl	0	0	0	0	0	0	0	0	0	2	4	0	0	6	6
3	Production	1	0	0	1	2	0	0	0	2	3	2	0	0	5	8
4	Money	2	0	0	2	2	0	0	0	2	0	0	0	0	0	4
5	Banking Organis	1	0	0	1	0	0	0	0	0	2	2	0	0	4	5
6	Pricing	2	2	0	4	0	0	0	0	0	0	0	0	0	0	4
7	Introdu to B K	2	0	0	2	3	0	0	0	3	0	0	0	0	0	5
	Introduc to Comput	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
8	Transact	2	0	0	2	0	1	0	0	1	0	0	0	0	0	3
9	Journal & Ledge	1	0	0	1	0	0	0	0	0	1	2	3	0	6	7
10	Cash Book	0	2	0	2	0	0	0	0	0	0	3	2	0	5	7
11	Trial Balance	3	0	0	3	2	0	0	0	2	0	0	0	0	0	5
12	Componts F/Ac	0	0	0	0	0	0	0	0	0	2	3	0	0	5	5
	Total	20	5	0	25	11	3	0	0	14	10	16	5	0	31	70

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application **Higher than Application (Analysis, Synthesis, Evaluation)**

T = Total

11 Suggested implementation Strategies: Modified syllabus may be implemented with effect from July, 2018 (Starting with the present batch (2018) of 2nd Semester students)

12 Suggested learning Resource: Book list

Sl. No.	Title of Book	Name of Author(s)	Publisher
1	Introductory Micro Economics	Sandeep Garg	Dhanpat Rai Publication Pvt. Ltd. New Delhi
2	Introductory Macro Economics	Sandeep Garg	Dhanpat Rai Publication Pvt. Ltd. New Delhi
3	Theory and Practice of Accountancy	B. B. Dam R. A. Sarda R. Barman B. Kalita	Capital Publishing Company, Guwahati – 5
4	Book-Keeping & Accountancy	Juneja, Chawla & Saksena	Kalyani Publisher, New Delhi - 110002
5	Tally. ERP 9 For Beginners	Tally Solutions Pvt. Ltd.	Sahaj Enterprises, Bangalore

b. List of Journals

c. Manuals

d. Others

3 Course Title– Mathematics-III

1 Course Title: Mathematics – III

2 Course Code : Sc – 303

3 Semester : Third Semester

4 Aim of the course:

- a) To learn about derivatives of functions having two or more variables.
- b) To learn about formation and solution of equations involving differential co-efficients.
- c) To learn how to collect, compile and tabulate similar or different types of large data and to draw valid conclusions from them.
- d) To learn the use of matrices for solving simultaneous equations.
- e) To learn method of solving two variable linear programming models by the graphical solution.

5. Course Outcome:

- a) On completion of the course, students will be able to
- b) Recognize and differentiate functions having two or more variables.
- c) Form and solve first and higher order ordinary differential equations having differential coefficients.
- d) Calculate the measures of central tendency and measures of dispersion from statistical data.
- e) Determine the correlation co-efficient of bivariate distribution.
- f) Calculate the probability of occurrences of events under different conditions.
- g) Solve simultaneous equations using matrices and also solve two variable linear programming models by the graphical solution method.

6. Teaching scheme(in hours):

Teaching scheme(in hours)		
Lectures	Tutorial	Total (per week)
3	1	4

7.Examination Scheme:

Theory			Total Marks 100
ESE Full Marks	Sessional Full Marks	Pass Marks (ESE+Sessional)	
70	30	33	

8.Detailed Course Content:

Chapter No.	Chapter Title	Contents	Intended learning outcomes	hours
		GROUP-A: DIFFERENTIAL CALCULUS Hours: 2 Marks: 5		
A1	Partial differentiation	Function of two or more variables, Definition and meaning of partial derivatives (first order).	Understand functions having two or more variables.	2
		GROUP – B: DIFFERENTIAL EQUATION Hours: 21 Marks: 30		
B 1	Differential Equation	Definition, classification, order and degree of a Differential Equation. Formation of Ordinary Differential Equations.	Recognize and form differential equations.	3
B 2	Ordinary differential equations of first order and first degree	2.1. Separation of variables. 2.2. Homogeneous equations. 2.3 Equations reducible to homogeneous form. 2.4. Exact equations. 2.5. Linear equations. 2.6. Bernoulli's equations. 2.7. Application of Differential Equations[Laws of voltage ,current related to EC,RC,LRC]	Solution of different types of first order and first degree ordinary differential equations and their application in solving different types of circuit related problems.	7
B 3	Differential Equations of first order and higher degree	3.1. Left hand side resolved into factors, 3.2.Equations solvable for x, 3.3. Equations solvable for y, 3.4. Clairaut's equations.	Solution of different types of first order and higher degree ordinary	4

			differential equations.	
B 4	Differential Equations of second order	4.1. Differential Equations of second order with constant co-efficient and right hand side zero. 4.1.1. Operator D, Auxiliary equation. 4.1.2. Rules for real and equal, real and unequal and complex roots. Complete solution. 4.2. Differential Equations of second order with constant co-efficient and right hand side a simple function of x. [Exponential , Trigonometric and algebraic function].	To know about Complementary function, particular integral, General solution, particular solution, completesolution of different types of second order differential equations.	7
		GROUP – C: STATISTICS AND PROBABILITY Hours: 13 Marks: 18		
C 1	Measures of Central Tendency	Mean, Median, Mode.	Basic measures of central tendency	3
C 2	Measures of Dispersion	2.1. Range, Quartile Deviation. 2.2. Mean Deviation (from mean, median, mode). 2.3. Standard Deviation, Variance, Co-efficient of variation.	Different types of measures of dispersion	5
C 3	Correlation	3.1. Definition of Bivariate distribution, scatter diagram. 3.2. Determination of Karl-Pearson's co-efficient of Correlation.	Correlation in bivariate distribution	2
C 4	Probability	4.1. Classical definition of probability 4.2. Addition and multiplication laws, related examples (simple cases).	Definition and uses of probability.	3
		GROUP – D: Graphics, Matrix, Linear Programming problems. Hours: 9 Marks: 17		
D1	Graphics	Graphs of Trigonometric functions.	Tracing of curves (trigonometric)	2
D2	Matrix	2.1. Transpose of a matrix, 2.2. Adjoint of a square matrix	1. Use of matrices for solving	

		2.3. Inverse of a matrix 2.4. Solution of Simultaneous Linear equations. 2.5. Characteristic Equations.	simultaneous equations. 2. Computation of determinants and eigenvalues of a matrix.	4
D3	Linear Programming Problems(Basics)	3.1. Introduction of system of Linear Inequations involving two variable and graphical solution of the system. 3.2. Mathematical formulation of LPP (two variables). 3.3.Unique optimal feasible solution of LPP with two variables by graphical method.[Infinite no. of solutions, unbounded solutions and no solution cases may be discussed but not for the examination point of view)	Method of solving two variable linear programming models by the graphical solution procedure.	3

8. Distribution of Marks:

Chapter No.	Chapter Title	Type of Question			Total Marks
		Objective Type (compulsory)	Short questions	Descriptive questions	
A1	Partial Differentiation		2	3	70
B1	Differential Equation	1+1+1=3	2		
B2	Diff. Equation of first ord. first degree	1+1+1+1=4	2	3	
B3	Diff. Equation of first ord. higher degree	1+1+1=3	2	3	
B4	Diff. Equation of second order	1+1+1=3	2	3	
C1	Measures of Central Tendency	1+1=2	2		
C2	Measures of	1+1=2	2	3	

	Dispersion				
C3	Correlation			3	
C4	Probability	1+1=2	2		
D1	Graphics	1+1=2		3	
D2	Matrix	1+1=2	2	3	
D3	LPP	2		3	
		25	18	27	70

9. Suggested implementation strategies: The syllabus can be completed by taking regular classes along with tutorial classes. Audio-Visual aids also can be used.

10. Suggested Learning Resources:

1. Applied Mathematics (vol. I&II) by R . D. Sharma

2. Engineering Mathematics by H .K. Das

3. Mathematics for Polytechnics by S.P.Deshpande.

4. An Introduction to polytechnic mathematics Vol-II by Parbin Ahmed, Ajanta Choudhury, Geetali Das

Annexure-I

TABLE OF SPECIFICATIONS FOR THEORY

Sr. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage(c)	K	C	A	HA
1	DIFFERENTIAL CALCULUS	2	4.4	2	0	3	
2	DIFFERENTIAL EQUATION	21	46.7	9	16	5	
3	STATISTICS AND PROBABILITY	13	28.9	4	6	8	
4	GRAPHICS, MATRIX, LPP	9	20	4	7	6	
Total		Σ b=45	100				

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} \times 100$$

DETAILED TABLE OF SPECIFICATIONS FOR THEORY

Sr. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	DIFFERENTIAL CALCULUS					2				2			3		3
2	DIFFERENTIAL EQUATION	7	6		13	2	4	2		8		6	3		9
3	STATISTICS AND PROBABILITY	4	2		6		4	2		6			6		6
4	GRAPHICS,MATRIX,LPP	4	2		6			2		2		3	3+3		9

K = Knowledge, C= Comprehension, A = Application, HA = Higher Than Application, T=Total

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

4. Course Title– Principle of Electrical Engineering

Course Title: Principle of Electrical Engineering

2. Course Code: EI - 301

3. Semester: 3rd

4. Rationale of the Subject:

This is a basic technology subject. This subject will help the students to develop certain technology related skill. This subject includes DC, AC circuit, magnetism, electromagnetism etc. This is one of the important core engineering subjects for electrical engineers. The main objective of this subject is to enhance the basic knowledge and skill. This course is designed to impart basic knowledge of Electrical Engineering to Electrical Diploma student.

5. Aim:-

1. This is a basic technology subject in electrical engineering.
2. This subject helps the student to enhance basic knowledge and skill of the student in electrical engineering.

6. COURSE OBJECTIVES: - The student will be able to-

1. Enhance the fundamental concept in electrical engineering.
2. Know magnetism, electromagnetism, electromagnetic induction, electrostatic.
3. Know energy conversion principle.
4. Know fundamental of AC, phasor algebra, ac series circuit and significance of power factor.

COURSE OUTCOMES:-

OUTCOMES NOS.	COURSE OUTCOMES (COs)
1. CO-301.1	After successfully completion of the course ,student will able to know- - The basic knowledge of electricity,current,voltage,power, energy and behaviour of circuit components resistance, inductance and capacitance.
2. CO-301.2	- Ohms law and realize the limitation of Ohms law due to temperature dependence. Series and parallel circuit.

3.	CO-301.3	- Faradays laws of Electromagnetic induction, Lenz's law, Flemings right and left hand rules and uses of appropriate laws and solve numerical problems. Self and mutual inductance, B-H curve, Hysteresis and eddy current loss.
4.	CO-301.4	- Capacitor and its construction and finding out capacitance of condenser made of using uniform dielectric medium , composite electric medium, medium partly air.
5.	CO-301.5	- Know the energy conversion principle and its application.
6.	CO-301.6	- Know the fundamental concept of A.C,phasoralgebra,a.c series circuit and concept of power factor.

7. Pre-Requisite:-

1. Conductor, insulator
2. Resistance, inductance and capacitance
3. Simple differential, integral calculus, matrix.

8. Teaching Scheme (in hours per week):

Lecture	Tutorial	Practical	Total
3	1	3	7

9. Examination Scheme:

Theory			Pass marks(ESE+SS)	Practical		Pass marks(PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA	17/50	150	4
	TA	HA		25	25			
	70	10 20						

10. Detailed Course Content:

Chapter No	Chapter Title	Content	Duration (in hours)
1.0	Fundamental Concept	1.1 Concept of current, voltage, resistance 1.2 Work, power, energy and relationship between work, power and energy 1.3 Resistance in series and parallel 1.4 Ohm's law and problem 1.5 Kirchhoff's laws and problem	6
2.0	Magnetism and Electromagnetism	2.1 Magnetic circuit parameter 2.2 Direction of magnetic field in straight conductor, coil, solenoid etc. 2.3 Force on current carrying conductor lying in magnetic field, force between two parallel conductors, mmf, magnetizing force, flux, flux density, reluctance, permeability, 2.4 Series and parallel magnetic circuit, related problems 2.4 hysteresis and hysteresis loop	6
3.0	Electromagnetic Induction	3.1 Electromagnetic induction 3.2 Faraday's law, Lenz Law, direction of induced Emf and current 3.3 Statically and dynamically induced Emf 3.4 Self and mutual inductance	5
4.0	Energy Conversion Principle	4.1 Law of conversion of energy 4.2 Role of electrical energy and its uses 4.3 Electromechanical energy conversion principle 4.4 Condition of production of Emf, rotor action 4.5 Single excited and doubly excited field theory	5
5.0	Electrostatic	5.1 Coulomb's law of electrostatic 5.2 Electric field, electric field strength, electric potential and potential difference between two points 5.3 Capacitor, capacitance, energy stored in a capacitor 5.4 Capacitance of parallel plate capacitor with uniform dielectric medium and composite medium, calculation.	5
6	AC Fundamentals	6.1 Definitions, Equations, Cycle, Time period, Frequency, Amplitude, Phase, Phase difference, RMS value, Average value, Maximum values, form factor, Crest factor, Simple	4

		problem	
7	Phasor Algebra	7.1 J operator 7.2 Rectangular, polar and trigonometrical form of phasor 7.3 Addition, subtraction, multiplication and division of phasor	3
8	AC Series Circuit	8.1 Definitions – Inductance, Inductive reactance, Capacitance, Capacitive reactance, impedance 8.2 A. C. through pure resistance, pure inductance and pure capacitance 8.3 A. C. through R—L, R—C and R—L – C series circuit and their problems 8.4 Resonance and problems	8
9	CLASS TEST		3

11. TABLE OF SPECIFICATIONS FOR THOERY

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Fundamental concept	6	14	14	2	1	7	
2	Magnetism & electromagnetism	6	14	14	7	1	2	
3	Electromagnetic induction	5	12	12	2		6	
4	Energy conversion principle	5	12	12	3	1	4	
5	Electrostatic	5	12	12	3	1	4	
6	A.C fundamental	4	10	10	4	2	1	
7	Phasor algebra	3	07	06	1	1	3	
8	A.C series circuit	8	20	20	8	2	4	
	Total	42	100	100	30	9	31	

12. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM:-

Sl no.	Topics	Objective type				Short answer type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Fundamental concept	2	1	1	4			2		2			4		4
2	Magnetism and electro – magnetism	2	1	1	4	2		1		3	3				3
3	Electromagnetic induction	2		2	4								4		4
4	Energy conversion principle	1		1	2	2	1			3			3		3
5	Electrostatic	1	1		2	2				2			4		4
6	A.C fundamentals	2	1	1	4	2	1			3					
7	Phasor algebra	1			1		1			1			3		3
8	A.C series circuit	2	1	1	4	2	1			3	4		3		7
	Total				25					17					28

13. Suggested Implementation Strategies: This subject will develop the foundation of the electrical diploma students. Therefore more tutorial assignments are to be given the students. Experiments performed in the laboratory will help the students in developing the skill.

14. Suggested Learning Resources:

Book List:

1. Fundamentals of Electrical Engineering by Tarlok Singh, S. K. Kataria & Sons,
2. Electrical Technology Vol.-I & Vol.-II by B. L. Thereja & A. K. Thereja, S. Chand & Co.
3. Basic Electrical Engineering by V. K. Mehta & Rohit Mehta, S. Chand & Co.
4. Fundamentals of Electrical & Electronics Engineering by S. Ghosh, PHI
5. Electrical Technology Vol.-I by J. B. Gupta, S. K. Kataria & Sons
6. Theory and Performance of Electrical Machines by J B Gupta

4. Course Title– Principle of Electrical Engineering Laboratory

3rd Semester

CODE No. EI – 301P

Practical: Full Marks: 50 Practical test/viva = 25 Sessional (TA+HA) = 25

Pass Marks: 17/50

Skills to be developed:-

a) Intellectual Skills:-

1. Skill of properly interpretation of results.
2. Skill of selection and identification of instruments.

b) Motor Skill:-

1. Skill of connecting the instruments properly.
2. Skill of taking reading accurately.
3. Skill of drawing phasor diagram and graph.

List of practical

1. To find the following for a filament lamp
 - a) Variation of resistance with voltage
 - b) Variation of power with voltage
2. Verification of Ohm's law.
3. Verification of Kirchhoff's laws.
4. Testing of fuse and find out the fusing constant.
5. To find out the voltage-current relationship in an R-L series AC circuit to determine power factor of the circuit.
6. To find out the voltage-current relationship in an R-C series AC circuit to determine power factor of the circuit.
7. To find out the voltage-current relationship in an R-L-C series AC circuit to determine power factor of the circuit.

Reference Book:

Lab manual on basic Electrical Engineering and Electrical Measurement by S K Bhattacharjee, K M Rastogy

Lab Course in Electrical Engineering by S G Tarnekar, P K Kharbandha

A Text Book of Practical in Electrical Engineering by Dr. N. K. Jain

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5. Course Title– Elements of Electronic and Devices

1.Course title- Elements of Electronics and Devices

2.Course code- EI-305

3.Semester- 3rd

4. Rationale of the subject – This subject is the base of all advance electronics. It starts with semi -conductor physics and P-N junction which makes the student to follow the functioning of all semi-conductor based devices. Understanding of this subject will provide skill to the student for troubleshooting and testing of some basic electronic components and circuits.

5. Aim:-

This subject is the base of all advance electronics. It starts with semi -conductor physics and P-N junction which makes the student to follow the functioning of all semi-conductor based devices. Understanding of this subject will provide skill to the student for handling and testing of some basic electronic components and circuits.

6. COURSE OBJECTIVES:-

The student will be able to

- A. Describe the formation of P-N junction
- B. Draw the characteristic of basic electronic components like diode, transistor etc.
- C. Draw and describe the basic circuit of rectifier, filter and amplifier.
- D. Testing of diode and transistor.
- E. Construction and performance of different types of oscillator.
- F. Performance of UJT, FET, MOSFET.
- G. Performance of SCR, DIAC, TRIAC.

5(a) COURSE OUTCOMES:-

CO305.1 –to enable one to identify and measure the value of different resistors, capacitors, diodes and transistors.

CO305.2 -To enable one to study and draw the characteristics curve of diodes.

CO305.3- To enable one to classify and study the different types of transistors in different modes.

CO305.4-To enable one to classify and analyze different types of amplifiers and oscillator circuits.

CO305.5- To enable one to identify and study the special semiconductor devices.

6. Pre- requisite

A. knowledge of semiconductor physics

7. Teaching scheme (in hours)

Lecture	Tutorial	Practical	Total
3 hrs/week		3 hrs/week	6 hrs/week

8. Examination Scheme

Theory			Pass marks(ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA	17/50	150	5
	TA	HA						
	70	10	20	25	25			

9. Detailed Course Content

Chapter no.	Chapter Title	Content	Duration Hours
1.	semiconductor	Introduction of valve tubes and classification Definition, energy band diagram, intrinsic and extrinsic semiconductor, doping, P-type, N-type semiconductor PN junction diode, forward bias & reverse bias characteristics of PN junction diode, half and full wave rectifier circuits, filter circuits.	08
2	Electronic devices	Resistor and capacitor-types, color codes and uses, Zener diode, tunnel diode, photodiode. Cathode ray oscilloscope, Multimeter-construction, working principles, uses	06
3	Transistor	Physical construction of bipolar PNP and NPN transistor, biasing circuit configuration(CB CE CC), their input and output characteristics. Application of transistor as an amplifier. Concept of Load line, Q-point and phase reversal in amplification	08

4	Transistor amplifier	Different types of amplifier – class A, B,C , AB amplifier, push pull amplifier, Multistage amplifier – RC coupled, transformer coupled, and direct coupled amplifier.	06
5	Feedback circuit and oscillator	Types of feedback-positive and negative feedback, their comparison. Condition of oscillations, tank circuit, types of oscillator-Hartley, Colpitt, Crystal Oscillator, their advantages, disadvantages and application	05
6	Special semiconducting devices	Construction, operation and application of FET ,MOSFET, UJT, SCR, DIAC, TRIAC	06
7	Integrated circuits	Introduction and familiarization with some commonly used IC's	03
8	Class test		03

10. Table of specification for theory:

Sr. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Modified Percentage Weightage (d)	K	C	A	HA
1	Semiconductor	8	19	19	8	1	5	
2	Electronics devices	6	14.2	14.2	2	0	8	
3	Transistor	8	19	19	6	1	6	
4	Transistor amplifier	6	14.2	14.2	3	2	5	
5	Feedback circuit and	5	12	12	2	1	5	

	oscillator							
6	Special semiconductor devices	6	14.2	14.2	8	0	2	
7	Integrated circuit	3	7	7	2	0	3	
Total		Σ b=42	100	100	31	5	34	

11. Detailed table of specification for Examination:

SL No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Semiconductor	2	1	2	5	2				2	4		3		7
2	Electronics devices	1		2	3	1		2		3			4		4
3	Transistor	2	1	2	5						4	0	4		8
4	Amplifier	1		2	3	2	2			4	0		3		3
5	Feedback circuit And oscillator	2	1	2	5								3		3

6	Special semiconductor Devices	2		2	4	2				2	4				4
7	Integrated circuit				0						2		3		5

12. Suggested Implementation strategies:—

The teacher should bring electronic components and devices in the class and explain and make the students familiar with them. Also, the students should be encouraged to do some small project work.

10. Reference book

1. Principle of Electronic by V. K. Mehta, S. Chand
2. Electronic Principle by S.K. Sahdev, Dhanpat Rai & Co
3. Electronic Principle by Malvino

5.Course Title– Elements of Electronic and Devices Laboratory

ELEMENTS OF ELECTRONICS AND DEVICES- LAB

Code: EI-305

Total marks: 50

Practical: 25

Sessional: 25

Pass marks: 17/50

Skills to be developed-

Intellectual skills:

- 1.To locate the faults in circuit
- 2.Identification of various components

Motor skills:

- 1.Ability to draw the circuit diagram.
- 2.Ability to interpret the circuits

List of Practical (at least five experiments are to be performed)

- a.Testing of resistor, capacitor, diode and transistor using multimeter .
- b.Characteristics of PN junction diode.
- c.Characteristics of zener diode.
- d.Input and output characteristics of transistor in CB, CE, CC mode
- e.Study of Hartley, Colpitt oscillator
- f.Study of single stage amplifier.
- g.Test the characteristics of DIAC, TRIAC

6.Course Title– Element of Mechanical Engineering.

Subject Title	:	Elements of Mechanical Engineering
Subject Code	:	Me-302
Hours Per Week	:	03
Hours Per Semester	:	45
Class Test hrs	:	03
Total hrs	:	48
Full marks(Theory)	:	70
Sessional Marks	:	30
Class hours		L T P
		3 0 3

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks	Marks of questions of type		
				Obj	Short	Long
1	Introduction	02	04	2	2	-
2	Properties and Laws of Gases	04	10	3	3	4
3	Properties of Steam	07	15	3	4	8
4	Generation of Steam	06	13	3	3	7
5	Steam Engine	05	12	3	3	6
6	Internal Combustion Engine	07	14	3	5	6
7	Steam Turbines	06	12	3	3	6
8	Gas Turbines	04	09	3	2	4
9	Transmission Of Motion And Power	04	08	2	2	4
Total		45	97	25	27	45

CO : Outcome based Course Objectives

After studying the subject the students will be able to

1. Acquire a brief information of the prime mover
2. Solve problems on ideal gases following Characteristics Gas Equation

3. Explain the thermodynamic process Isothermal, Adiabatic and polytropic.
4. Solve problems of steam using steam table
5. Explain the function of a boiler
6. Identify the Mounting and accessories of a boiler
7. Know the function of a steam engine
8. Know the operation of an Internal Combustion Engine
9. Know the principle of steam turbine
10. Acquire the knowledge of information on power transmission systems

ILO (Intended Learning Objectives)

1. Know the information about the source of power
2. Explain the principle of prime mover
3. Know the conversion of thermal energy to mechanical energy
4. Know the Types of prime mover
5. Define Charles Law
6. Define Boyle's Law
7. Derive Characteristics Gas Equation
8. Define Ideal Gas
9. Solve problems on Characteristics Gas Equation
10. Explain Energy equation
11. Know about thermodynamic system, surrounding and environment
12. Define isothermal, Adiabatic, Polytropic process
13. Describe the properties of Steam
14. Explain sensible heat & latent heat of steam
15. Define the enthalpy of steam
16. Know about wet, dry saturated and superheated steam
17. Know the use of steam table for solving problems
18. Define boiler or steam generator

19. Explain the importance of Mountings
20. Explain the function of accessories
21. Know brief about draught, natural and artificial type
22. Know the working principle of steam engine, its parts and functions in brief
23. Calculate the power developed, efficiency and its related small problems
24. Know about the principle of Internal Combustion engine, its type (SI & CI engine)
25. Explain the thermodynamic cycle (Two stroke and four stroke) in SI and CI engine
26. Know the important parts of engines and its functions
27. Estimate the power developed, efficiency and the work done in IC engine
28. Know the working principle of steam turbine
29. Know the function of condenser
30. Know the working of gas turbine cycle and its types
31. Know the type of fuel used in gas turbine cycle
32. Know the application of gas turbine
33. Know about belt and pulley its uses
34. Know the effect of creep, slip, and centrifugal force in belt
35. Calculate the velocity ratio of belt and pulley
36. Know about the power transmission through gears
37. Determination of size of gears according to the velocity ratio
38. Determine the power transmitted by gear train
39. Solve small problems on simple machine

Course Details

1. Introduction: Sources of power, prime movers, types of prime movers, Heat and temperature, conversion of heat into mechanical power—2 hrs
2. Properties and laws of gases: Internal energy, enthalpy, specific volume, specific heats, energy equation, isothermal, adiabatic and polytropic processes of gases—4 hrs

3. Properties of steam: Differences between gas and vapour, sensible heat, latent heat, enthalpy of steam, wet, dry saturated and superheated steam, steam table and its uses, some basic problems---6hrs
 4. Generation of steam: Boilers, different classification of boiler, Mainly study of Cochran, Lancashire, and water tube boilers, Boiler mountings and accessories pressure gauge, water level indicator, safety valve, stop valve, feed check valve, blow off cock, fusible plug, manhole, feed pump, injector, feed water heater , air pre heater, steam separator, steam separator, steam trap, all with brief study, Draught natural and artificial draught---- 8hrs
 5. Steam engine: Working principle of steam engine, and its classification, names of various parts of steam engine and their function, Estimation of power and its efficiency and related problem.
 6. Internal combustion engine: What is I.C. engine , Classification of IC engine, four stroke cycle, two stroke cycle, principle of working of diesel and petrol engine, names and function of the main parts, carburation, ignition , injection, governing, cooling and lubrication , estimation of power and efficiency and its problem, common defects in IC engines and their remedies
 7. Steam Turbines: Classification -impulse and reaction turbine, Cycle and principle of working of a simple steam turbine, Condenser functions and types.
 8. Gas Turbines: Cycle and principle of working, main components, types of fuel used in gas turbine, application of gas turbine.
 9. Transmission of motion and power: Belt and pulley, types of belts, pulleys and drives, velocity ratio, length of belt tension in belts, power transmitted by belt, effect of creep, slip, and centrifugal force, gears, types of gears , elements of spur gear , velocity ratio, determination of sizes of gears, gear trains, power transmitted by gear drive, worm and worm wheel, rack and pinion
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6.Course Title– Element of Mechanical Engineering (Practical)

Elements of Mechanical Engineering Laboratory

CO-----Outcome based objectives:

After performing the experiments the students will be able to

- a. Identify the mountings and accessories of a boiler
- b. Know the working principle of a steam engine
- c. Explain the working principle of an SI Engine
- d. Explain the working principle of an CI Engine
- e. Explain the principle of power transmission system

Course Content

Total 48 hrs

1. Study of boilers
 - i) Cochran boiler
 - ii) Lancashire boiler
 - iii) Babcock & Wilcox boiler
 - iv) Locomotive Boiler
2. Study of Steam Engine
 - i) Reciprocating Steam Engine
3. Study of S I & C I Engine
 - i) Two stroke cycle model and valve diagram
 - ii) Four stroke cycle model and valve diagram
4. Study of power transmitting devices
 - i) Belt
 - ii) Gear
 - iii) Pulley
 - iv) Link
5. Viva voce

7. Course Title– Professional Skill-I.

PROFESSIONAL SKILL –I

3rd SEMESTER, ELECTRICAL ENGINEERING

CODE: EL-310

THEORY SCHEME:

Theory: 1hr/week

Practical: 2hrs/week

Credit: 2

PRACTICAL SCHEME:

Practical assessment: 25 marks

Practical test: 25 marks

A) RATIONAL:-

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through industrial visits, guest lectures on technical topics and conducting group discussions.

B) AIMS AND OBJECTIVES:-

The student will be able to:

- Preparing report on industrial visits, expert lectures.
- Interacting with peers to share thoughts.
- Prepare notes for given topic.
- Presentation in seminar, group discussion on improvement of communication skills.
- Acquire information from different sources.

C) PRE- REQUISITE:-

1. Desire to gain comparable knowledge and skills of various activities in various areas of importance.
2. Eagerness to participate in group work and to share thoughts with group members.
3. Knowledge of basic electrical engineering.

Activities:

1. INDUSTRIAL/FIELD VISIT: - - 10 HRS.

Structured field visits be arranged and report of the same should be submitted by the individual student, to form part of the team work.

Visits to ANY TWO from the list below:

- a. Nearby power distribution sub-station (APDCL) or grid substation and observe substation equipments and power distribution system.
- b. Transformer and other electrical equipments manufacturing and repairing workshop and observe the repairing of different parts.
- c. Low and high voltage Cable manufacturing company.
- d. Nearby electrical workshop for observation of installation and identifications of various electrical equipments.
- e. Nearby petrol pump (fuel, oil, product specifications)
- f. Tea processing industry (layout and machine)
- g. Food processing industry (layout and machine)

2. GUEST LECTURES: (Any three) Lectures by professional /industrial expert/ student

Seminars on the following areas. -10 HRS

- a. Street lighting system and illumination
- b. Safe application of electrical energy in daily life.
- c. Non destructive testing
- d. Solid waste power generation.
- e. Computer networking and MAT lab.
- f. Topics related to social awareness –
 - i) Energy saving and protection of power theft
 - ii) Pollution control.
 - iii) Yoga meditation practice.
 - iv) AIDS awareness and health awareness programme.

Individual report of the above lecture should be submitted by the students.

3. GROUP DISCUSSION: (Any TWO among a group of four to five students). Topic and time duration of the group discussion to be decided by concerned teacher. –10 HRS.

- a. Current topics related to electrical engineering field.
- b. Current news items
- c. Current and historical events related to social, cultural and environmental.
- d. Discipline and housekeeping.
- e. Rural electrification system.
- f. Use of plastic carry bag (social and domestic Hazard)

4. STUDENTS ACTIVITY: The students in a group of 4 to 5 will perform any one of the following activities. –10 HRS.

- a) Identify the various electrical tools and equipments and write their functions and ISI standard specification.
- b) List of Energy efficient equipments and uses.
- c) Tree plantation inside or outside of the institute campus.
- d) Help in flood relief camp (by all students)
- e) Other co- curricular and extracurricular activity.

EXAMINATION SCHEME (on Practical assessment)

Continuous internal assessment of 25 marks is to be carried out by the teachers.

Distribution of marks: -

Activities =10,

Group discussion = 5,

Field visits=5 and

Guest lecturer attendance and Report= 5

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COURSE STRUCTURE OF 4TH SEMESTER (ELECTRICAL)

Sl no	Code no	Subject	Contact hours /week			Evaluation scheme										Total Marks (Th+Pr)	Credit
						Theory (Th)					Practical (Pr)						
			L	T	P	ESE	Sessional(SS)			Pass (ESE+SS)	Practical Test(PT)	Practical Assessment (PA)	Pass (PT+ PA)				
TA	HA	Total (TA+ HA)															
1	EL - 401	Electrical circuit and network	3		3	70	10	20	30	33/100	25	25	17/50	150	5		
2	EL - 402	Electrical and Electronics drawing and design			6						100	50	50/150	150	4		
3	EL- 403	Electrical measurement and measuring instruments —I	3	1	3	70	10	20	30	33/100	25	25	17/50	150	4		
4	EL- 404	Electrical Machine -I	3	1	3	70	10	20	30	33/100	25	25	17/50	150	4		
5	EL - 405	Electrical Engineering material	3			70	10	20	30	33/100				100	3		
6	EL 406	Digital electronics	3			70	10	20	30	33/100				100	3		
7	El - 410	Professional practices -II	1		2						25	25	17/50	50	2		

1. Course Title: Electrical Circuit & Network

1. Course Code: El - 401

2. Semester: 4th

3. Rationale of the Subject: Electrical circuit analysis helps in finding voltage drop across and current through any component in the network. There are theorems and techniques for finding these values. This subject contains the basic of network analysis, introduction to various network elements, various networks for with DC, single phase AC and 3 phase AC for finding voltage and current. This subject helps to understand the concept in other electrical subjects like electrical power system, electrical measurement, electrical machine instrumentation etc.

4. Aim:

1. To enable the student to have a grasp on basic principles of electric circuit.

2. To help the student in understanding the concept in electrical subjects like Power System, AC Distribution and Utilization, Electrical Measurement and Measuring Instrument etc.

5. Course Objectives : The student will be able to -

1. Know and define electric circuit terminology, different energy sources used in electric circuit.

2. Know various network theorems and application of these theorems in solving problems of both DC and AC network.

3. Interpret the performance of AC parallel circuit.

4. Know relationship between phase and line voltage and current in three phase system.

5. Understand the behavior of circuit in transient condition.

6. Develop the concept of application of MATLAB in network analysis.

5(a) COURSE OUTCOMES:-

On successful completion of the course the student will be able to –

CO 1: Understand different network theorems and apply them on dc dependent source as well as independent source, solve numerical problem.

CO 2: Comprehend the theorems of AC network.

CO 3: Analyze the AC parallel circuits and apply Matlab in Ac series and parallel circuit.

CO 4: Understand the AC poly phase circuit and solve numerical.

CO 5: Know AC transient.

6. Pre-Requisite:

1. Current and voltage.
2. Resistance in series and parallel, cells in series and parallel.
3. Inductance, capacitance, inductive reactance, capacitive reactance.

7. Teaching Scheme (in hours per week):

Lecture	Tutorial	Practical	Total
3hrs		3hrs	6 hrs/week

8. Examination Scheme:

Theory			Pass marks(ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	5

9. Detailed Course Content:

Chapter No	Chapter Title	Content	Duration (in hours)
1.0	D. C Network Theorem(With independent Source)	1.1 Network Terminology – Parameters, active, passive element, active and passive network, linear, nonlinear, bilateral, unilateral circuit, node, branch, loop, mesh 1.2 Super position theorem, Thevenin's theorem, Norton's theorem, reciprocity theorem, maximum power transfer theorem, Star delta transform.	9
2.0	D. C Network Theorem(With dependent Source)	2.1 Super position theorem, Thevenin's theorem, reciprocity theorem, Norton's theorem	4

3.0	A. C Network Theorem	3.1 Mesh analysis, Node analysis, Super position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem,	8
4.0	Single phase AC parallel circuit	4.1 Solving parallel circuit by vector method, admittance method and complex algebra method 4.2 Resonance in parallel circuit	7
5.0	Three phase circuit	5.1 Importance of 3 phase circuit , generation of three phase power, phase sequence, balanced load 5.2 Relation between voltage, current of line and phase values in star and delta connection, problems in balanced loads of star and delta connection	5
6.0	Transients	6.1 Introduction and types of transient 6.2 Transient in R-L circuits (DC), R-C circuits(DC) 6.3 Transient in R-L circuits (AC), R-C circuits(AC)	4
7.0	Application of Mat lab	7.1 Introduction to Mat lab 7.2 Application in series and parallel R – L, R – C & R- L –C circuits	5
CLASS TEST			3

10.

circuit and network)

TABLE OF SPECIFICATIONS FOR THEORY (Electrical

Sr. No	Topic (a)	Time allotted in hours(b)	Percentage Weightage(c)	Modified Percentage Weightage(d)	K	C	A	HA
1	DC network theorem(With independent Source)	9	21	21	6	1	8	
2	DC network theorem (with dependent source)	4	10	10	2	1	4	
3	AC network theorem	8	18	18	7	1	5	
4	Single phase AC parallel	7	17	17	7	1	4	

	circuit							
5	Three phase circuit	5	12	12	3	1	4	
6	Transient	4	10	10	1	1	5	
7	Application of Mat lab	5	12	12	3	1	4	
	Total	42	100	100	29	7	34	
	Class test	3						

11. DETAILED TABLE OF SPECIFICATIONS FOR THEORY

Sr. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	DC network (With independent Source)	2	1	1	4			2		2	4		5		9
2	DC network (with dependent source)	2	1	1	4								3		3
3	AC network theorem	2		1	3	1	1			2	4		4		8
4	Single phase AC parallel circuit	2	1		3	2				2	3		4		7
5	Three phase circuit	2	1	2	5	1		2		3					
6	Transient	1	1	1	3								4		4
7	Application of MATLAB	1	1	1	3	2				2			3		3
	Total				25					11					34

12. Suggested Implementation Strategies:

This subject contains various theorems. Teacher may give more home assignments which will help the student in developing skill and concept to solve the network problem using these theorems. Laboratory experiments will also help the students to understand the theorem as well as single phase and three phase AC circuit.

13. Suggested Learning Resources:

Book List: 1. Circuit Theory by A. Chakrabarti

2. Circuits & Network by A. Sudhakar, Shyammoan S. Palli

3. Electrical Circuit Analysis by H. Chandragupta

4. Electrical Circuit by Nilsson J. W, Riedel S. A.

5. Electrical Technology Vol.-I by B. L. Thereja & A. K. Thereja.

6. Basic Electrical Engineering by V. K. Mehta & Rohit Mehta.

7. Getting Started with Matlab: A quick Introduction for Scientist and Engineers: Rudra Pratap

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1. ELECTRICAL CIRCUIT AND NETWORK LABORATORY

4th Semester

CODE No. EI – 401P

Practical: Full Marks: 50, Practical test/viva = 25 Sessional (TA+HA) Marks: 25,

Pass Marks: 17/50

Skills to be developed:-

a) Intellectual Skills:-

1. Interpret results
2. Calculate values for various components for given circuit.
3. Select instruments.

b) Motor Skill:

1. Connect the instrument properly.
2. Take accurate results.
3. Draw phasor diagram and graph.

List of practical

1. Verification of Kirchhoff's Laws.
2. Verification of Super-position theorem.
3. Verification of Thevenin's theorem.
4. Verification of Maximum power transfer theorem.
5. Verification of Reciprocity theorem.
6. To find out the voltage-current relationship in a single phase R-L, R-C and R-L-C series AC circuit, draw their impedance triangle and determine the power in each case.
7. Study of AC parallel circuit.
8. To find out resonance frequency in an RLC circuit.
9. Measurement of power and power factor in a single phase RLC circuit and to calculate active and reactive power.
10. Measurement of 3 phase power.

Reference Book:

Lab manual on basic Electrical Engineering and Electrical Measurement by S K Bhattacharjee, K M Rastogy

Lab Course in Electrical Engineering by S G Tarnekar, P K Kharbandha

A Text Book of Practical in Electrical Engineering by Dr. N. K. Jain

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2. COURSE TITLE: - ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS. –I

2) Course Code: - EL- 403

3) Semester: - 4th.

4) Rational of the Subject: - The quality of electrical energy supplied is governed by the values of operating variables maintaining at consumer terminals. The operating variables that define the condition of the supply system are voltage, current, frequency, power and energy. In order to monitor the operating variables, measuring instruments are essential to measure these quantities accurately. Therefore, in this subject included some measuring instruments, such that student can acquired knowledge how to measure such operating variables with the help of these instrument and also categorize the various types of errors likely come about while taking measurements.

5.Aims: - a) Identify the different instruments their construction and uses.

b) Testing, measuring and monitoring of the instruments for particular uses.

6. Course objectives:- Students will be able to:-

1. Identify the measuring instruments used for measuring electrical quantities like current, voltage, resistance, inductance, capacitance etc.

2. Select appropriate instruments with range for measurement of various electrical quantities. Select and use range multiplier if required.

3. Classify measuring instruments based on construction, principle of operation and quantities to be measured.

6(a) COURSE OUTCOMES:-

Sl. no	COURSE OUTCOMES (COs)
1.	Student will be able to learn– CO-1 Unit and dimension of measuring system ,dimensional equation
2.	CO-2 Classification of measuring instruments. Essentials of indicating, recording and integrating instrument. Different torques and their importance.
3.	CO-3 MC, MI, ED and induction type instrument, their construction and working.
4.	CO-4 Identify the measuring instruments used for measurement of electrical quantities like resistance, inductance and capacitance using different bridges.

5.	CO-5 Extension of meter range using shunt and multiplier, construction and working of CT and PT.

7. Pre-requisite –

1. Knowledge of current, voltage, resistance and their measurements

8. Teaching Scheme (In hrs):-

Lecture	Tutorial	Practical	Total
03	01	03	07

9. Examination scheme:-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA	17/50	150	4
	TA	HA						
	70	10	20	25	25			

10. Detailed course content:-

Chapter No	Chapter Title	Contents	Duration s (hrs)
1.0	Unit, dimensions and Standards	1.1 Fundamental unit, absolute and derived units, CGS, MKS, RMKS, RMKSA, SI, unit. 1.2 Dimensional analysis. 1.3 Standards and classification of standard.	5 hrs
2.0	Measurement and instrumentation system	2.1 Method of measurement, Role of instrument. Selection of instrument and type of instrument static and dynamic characteristics	4hrs
3.0	Electromechanical instruments	3.1 Classification – absolute, secondary indicating, integrating instruments. 3.2 Constructional idea, different types of torque, 3.3 PMMC, MI, Induction type instrument, Electro dynamometer type, electro static instruments.	8 hrs
4.0	Measurement of resistance	4.1 Measurement low, medium and high resistance by modified Kelvin's double bridge, wheat stone bridge and megger . 4.2 Construction and working principle of megger.	5 hrs
5.0	Potentiometer	5.1 D.C. and A.C. potentiometer, basic circuit, applications,	4 hrs

6.0	A.C. Bridge	standardization, advantages. 6.1 Fundamentals of A.C. bridge, 6.2 measurement of inductance and capacitance – Maxwell's, Inductance bridge, Hay's bridge, Anderson bridge, Owens bridge, De-Sauty's bridge, Schering bridge, Wien bridge, universal inductance bridge, balance equation, simple problems.	10 hrs
7.0	Measurement of current and voltage	7.1 Construction and working principle of different type of ammeter and voltmeters 7.2 Extension of range – shunt and multiplier. 7.3 CT and P.T., Ratio error, Phase angle error, simple problems.	6 hrs
8.0	Class test		3 hrs

11. TABLE OF SPECIFICATIONS FOR THEORY (EMMI-I)

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Unit, dimensions and standards	5	12	12	3	1	4	
2	Measurement and instrumentation	4	10	10	2	1	4	
3	Electromechanical instruments	8	18	18	7	1	5	
4	Measurement of resistance	5	12	12	4	1	3	
5	Potentiometer	4	10	10	3	2	2	
6	A.C. bridge	10	24	24	9	1	7	
7	Measurement of current and voltage	6	14	14	3	1	6	
	Total	42	100	100	31	8	31	
	Class test	3						

12. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer Type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Unit ,dimension & standard	2	1	2	5	1				1			2		2
2	Measurement & instrumentation	2	1	1	4								3		3
3	Electromechanical instruments	2		2	4	2	1			3	3		3		6
4	Measurement of resistance	1	1	1	3			2		2	3				3
5	Potentiometer	1	1	2	4	2	1			3					
6	A.C bridge	1		1	2	2	1	2		5	6		4		10
7	Measurement of current and voltage	1	1	1	3	2		1		3			4		4
	Total				25					17					28

13. Suggested implementation:- There are Five questions in Descriptive portion each carry 15 marks. Student should be allow to answer any three questions.

14. Suggested learning resources =

List of books:-

Sl No	Title of book	Authors	Publications
1.	A course in Electrical measurement and measuring instrument	A.K. Sawhney	-Dhanpat Rai, New Delhi
2.	Electrical measurement and measuring instrument	M.L. Anand	-S.K. Kataria & sons, New Delhi
3.	Electrical measurement and measuring instrument	S.K. Sahdev	-Unique international publication, Jalandhar.
4.	Electrical measurement and instrumentation	J.B. Gupta	- S.K. Katari & Sons, New Delhi
5.	Fundamentals of microprocessor	Ram. B	- Dhanpati Rai Publications, New Delhi

6.	&microcontrollers Modern electronic Instrumentation & measurement techniques	Albert D. Helfrick William David	- Prentic-Hall India (P) Ltd, New Delhi.

2.ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENT-I LABORATORY

Code = EL-403 (P)

Total Marks =50

Practical/ Viva = 25

Pass Marks = 17/50

Sessional = 25

Skills to be developed –

Intellectual skills :-- I. Identification of instruments

II. Selection of instruments for particular applications

Motor skills :-- I. Accuracy in measurement

II. Making proper connection.

Experiment No :-

Title of the Experiments

1	Calibration of Ammeter by direct loading with standard one.
2	Calibration of voltmeter by direct loading with standard one.
3	Extension of range of Ammeter and voltmeter with the help of shunt & multiplier.
4	Measurement resistance by Wheatstone bridge method.
5	Measurement of insulation resistance with megger.
6	Study of Anderson Bridge and find out unknown inductance.
7	Study of Maxwell Bridge and find out unknown inductance.
8	Study of De-Sauty's bridge and find out unknown capacitance.
9	Study of current transformer.
10	Study of potential transformer.

Reference books:-

1. Lab manual on basic Electrical Engineering and electrical measurement – By S.K. Bhattacharjee, K.M. Rastogy.
2. Lab. Course in Electrical engg – By S.G. Tarnekar, P.K. Kharbandha.

1.Course Title :- ELECTRICAL MACHINE –I

2. Course Code: - EI-404

3.Semester: - 4th

4.Rationale :- Through this course contents, a student will deal with various types of Electrical D.C. & A.C. Machines which are employed in industries power sectors, domestic and commercial appliances etc. After studying this subject, an electrical diploma holder must be competent to detect faults, repair, installation and maintenance of these machines and give suggestions to improve their performances. In this subject included some special type of machines which have higher efficiency compact sizes and useful for specific applications in production, processing and fabrications etc.

5Aims: - 1.Students will be able to analyze the construction, operation, characteristic of D C generator, motor and transformer.

2.Knowledge gained from the subject will be helpful for uses, testing and maintenance of the electrical machines as machine operator, supervisors and controllers etc.

6. COURSE objectives:- Students will be able to –

Know the constructional details, working principles and operation of DC machine and transformer.

Starting, running and controlling of the machines for particular works properly.

Evaluate the performances of DC machines and transformer by conducting various tests.

Decide the suitability of DC generator, motor and transformer for particular purpose .

Details specifications of dc machines and transformers as per requirement.

COURSE OUTCOMES:-

Sl. no	COURSE OUTCOMES (COs)
1	After successfully completion of the course ,Student will able to know - CO-1 Constructional details, working principle , operation and various application of d.c generator . Effects of armature reaction , improvement of commutation process.
2	CO-2 Calculation of different losses ,efficiency , voltage build up ,Evaluate of performances .

3	CO-3 Working of d.c motor , types ,voltage equation , calculation of armature torque and shaft torque ,application of different type of d.c motor.
4	CO-4 Starting and speed control of d.c motor .different losses and motor efficiency .
5	CO-5 Working and construction of single phase transformer , EMF equation , behaviour of no-load and loaded transformer .
6	CO-6 Testing of transformer ,calculation of different losses ,efficiency, voltage regulation, all day efficiency ,and rating of transformer .
7	CO-7 3-phase transformer construction , and its different connection and uses.
8	CO-8 Working and construction and application of special type machine like brushless dc motor ,d.c servomotor, printed circuit motor , Practical used of auto transformer ,CT and PT,welding transformer, induction heating transformer , phase shift transformer .

7. Prerequisite: - Knowledge of –

I.Principles of electrical engineering.

II. Electro mechanical energy conversion principle.

III. Basic electronics engineering.

8. Teaching Scheme (In Hrs):-

Lecture	Tutorial	Practical	Total
03	01	03	07

9. Examinationscheme:-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA	17/50	150	4
	TA	HA		25	25			
	70	10						

10.Course Contents:-

Chapter No	Chapter Title	Contents	Duration hrs
1.0	D.C. Generator	1.1 Principle of operation of d.c. generator. Construction, simple lap and wave winding, 1.2 E.M.F equation, 1.3 Types of generator, its electrical connections with voltage equation, its relating problems 1.4 Equalizing ring and dummy coil 1.5 performance, characteristics, critical resistance and critical speed, voltage build-up 1.6 armature reaction, its effects and methods of reduction 1.7 commutation, Process, Methods of improving commutation, 1.8 different losses, Power stages, efficiency, solve related problems and applications.	9hrs
2.0	D.C. Motor	2.1 Principle of operation of d.c. motor, construction, 2.2 Back emf, Types, its connections, Voltage equation, Conditions of Maximum power, 2.3 Torque equation. Losses, power stages and efficiency, & related problems. 2.4 Motor characteristic, methods speed control of different motor. 2.5 Motor Starter, types, construction 2.6 Testing of d.c. machines – Brake test, Swinburne test and Hopkinson test 2.7 applications of different d.c. motor.	9hrs
3.0	Single Phase Transformer	3.1 Working principle of a transformer, 3.2 construction, types of transformer 3.3 EMF equation, Transformer on no-load and its phasor diagram, solving problems. 3.5 Transformer on load, Voltage drop and its phasor diagram. 3.6 Losses in transformer, its related problems. 3.7 Open circuit and short circuit test. Calculation of efficiency, Regulation. Condition of maximum efficiency, simple Problems, Equivalent circuit of transformer 3.8 All day efficiency, equivalent circuit, and transformer rating.	9hrs

4.0	Three Phase Transformer	4.1 Construction of 3-phase transformer and its accessories, 4.2 connections of 3-phase transformer, 4.3 Power and distribution transformer construction, 4.4 Cooling of transformer, 4.5 Conditions for parallel operation.	5hrs
5.0	Special d.c. machine	5.1 Third Brush Generator, permanent magnet d.c. motor, Brushless d.c. motor, construction, application 5.2 D.C. servo motor, construction, application 5.3 Printed circuit d.c. motor. Constructions and applications.	5hrs
6.0	Special Transformer	6.1 Auto- transformer, construction, uses. 6.2 C.T and P.T. 6.3 Welding transformer, 6.4 Induction heating transformer, Furnace transformer, phase shift transformer. Construction & application of each.	5hrs
7.0	Class test		3hrs

11. TABLE OF SPECIFICATION FOR THEORY

Sl no	Topics (a)	Time allotted in Hrs (b)	Percentage Weightage (c)	Modified % Weightage (d)	K	C	A	HA
1	D.C Generator	9	21	21	8	2	5	
2	D.C Motor	9	21	21	8	2	5	
3	Single phase transformer	9	22	22	7	3	5	
4	3-phase transformer	5	12	12	5	1	2	
5	Special d.c machines	5	12	12	4	2	3	
6	Special transformer	5	12	12	4	1	3	

Total	42	100	100	36	11	23	
Class test	3						

12. DETAILED TABLE OF SPECIFICATIONS FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer Type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	D.C Generator	2	2	2	6	2				2	4		3		7
2	D.C Motor	2	2	2	6	1				1	5		3		8
3	Single phase transformer	1	2	2	5	2	1			3	4		3		7
4	3-Phase transformer	1	1	2	4						4				4
5	Special D.C machines	1	1		2		1			1	3		3		6
6	Special transformer	1	1		2						3		3		6
	Total				25					7					38

13. Suggested Implementation Strategies:-

Department should arrange practical training for skill development in repairing & rewinding and various connections of 3-phase power and distribution transformer.

14. Learning Resources:-

Book list:-

Sl No	Title of Books	Author	Publisher
1	Electrical Technology	B.L. Theraja and A.K. Theraja.	S. Chand & Co. New Delhi
2	Vol-II-	J.B. Gupta	S.K. Kataria & Sons, New Delhi
3	Electrical Machines –	K.R. Siddhapura & D.B. Raval	Vikas Publication house pvt ltd., Noida, U. P.
4	A Text Book of	Tarlok Singh.	S.K. kataria & Sons, New Delhi
5	Electrical Machine –	S.K. Bhattacharjee	-
6	Electrical Machines –II –	Ashfaq Hussain	Dhanpat Rai & Co., New Delhi
	Electrical Machines		

3. Electrical Machines –I Laboratory.

Total Marks -50.

Practical -25 Pass Marks = 17/50

Sessional -25

2. Course Code =EL-404 (P)

3. Semester = 4th.

Skills to be developed:-

A) Intellectual skills: 1) Identification skills

2) Analytical skills

B) Motor skills: 1) Connection skills

2) Operating skills

3) Testing and measurement skills.

<u>Experiment No.</u>	<u>Title of the experiments</u>
1	Study of 3 point and 4 point starter.
2	Speed control of D.C. shunt motor by (a) Flux control (b) by armature control method
3	Swinburne test of a DC shunt motor to find efficiency.
4	Load Characteristics of DC Shunt motor.
5	Efficiency of DC motor –generator set.
6	Open circuit characteristic of a DC shunt generator.
7	Brake test of DC shunt motor.
8	Determination of Transformation ratio of single phase transformer.
9	Polarity test of a single phase transfer.
10	Open circuit and short circuit test of single phase transformer and determination of efficiency and regulation.

Reference Books-

- 1) Lab manual on basic Electrical Engg and Electrical measurement –By S.K. Bhattacharjee, K.M. Rastogy.
- 2) Lab courses in Electrical Engineering – By S.G. Tarnekar, P.K. Kharbandha.
- 3) A Text Book of Practical in Electrical Engineering by Dr. N. K. Jain

4. Course Title: Electrical Engineering Materials

1. Course Code: El - 405

2. Semester: 4th

3. Rationale of the Subject:

Conductor, insulator, semiconductor, magnetic materials are always used in electrical and electronics engineering. Therefore it is essential for quality assessment of these materials. In this subject, effort is made to develop skill in the electrical diploma students to inspect and test the electrical and electronics materials.

5. Aim:-

1. To develop knowledge on properties, characteristics, applications and limitations of electrical engineering materials.

2. To develop skill to inspect and to test the electrical and electronics materials.

6. COURSE OBJECTIVES:-

The students will be able to

1. Know insulator, semiconductor and conductor

2. Know conducting, insulating, semiconducting, dielectric and magnetic materials; their physical, mechanical, and electrical properties.

3. Know different types of constructional material, uses and testing.

4. Practical uses of various materials in different fields.

6(a) COURSE OUTCOMES :-

On successful completion of the course the student will be able to –

CO 1: Know properties of conductor, insulator and semiconductor.

CO 2: Understand the properties of different conducting, insulating, semiconducting and magnetic material.

CO 3: Assess the quality of these materials.

CO 4: Learn different types of constructional materials, use and testing.

CO 5: Know the practical uses of various materials in different electrical engineering field.

7. Pre-Requisite:-

1. Basic electrical engineering.

8. Teaching Scheme (in hours per week)

Lecture	Tutorial	Practical	Total
3			3

9. Examination Scheme:

Theory			Pass marks(ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA		100	3
	TA	HA						
	70	10 20						

10. Detailed Course Content:

Chapter No	Chapter Title	Content	Duration (in hours)
1.0	Conducting Materials	1.1 Electron theory of metal 1.2 Resistance and resistivity, linear and non-linear resistance 1.3 Properties of conducting material – low resistivity material and high resistivity materials 1.4 Different conducting materials like copper, aluminum, ACSR, AAC, silver, carbon, tungsten, eureka, constantan, manganin, invar 1.5 Thermocouple, superconductor, annealing 1.6 Materials used in house wiring	9
2.0	Semiconducting Material	2.1 Introduction, commonly used semiconducting material, application of semiconducting materials 2.2 energy level diagram of conductor, semiconductor and insulator 2.3 Formation of p-n junction.	

		2.4 Characteristics of different semiconducting materials (germanium and silicon) 2.5 Simple idea and application of thermistor, photoconductive cell, photovoltaic cell, varistor, LCD and strain gauge 2.6 Introduction and application of Hall-Effect Generator piezo-electric materials 2.7 Printed circuit board (PCB), types and uses, the process of preparing PCB, advantages of using PCB	9
3.0	Insulating Materials	3.1 Classification based on physical state and on thermal basis 3.2 Properties of insulating materials 3.3 Properties and application of different insulating materials 3.4 Hygroscopicity, effect of moisture on insulating material, impregnation	7
4.0	Dielectric Material	4.1 Dielectric strength, factors affecting dielectric strength, dielectric loss, factors affecting dielectric loss, dissipation factor, dielectric constant 4.2 Polarization 4.3 Charging and discharging of dielectric, different dielectric (solid, liquid, gaseous)	3
5.0	Magnetic Material	5.1 Magnetic field strength, unit pole, flux, magnetic circuit, MMF, permeability, residual magnetism, retentivity, coercive force, curie temperature, magnetostriction. 5.2 Classification based on permeability, electromagnet and uses 5.3 Aging and its affect on permanent magnet losses in ferromagnetic material, 5.4 Hysteresis, hysteresis loop, hysteresis loss, factors on which hysteresis loss depends, eddy current loss 5.5 electrical sheet metal, permanent magnetic material, magnetization curve for ferromagnetic material 5.6 Soft and hard magnetic material, effect of silicon on ferromagnetic material, pure alloy, carbon steel, ferrite 5.7 Magnetic memory devices used in computer	8
6.0	Electric Hardware	6.1 Different types of electric hardware like terminals, connectors, switches, fuses and fuse wire, characteristics, specification, applications of all these	

		6.2 Solder – composition, types, different soldering techniques, 6.3 Flux – composition, types, application	3
7.0	Constructional Materials	7.1 Physical properties of constructional materials like iron, steel 7.2 Bearing materials with reference to the electrical engineering practice 7.3 Concept of non – destructive test and method adopted for testing of different materials	3
CLASS TEST			3

11. TABLE OF SPECIFICATION FOR THEORY

Sl no	Topics (a)	Time allotted in Hrs (b)	Percentage Weightage (c)	Modified % Weightage (d)	K	C	A	HA
1	Conducting Materials	9	21	21	6	2	7	
2	Semiconducting Material	9	21	21	4	2	8	
3	Insulating Materials	7	17	17	3	3	6	
4	Dielectric Material	3	7	7	2		3	
5	Magnetic Material	8	20	20	5		5	
6	Electric Hardware	3	7	7	6	1	1	
7	Constructional Material	3	7	7	4		2	
	Total	42	100	100	30	8	32	
	Class test	3						

12. DETAILED TABLE OF SPECIFICATIONS FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Conducting material	2	2	2	6	2		1		3	2		4		6
2	Semiconducting material	2	2	2	6			2		2	2		4		6
3	Insulating material	1	1	2	4		2			2	2		4		6
4	Dielectric material	1		1	2	1				1			2		2
5	Magnetic material	1		2	3			1		1	4		2		6
6	Electric Hardware	1	1		2	2		1		3	3				3
7	Constructional material	1		1	2			1		1	3				3
	Total				25					13					32

13. Suggested Implementation Strategies: The teacher may bring different electrical and electronics materials, components, and devices in the class room at the time of taking the class. He should make the students familiar with these.

14. Suggested Learning Resources:

Book List: Electrical Engineering Materials – TTTI Madras

Electrical and Electronics Engineering Materials – J B Gupta

Electrical Engineering Materials – P L Kapoor

Electrical Engineering Materials – J Dekker

Electrical Engineering Materials – Raina, Bhattacharjee

Electrical Engineering Materials – Navneet Gupta

Electronic Engineering Materials and Devices by John Allison

5. Course Title: Electrical & Electronics Drawing and Design

2. Course Code: EI - 402

3. Semester: 4th

4. Rationale of the Subject:

Drawing is said to be the language of engineers and technician. Therefore, it is necessary for a polytechnic pass out in electrical engineering to understand, interpret electrical engineering drawing. They should have the ability to communicate through drawing. They should know to prepare drawing of electrical circuits, motor parts, transformer parts, earthing etc. The content included in this subject is to develop requisite skill and knowledge of electrical drawing in electrical diploma students.

5. Aim:-

1. Drawing indicates the symbolic representation and position of the components in a system.
2. To enable the students to draw and understand different symbols, parts of electrical and electronics devices and machines etc. It helps in troubleshooting, maintenance of the system.
3. To enable to identify the sequential flow of current, power and measure voltage, current at various points of the system.
4. To enable the students to know the use of Auto CAD.

6. COURSE OBJECTIVES:-

The students will be able to

1. Draw and understand the working of the system and its components
2. Find the different points of the circuit diagrams or layout for troubleshooting and maintenance.
3. Use drawings to measure various quantities in the system to find out the fault.
4. Use the graphic software to draw the circuit, components etc.

6. (a) COURSE OUTCOMES :-

On successful completion of the course the student will be able to –

CO 1: Develop requisite skill and knowledge of Electrical Engineering Drawing.

CO 2: Draw and understand the working of the system and its components.

CO 3: Use the circuit diagram or layout for trouble shooting and maintenance and find out fault.

CO 4: Use drawing to measure various quantities in the system.

CO 5: Use the graphical software to draw the circuit, components etc.

7. Pre-Requisite:-

1. Basic electrical engineering
2. Engineering graphic.

Practical:-

Skills to be developed:-

Intellectual skills---

1. Identification skill
2. Analytical skill

Motor skill ----

1. Draw the different components and parts of the system properly.
2. Problem solving skill.

8. Teaching Scheme (in hours per week):

Lecture	Tutorial	Practical	Total
-	-	6	6

9. Examination Scheme:

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional (SS)		50/150	PT	PA		150	4
	TA	HA						
	100	20	30					

10. Detailed Course Content:

Chapter No	Chapter Title	Content	Duration (in hours)
1.0	Symbols and Notation	1.1 Electrical and Electronics symbol used as per IS standard	9
2.0	Electrical Machine Drawing	2.1 Orthographic view of DC machine, AC machine and Transformer, parts, sectional view etc.	15
3.0	Winding	3.1 Skeleton of DC and AC winding of different types	15
4.0	Electrical Wiring	4.1 Service connection, house wiring, industrial wiring, terminal marking 4.2 Connection of motor starter 4.3 Control panel wiring diagram	12
5.0	Sub-Station	5.1 Pole mounted, foundation mounted and under ground	9
6.0	Electronic Drafting	6.1 Circuit diagram of rectifier, amplifier and oscillator 6.2 Preparation of drawing, layout of printed circuit board for given circuit	12
7.0	Transformer Design	Three phase transformer design (shell and core), Estimation of losses, efficiency and regulation for design parameters, heating and cooling of transformer, design of tank and cooling tube, estimation of transformer oil, testing of oil.	12
CLASS TEST			6

11. TABLE OF SPECIFICATIONS FOR THEORY (Electrical & electronics drawing and design)

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Symbols and notation	9	11	11	7	4		
2	Electric machine drawing	15	18	18	2	13	3	
3	Winding	15	18	18	4	10	4	
4	Electric Wiring	12	14	14	6	2	6	
5	Sub-station	9	11	11	4	7		
6	Electronic Drafting	12	14	14	2	6	6	
7	Transformer Design	12	14	14	3	3	8	
	Total	84	100	100	28	45	27	
	Class test	6						

12. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Symbols and notation	2			2	3	4			7	2				2
2	Electric machine drawing	2			2		4	3		7		9			9
3	Winding	2	2		4	1		4		5	1	8			9
4	Electric wiring	2	2		4	2				2	2		6		8
5	Sub-station	2	2		4	2				2		5			5
6	Electronic drafting	2		2	4			4		4		6			6
7	Transformer design	2	3		5	1		2		3			6		6
	Total				25					30					45

13. Suggested Implementation Strategies: The teacher may show models and parts of the machine which will help the students to develop skill. Computer software may be used for this subject. Use of software for electrical & electronics drawing will help the students.

14. Suggested Learning Resources:

Book List: Electrical Design and drawing by Raina & Bhattacharya

Electrical Drawing by K L Narang

Electrical Drawing and Estimating by C R Dargan

A.C. Machine: M.G. Say

Electrical Power: S.L. Uppal, Khanna Publisher

Suggestion: The examination time of this paper will be four hours. Out of four hours, one hour will be allotted for simple question on design of transformer. The student may be allowed to use data table for the question on design of transformer.

6. Course title- Digital Electronics

1 **Course code-** EI-406

2 **Semester-** 4th

3 **Rationale of the subject**—The subject of Digital electronics holds applications in all branches of engineering. This subject will impart in depth knowledge of number systems, logics of Combinational and Sequential circuits and also about various & recent memory devices. The concept of Digital Electronics will be implemented in all processor.

4 **Aim of the subject:-**

- a. It intends to teach the basic digital circuits and their applications, D/A, A/D converters etc.
- b. Understanding of the subject will provide skill to the student to operate digital instruments as the applications of digital instruments, microprocessor, computers etc. are increasing very fast in present age.

5. **Objective:-**

Student will be able to

- A .Understand various Number system
- B .Learn the different digital logic gates
- C. Learn arithmetic circuits –adder/Subtractor
- D.Understand digital logic circuit, flip flop, counter, resistor, D/A and A/D converter
- E. Understand the various display circuits

6. **Pre-requisite:-**

- a. Knowledge of basic electronics
- b. Knowledge of analog and digital electronics

7. **Teaching scheme (in hours)**

Lecture	Tutorial	Practical	Total
3 hours/week			3 hours

8. Examination Scheme

Theory			Pass marks(ESE+SS)	Practical		Pass marks(PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA		100	3
	TA	HA						
	70	10		20				

9. Detailed Course Content

Chapter no.	Chapter Title	Content	Duration
1.	Number System	Understanding number system, Binary, Octal, Decimal, Hexadecimal number system and their conversion. Different coding system i.e. binary, BCD, Excess 3, Grey, ASCII and Parity Code	6
2.	Logic gates	Symbolic representation & and truth table for logic gates - OR, AND, NOT, NOR, NAND, X-OR, X-NOR, Universal logic gates, realization of logic circuit from their logic expression. Logic families-RTL, DTL, TTL, CMOS.	7
3.	Boolean Algebra	Boolean Algebra theorem, De-Morgan's Theorem, simplification of Boolean expression by algebraic and K Map method. Don't care condition	5
4.	Combinational logic	- Half Adder, full Adder, Half Subtractor, Full Subtractor, multiplexer, Demultiplexer, encoder, decoder	5
5.	Flip-Flops	Flip-Flops: Latch, R-S, J-K, T, D, Flip-Flops, Master Slave J-K Flip-Flops	4
6.	Register and Counters	Shift Register, Serial In serial out (SISO), Serial in parallel out (SIPO), Parallel in serial out (PISO), Parallel in Parallel out (PIPO), Counters:- Synchronous counter, asynchronous counter, ring counter, Up/Down Counter	4
7.	Data Converter & Memory Devices	Basic concept of D/A and A/D converter Classification and characteristics of Memories, ROM- Architecture, types and application, RAM- Static and Dynamic,	6

		Magnetic Memories: Magnetic tape, Disk, Hard Disk, Floppy Disk, Optical Disk (CDs),	
8.	Display	Construction, Working and operating Principle of LED, LCD, Seven Segment, Dot Matrix and Alphanumeric Display	5
	Class test		3

10. TABLE OF SPECIFICATIONS FOR THEORY

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Number system	6	14	14	4	3	3	
2	Logic gates	7	17	17	4	1	7	
3	Boolean algebra	5	12	12	5	1	2	
4	Combinational logic	5	12	12	2	6		
5	Flip-Flops	4	9	9	3	1	3	
6	Register and counter	4	9	9	2	1	4	
7	Data converter and memory devices	6	14	14	1	3	6	
8	Display	5	13	13	7	1		
	Total	42	100	100	28	17	25	

11.DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer Type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Number system	2	1		3	2	2			4	4		3		3
2	Logic gates	3	1	2	6	1		2		3			3		3
3	Boolean algebra	1	1		2	2		2		4	2				2
4	Combinational logic	1	2		3	1	2			3		2			2
5	Flip-Flop	1	1		2	2		3		5					
6	Register and counter	1		1	2						1	1	3		5
7	Data converter and memory devices	1	1	2	4		2			2			4		4
8	Display	2	1		3		2			2		3			3
	Total				25					23					22

12. Suggested Implementation Strategies: The digital system in microprocessor has significant importance in the area of electronics. Adequate competency needs to be developed by giving sufficient practical knowledge. Mini project should be given to students as assignments.

13. Suggested Learning Resources:

1. Modern Digital Electronics- R.P. Jain
2. Digital Principles and Application- Malvino and Leach
3. Digital System- Ronald Tocci
4. Digital Fundamentals- Thomas I. Floyd
5. Digital Electronics- Douglas V. Hall

7. PROFESSIONAL SKILLS-II

4th SEMESTER, ELECTRICAL ENGINEERING

Code no:-EL-410

TEACHING SCHEME:

Theory: 1 hr/week

Practical: 2hrs/week

Credit: 2

EXAMINATION SCHEME:

Practical assessment: 25 marks

Practical test: 25 marks

Pass marks: 17/50

A. RATIONAL:-

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through industrial visits, expert lectures, seminars on technical topics and group discussion.

B. AIM: - Student will able to:

- a) Acquire information from different sources.
- b) Prepare notes for given topic.
- c) Presentation on given topic in a seminar.
- d) Interact with peers to share thoughts.
- e) Prepare a report on industrial visits, expert lecture.

C. PRE- REQUISITE:

1. Desire to gain comparable knowledge and skills of various activities in various areas of importance.
2. Eagerness to participate in group work and to share thoughts with group member.
3. Knowledge of electrical engineering up to 4th semester.

Activities:

1. Industrial/ Field Visits: - -15hrs

Structured field visits be arranged and report of the same should be submitted by the individual student to form part of the team work. (Any ONE).

a) Nearby generating /grid substation for observing for installation, maintenance and earthing system of various electrical equipments.

b) Visit nearby electrical workshop and auto electrical workshop for observing wiring, installation and maintenance of motor and their starting, running and applications.

c) Visits nearby electrical repairing shop for skill development on repairing, rewinding and assembling of various dc/ac motors.

d) Load dispatch centre.

e) An industry automation in manufacturing.

f) Signalling system of a railway station.

2. Guest lectures by professional/industry expert: - -15hrs

Any TWO of the following areas:-

a) Substation grounding system.

b) Protection of electrical equipments from lightning.

c) Role of power factor improvement as a tool in reducing cost of generation.

d) Power transformer protection, installation and testing

e) Automatic meter reading/ automatic energy meter.

f) Super conductor.

g) Role of micro, small and medium enterprise in Indian economy.

Individual report of the above lecture should be submitted by the students.

3. Seminar/ activities :- (Any one seminar and one activity) -10hrs

a) Making working model of 3-point starter, M.C and M.I instrument.

b) Repairing, rewinding and testing of fan motor /any 1-phase motor.

c) Fabrication of lead acid tubular battery.

d) Seminar on non conventional sources and uses.

e) Seminar on energy efficient devices.

f) Seminar on Seismic protection /environment protection/ pollution control.

- g) Water supply scheme/ problems of drinking water in rural area.
- h) Computer security

COURSE STRUCTURE OF 5TH SEMESTER (ELECTRICAL)

Sl n o	Code no	Subject	Contact hours /week			Evaluation scheme									
						Theory (Th)					Practical (Pr)			Total Mark s (Th+ Pr)	Credit
			L	T	P	ESE	Sessional(SS)			Pass (ESE+ SS)	Practical Test(PT)	Practical Assessme nt (PA)	Pass (PT+ PA)		
TA	HA	Total (TA+ HA)													
1	EL-501	Electrical Power	3		3	70	10	20	30	33/100	25	25	17/50	150	4
2	EL-503	Electrical Measurement and measuring instruments- II	3		3	70	10	20	30	33/100	25	25	17/50	150	5
3	EL-504	Electrical Machine –II	3	1	3	70	10	20	30	33/100	25	25	17/50	150	4
4	EL/Me /Au/IP E-505	Non - conventional energy sources	3			70	10	20	30	33/100				100	3
5	ET-502	Microprocessor	3		3	70	10	20	30	33/100	25	25	17/50	150	4
6	EI-510	Professional practices-III	1		2						25	25	17/50	50	2
7	Optional subject (any one)														
i)	EI-502	Control system	3			70	10		20	30	33/100			100	3
ii)	EI-506	Power electronics	3			70	10		20	30	33/100			100	3

1. Course Title: - CONTROL SYSTEM

1. Course Code: - EL-502

2. Semester: - 5th

3. Rationale: -control system play a vital role in our day to day life. Automatic control system plays an important role in the advancement and improvement of engineering skills of electrical diploma engineer in the field power system and in the process industries. Automatic control system saves manpower, reduces cost of production, increase the accuracy of power supply system so that the knowledge of this subject is required to have deeper grasp of the control techniques or environment as need to be studied in the subject.

4) Aims:-

1. Since control system plays an important role in the field of the modern industries and power system. So the subject is to give the students basic concept of control system and analysis of circuit using transfer function and block diagram representation.

2. To study the time response and frequency response for stability analysis of the system.

5. COURSE OUTCOMES (CO):- Students will be able to –

1. Know the basic elements of control system, feedback system and uses.

2. Know the application of Laplace transform and inverse Laplace transform; find the Transfer function and drawing of Block diagram representation of electrical circuit.

3. Stability analysis of control system by time domain and frequency domain approach.

6) Pre-requisite –

1. Differential, Integral and Differential equation.

2. Electrical circuit and network.

7. Teaching Scheme (In Hrs):-

Lecture	Tutorial	Practical	Total
03hrs/week			03hrs/week

8. Examination scheme:-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA		100	3
	TA	HA						
	70	10 20						

9. Details course content:-

Chapter NO	Chapter Title	Content	Duration (in hrs)
1.0	Introduction to automatic control system	1.1 Basic elements of control system, definitions, classification of control system. Open loop and closed loop systems, 1.2 concept of feedback, effect of feedback, adv&disadv. of feedback, servo mechanism, 1.3 standard test signals –step, ramp & parabolic function. Functional block diagram of a control system, time lag, dead time, hysteresis, self regulating and non self regulating systems, practical examples of the above.	8hrs
2.0	Laplace Transform	2.1 Laplace transform, inverse Laplace transform, Laplace transform of standard input signals- unit step function, ramp function, parabolic function, exponential function, sine wave, cosine wave, hyperbolic sine wave, hyperbolic cosine wave, 2.2 Laplace transform of derivatives, Laplace transform of integral, problems.	6hrs
3.0	Transfer function	3.1 Transfer function, impulse response and transfer function, properties of transfer function, advantage & disadvantage of transfer function, 3.2 poles and zero of transfer function – representation of poles & Zero on S- Plane, Characteristic equation, problem of above.	10hrs
4.0	Block diagram	4.1 Basic elements of Block diagram, properties of block diagram. Significance of block diagram, procedure for drawing of Block diagram. 4.2 Block diagram of open loop and closed loop control system, Block diagram reduction. Problems of above.	4hrs
5.0	Control system component	5.1 Components of automatic control system, synchros, error detectors, 5.2 servo motors, power actuators, and servo mechanism.	3hrs
6.0	Time Domain analysis	6.1 Classification of time responses-transient responses & steady state response, system time response.	2hrs

7.0	Introduction to stability analysis	7.1 Characteristic equation, stability of control system, necessary condition for stability. 7.2 Nyquist criteria, Bode plots, gain margin and phase margin. 7.3 Determination of transfer function and drawing of Bode Plot using Mat lab (for assignment only, no theory question)	9hrs
8.0	Class test		3hrs

10. TABLE OF SPECIFICATIONS FOR THEORY

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Introduction to automatic control system	8	19	19	4	2	7	
2	Laplace transform	6	14	14	4	0	6	
3	Transfer function	10	24	24	10	1	6	
4	Block diagram	4	10	10	2	0	5	
5	Control system component	3	7	7	2	1	2	
6	Time domain analysis	2	5	5	3	0	0	
7	Introduction to stability analysis	9	21	21	8	2	5	
	Total	42	100	100	33	6	31	
	Class test	3						

11. DETAILED TABLE OF SPECIFICATION FOR THE EXAM:

Sl no.	Topics	Objective type				Short answer Type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Introduction to automatic control system	2	1	2	5	2	1	1		4			4		4
2	Laplace transform	1		2	3						3		4		7
3	Transfer function	4	1	1	6	2		1		3	4		4		8
4	Block diagram			2	2	2				2			3		3
5	Control system component	2	1	1	4			1		1					
6	Time domain analysis	1			1	2				2					
7	Introduction to stability analysis	2	2		4	2				2	4	5			9
	Total				25					14					31

12. Suggested learning Resources:-

Sl No	Ref. Books	Authors	Publication
1	Control System	S.P. Mehar	S.K. Kataria & Sons, New Delhi
2	Control System	Smarajit Ghos	-
3	Modern Control Engineering	Katsuhiko Ogata	Prentice Hall of India, New Delhi
4	Control System Engineering	Nagarath I. J., & Gopal M.	New age Publisher, New Delhi
5	Modern Control System Analysis and Design using Mat lab and Simulink	R.H. Bishop	Wesley and Longman Pub. Co.
6	Dynamic Simulation of Electric Machinery using Mat lab / Simulink	C.M. Ong	Web Book

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2. Course Title: - ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENTS-II

1. Course Code: - EL – 503

2. Semester: - 5th

3. Rationale of the Subject: - Diploma holders in Electrical Engineering have to work on various job in the field as well as in testing laboratories and on control panels, where he performs the duties of installation, operation, maintenance and testing by measuring instruments. Persons working on control panels in power plant, substation, in industries and domestic consumer, etc. will come across the use of various types of instruments and have to take measurement. Instruments used to read and observe electrical power, energy, frequency, resistance, wave shapes etc, have been incorporated in this subjects. So the technician will understand the construction and use of various types of Electrical instrument.

4) Aims:- Diploma holder has to work as Supervisor , maintenance Engineer in Electrical power generation , transmission ,distribution system , installation system , machine operation etc .For the above job responsibility he has to take the measurement , testing ,monitoring ,maintenance and controlling of various electrical quantities current , voltage , power, energy , frequency etc .According to these contents of the subject is included .

5) COURSE OBJECTIVES:-- The students will be able to—

1. Identify the measuring instrument Wattmeter, Energymeter, Ohmmeter, frequency meter, CRO, Synchroscope, transducers etc for appropriate measurement.

2. Know the construction and operation and application of the above instruments.

3. Study of Microprocessor based instrumentation system.

COURSE OUTCOMES:-

Sl. no	COURSE OUTCOMES (COs)
1	CO-1 Students get familiar with the concept of instrument mainly used in the field as well as industry .
2.	CO-2 Measurement of electrical power and energy
3.	CO-3 Construction and used of electronics instruments like CRO, digital frequency meter, power factor meter ,DVM,TVM, FET , VMS ,Q meter .
4.	CO-4 Construction and uses of transducer ,Sensors like resistive , capacitive, inductive, magnetic , measurement of temperature , pressure ,flow of liquid .
5.	CO-5 Study of data transmission and telemetry , microprocessor based instrumentation system.

7. Teaching Scheme (In Hrs):-

Lecture	Tutorial	Practical	Total
03		03	06

8. Examination scheme:-

Theory			Pass marks(ESE+S S)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)			PT	PA		150	5
	TA	HA						
	70	10	20	33/100	25	25	17/50	

9. Detailed course content:-

Chapter No	Chapter title	Contents	Duration hrs
1.0	Measurement of power.	1.1 Wattmeter: Dynamometer type and induction type single phase and three phase wattmeter, construction, errors. 1.2 Measurement of single phase power by three ammeters and three voltmeter method. 1.3 Measurement of three phase power by two and three watt meter method.	6 hrs
2.0	Measurement of energy	2.1 Single phase energy meter-induction, construction type-testing and adjustment. 2.2 Three phase energy meter-induction type construction error, torque equation, 2.3 construction of single phase & three phase digital energy meter.	4hrs
3.0	Instruments for special purpose	3.1 Construction of Digital frequency meter, 3.2 power factor meter, synchroscope ,construction	3 hrs
4.0	Electronics Instrument	4.1 C.R.O, its application, study of front panel, Measurement of phase, frequency, Lissajous pattern, B-H loop. 4.2 D.V.M. , T.V.M, FET Voltmeter, 4.3 Q- meter.	8 hrs
5.0	Primary sensing	5.1 Primary sensing element :- Diaphragm bellow, Bourdon	10 hrs

	element and transducer	tube, 5.2transducer :- basic requirement, selection of transducers, advantages, classification – resistive, inductive, capacitive, magnetic, photo electric, piezo electric transducer, thermistor, thermocouple, 5.3strain gauge, LVDT. Measurement of pressure, temperature, flow, liquid level etc.	
6.0	Data transmission and telemetry	6.1 Method of data transmission, telemetry – classifications, different land line telemetering methods, 6.2 Recorder – graphic oscillographic, magnetic tape recorder, X-Y recorder and strip- chart recorder.	6 hrs
7.0	Microprocessor based Instrumentation system	7.1Principle of microprocessor based instrument, 7.2 Type of control – Lumped digital control and distributed digital control, Block diagram of both controls. 7.3Application of microprocessor & micro controller for switch, LED control, temperature control of furnace, Traffic light control, SCR firing angle control.	5 hrs
8.0	Class test		3 hrs

10. TABLE OF SPECIFICATIONS FOR THOERY:-

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Measurement of power	6	14	14	4	2	4	
2	Measurement of energy	4	10	10	2	3	2	
3	Instruments for special purpose	3	7	7	2	3	0	
4	Electronic Instrument	8	19	19	2	5	6	
5	Primary sensing element and transducer	10	24	24	8	4	5	
6	Data transmission and telemetry	6	14	14	5	5		
7	Microprocessor based instrumentation system	5	12	12	7	1		
	Total	42	100	100	30	23	17	
	Class test	3						

11 DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer Type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Measurement of power	2	2		4	2				2			4		4
2	Measurement of Energy	2	1		3		2	2		4					
3	Instrumentation for special purpose	2			2		3			3					
4	Electronic Instrument	2	2		4		3	0	0	3			6		6
5	Primary sensing element and transducer	4	2		6	2	2			4	2		5		7
6	Data transmission and telemetry	2	1		3	3				3		4			4
7	Microprocessor based instrumentation system	2	1		3	5				5					
	Total				25					24					21

12 . Suggested Implementation Strategies:- The Teacher should explain the scope of various measuring devices and their practical applications in the field. Frequent visit to nearby process industries, generating station, and substation will be immense help to the student.

13 Suggested Learning Resources:-

Sl No	Title of book	Authors	Publications
1.	-A course in Electrical measurement and measuring instrument	A.K. Sawhney -	-Dhanpat Rai, New Delhi
2.	-Electrical measurement and measuring instrument	M.L. Anand -	
3.	-Electrical measurement and measuring instrument	S.K. Sahdev -	-S.K. Kataria & sons, New Delhi
4.	-Electrical measurement and	J.B. Gupta -	-Unique international publication, Jalandhar.

5.	instrumentation -Fundamentals of microprocessor & microcontrollers	Ram. B	- S.K. Katari& Sons, New Delhi
6.	-Modern electronic Instrumentation & measurement techniques	Albert D. Helfrick and William David	- DhanpatiRai Publications, New Delhi - Prentic-Hall India (P) Ltd, New Delhi.

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2. ELECTRICAL MEASUREMENT AND MEASURING INSTRUMENT –II LABORATORY.

Code No = EL-503 P

Full marks = 25

Pass Marks = 17/50

Sessional Mark= 25

1. Skill to be developed :-
 - a) Intellectual skills: - 1. Identification of instruments.
2. Selection of instruments for measurement.
 - b) Motor skills:- 1. Accuracy in measurement.
2. Making proper connection.

Experiment No. : - Title of the experiment

- 1.0 Measurement of I- phase power and power factor by 3- ammeter method.
- 2.0 Measurement of I- phase and power factor by 3- voltmeter method.
- 3.0 Measurement of 3- phase power and power Factor by 2- wattmeter method.
- 4.0 Measurement of 3- phase power and power factor by 3- wattmeter method.
- 5.0 Calibration of analog energy meter and digital energy meter.
- 6.0 Calibration of C.R.O.
- 7.0 Use of analog and digital multimeter for measurement current, voltage and resistance.
- 8.0 Measurement of phase and frequency by C.R.O.
- 9.0 To obtain the Hysteresis loop curve of single phase transformer by C.R.O.
- 10.0 Measurement of displacement, pressure with the help of transducer.

Reference Books:-

- Lab manual on basic Electrical Engineering and Electrical Measurement.
- By S.K. Bhattacharjee, K.M. Rastogy
- : Lab Course in Electrical Engineering –By S.G. Tarnekar, P.K. Hkarbandha

3. Course Title: - ELECTRICAL MACHINE-II

1. Course Code: - EL-504

2. Semester: - 5th.

3. Rationale: - Electrical Machine is the heart of Electrical Engineering. Mainly Machines play an important role in industry for production, processing, fabrication and also domestic and commercial appliances. Similarly Alternator also plays an important role for mega generation of Electrical power. Course content of this subject gives full knowledge about starting, running and controlling the electrical machine from no-load to full load efficiently. Explanation of practical aspects of the subject will make the student capable of performing various tests on the machines as per latest BIS.

4. Aims: - a) To study construction, working principle and operation of AC machines and some other special machines.

b) Various applications, their testing and maintenance.

5. COURSE OUTCOMES (CO):- Students will be able to –

- 1) Know the constructional details and working principle of various types of AC machines
- 2) Operate given machine properly.
- 3) Testing and performance analysis of the machines
- 4) Selection of motors of proper rating for particular use.

COURSE OUTCOMES:-

Sl.no	COURSE OUTCOMES (COs)
1	After completion of the course, Student will be able to learn – CO-1 The constructional details and working principles of Induction motor, alternator and synchronous motor.
2	CO-2 Starting, testing and performance analysis of different a.c machines.
3	CO-3 Selection of motor of proper ratings for particular uses.
4	CO-4 Calculation of Voltage regulation and parallel operation of alternator.
5	CO-5 Construction and working and uses of special a.c machines like a.c series motor, universal motor. Schrage motor, repulsion motor, servo motor, linear induction motor.

6. Pre- requisite – a) AC fundamentals b) knowledge of 3-phase circuit
 c) Principle of electrical engineering d) Basic knowledge of electronic engineering.

7. Teaching Scheme (in hrs).

Lecture	Tutorial	Practical	Total
03	01	03	07

8. Examination Scheme:-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA	17/50	150	4
	TA	HA						
	70	10	20	25	25			

9. Course contents:-

Chapter No	Chapter Title	Contents	Duration (in Hrs)
01	Poly phase induction motor.	1.1.Production of rotating magnetic field in 3-phase supply, working principle 1.2. construction of 3-phase induction motor, Types of rotor 1.3.slip speed, frequency of rotor current, solving problems 1.4. Relationship between torque and rotor power factor, starting torque, maximum starting torque, effect of change of supply voltage. Torque under running condition, maximum running torque, torque- slip Characteristic, solving problems 1.5.Power stages, different losses, Gross torque developed, Induction motor as transformer, problems, equivalent circuit, maximum power output and corresponding slip, 1.6.No- load test and Blocked rotor test, 1.7. Starting of induction motor, different types of starter, its construction 1.8. Speed control of induction motor.	10 hrs
02	Single phase of induction motor	2.1 Principle and construction, double field revolving theory, methods of starting, 2.2 Types, construction, performance, characteristic and applications of each type.	8 hrs

03	Alternators	3.1 Construction, type of rotor, principle of alternator, 3.2 Pitch factor, distribution factor, short pitch coil, 3.3 EMF equation, solving problems 3.4 Alternator on load, armature reaction, synchronous reactance, synchronous impedance, vector diagram of loaded alternator for lagging, leading and unity p.f, solving problems 3.5 Open circuit and short circuit test. 3.6 Voltage regulation by synchronous impedance, A-T, Zero p.f. method, relating problems, 3.7 Synchronisation, parallel operation of alternator, conditions of parallel operation.	10 hrs
04	Synchronous motor	4.1 Working principle and construction, 4.2 starting method, effect of change in excitation on armature current and P.F, 4.3 Power developed by a synchronous motor, 4.4 V-curve, synchronous condenser, 4.5 comparison of 3-phase induction motor and synchronous motor, 4.6 hunting effect.	7 hrs
05	Commutator motor	5.1 Construction and working of A.C. series motor, universal motor, uses 5.2 Schrage motor, construction, uses 5.3 repulsion type motor, construction, uses	4 hrs
06	Special A.C. machine	6.1 Construction & uses of Linear induction motor, 6.2 Stepper motor, construction, uses 6.3 A.C. servo motor, construction, uses.	3hrs
07	Class test		3hrs

10. TABLE OF SPECIFICATIONS FOR THEORY

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Poly phase induction motor	10	24	24	6	3	8	
2	Single phase induction motor	8	19	19	5	2	6	

3	Alternator	10	24	24	4	4	9	
4	Synchronous motor	7	16	16	4	2	5	
5	Commutator motor	4	10	10	5	2		
6	Special A.C machines	3	7	7	4	1		
7	Total	42	100	100	28	14	28	
8	Class test	3						

11. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer Type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Polyphase induction motor	4	1	2	7	2	2			4			6		6
2	Single phase induction motor	2		2	4	2	2			4	1		4		5
3	Alternator	2	2	2	6	2		3		5		2	4		6
4	Synchronous motor	2		2	4	2	2			4			3		3
5	Commutator motor	1		1	2		2			2	3				3
6	Special A.C machines	1		1	2	3				3					
	Total				25					22					23

12. Suggested Implementation Strategies:-

Department should arrange for give also wide practical knowledge for operating, detecting various faults, repairing, rewinding and assembling the different parts of the machine for skill development.

13. Learning resources:-

Book list-

Sl No	Title of Books	Author	Publisher
1	Electrical Technology	B.L. Theraja and A.K. Theraja.	S. Chand & Co. New Delhi
2	Vol-II-	J.B. Gupta	S.K. Kataria& Sons, New Delhi
3	Electrical Machines –	K.R. Siddhapura& D.B. Raval	Vikas Publication house pvt ltd., Noida, U. P.
4	A Text Book of Electrical Machine –	Tarlok Singh.	

5	Electrical Machines –II –	S.K. Bhattacharjee	S.K. kataria& Sons, New
6	Electrical Machines-	AshfaqHussain	Delhi
	Electrical Machines		-
			DhanpatPRai& Co., New
			Delhi

2. Electrical machine –II (Lab)

Code–EL-504 (P)

Total Marks:- 50

Practical: - 25

Pass Marks: - 17/50

Sessional: - 25

1. Skills to be developed –

- A) Intellectual skills – a) Identification skills.
b) Analytical skills.
- B) Motor skills -- a) Connecting skills
b) Operating skills.
c) Measurement and Testing skills.

List of the practical

1. Study of starter of 3-phase induction motor (Auto transformer/star-delta starter)
2. Study of resistance starter and starting of slip ring I.M.
3. Determination of Efficiency by No-load test and blocked rotor test on an induction motor.
4. Slip –torque characteristic of 3-phase induction motor.
5. Measurement of slip of a 3 phase induction motor
6. Study of capacitor start single phase induction motor and calculate starting and running current.
7. Study and starting of universal motor.
8. Determination of the regulation and efficiency of alternator from the open circuit and short circuit test.
9. Determination of the magnetization curve of an alternator at rated speed and half rated speed.
10. Study and starting of a 3-phase synchronous motor.

Reference books:-

- 1) Laboratory Course in Electrical Engineering – S.G. Tarnekar, P.K. Kharbandha
- 2) Laboratory Manual on basic Electrical Engineering and electrical measurement – By S.K. Bhattacharjee, K.M. Rastogy.
- 3) A Text Book of Practical in Electrical Engineering by Dr. N. K. Jain

4. Course Title: Electrical Power

1. Course Code: El- 501

2. Semester: 5th

3. Rationale of the Subject:

After the privatization and globalization of economy, electrical power generating stations are coming up more rapidly. State electricity boards are also taking initiative to construct new power stations. The majority polytechnics pass out of electrical engineering get employment in private and public sector. They have to perform various activities in the field of generation, transmission and distribution of electrical power. In this subject, all these are included and necessary efforts are made to develop skill in the student in above mentioned field.

4. Aim:-

1. This is the main technology subject in Electrical Engineering. Power System depends on generation, transmission, distribution of power, substation, types of generating plant, control and atomization and control of power plant and substation. System stability is another main factor to be considered.

2. To develop knowledge and skill to supervise the functioning of the power system for safe operation.

3. To help for further studies in distribution and utilization of power.

5. Objective:-The students will be able to

1. Know different types of generating plans, working principle, fuels, suitable sites, economics of generation, use of PLC in atomization control of power plant.

2. Know substation and use of SCADA in control of substation.

3. Know AC transmission, HV DC transmission, and mechanical design of transmission line.

4. Know power system stability.

5(a) COURSE OUTCOMES:-

On successful completion of the course the student will be able to –

CO 1: Know different types of generating plants, fuels, working principle, suitable sites and economics of generation.

CO 2: Understand the use of PLC in atomization of control of power plant.

CO 3: Know the substation and use of SCADA in control of substation.

CO 4: Understand AC and HV DC transmission, mechanical design of transmission line.

CO 5: Know power system reliability.

6. Pre-Requisite:-

1. Energy conversion
2. Conductor, insulator, transformer, constructional materials.

7. Teaching Scheme (in hours per week):

Lecture	Tutorial	Practical	Total
3		3	6hrs/week

8. Examination Scheme:

Theory			Pass marks(ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA	17/50	150	4
	TA	HA						
	70	10	20	25	25			

9. Detailed Course Content:

Chapter No	Chapter Title	Content	Duration (in hours)
1.0	Generation of Electrical Power	1.1 Types of power station, general feature, advantages and disadvantages, essential equipments and layout of thermal, hydro, nuclear, and diesel power station and site selection 1.2 Principle and type of cogeneration 1.3 Layout of control room, control room equipment and application thereof 1.4 Layout and equipment of switchyard at power station	8

		1.5 Grid or Inter connected system and load transfer	
2.0	Economics of Generation and Economic Load Dispatch	2.1 Load curves, load duration curve, integrated load duration curve 2.2 Connected load, maximum demand, demand factor, average load, load factor, diversity factor, plant capacity, plant capacity factor, utilization factor, cold reserve, hot reserve, spinning reserve, base load, peak load 2.3 Cost of generation, selection of unit size and operation schedule	6
3.0	Transmission of Electrical Power	3.1 Typical layout of AC power supply scheme, various transmission system, advantages, disadvantages, 3.2 High transmission voltage – advantages, economic choice of transmission voltage 3.3 Elements of transmission line, economic size of conductor, Kelvin's law, its limitation 3.4 Over head line conductor materials and their properties, insulator 3.5 Classification of over head transmission line, resistance, inductance and capacitance of transmission line, performance of short and medium transmission line, nominal T and π method, voltage regulation and efficiency, 3.6 Corona, Skin effect and Ferranti effect, 3.7 Introduction to FACTS, types and benefit 3.8 Introduction to load dispatch centre and PLCC	7
4.0	Mechanical Design of Transmission Line	4.1 Line support, type of supports and their application, spacing between conductors Length of span, sag in over head lines, calculation of sag when supports are at equal and unequal levels, effect of wind and ice loading over the line conductors, stringing chart, sag templates	5
5.0	HVDC Transmission	5.1 Advantages and disadvantages of DC transmission, 5.2 Layout scheme and principle of high voltage DC transmission 5.3 DC link configuration, HVDC convertor station, comparison between constant current and constant voltage HVDC system	4
6.0	Substation	6.1 Classification of substation, layout, 6.2 Busbar arrangement, substation equipment in details 6.3 Substation control using SCADA	4
7.0	Power System Stability	7.1 Introduction, stability conditions, stability limit, swing equation, equal area criterion, methods of improving system stability	4
8.0	PLC	8.1 Introduction to PLC and area of application of PLC 8.2 Basic of PLC	

		8.3 Advantages of PLC over other controller 8.4 System components of PLC 8.5 Introduction to power plant atomization and control using PLC	4
CLASS TEST			3

10. TABLE OF SPECIFICATIONS FOR THOERY

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Generation of electrical power	8	19	19	4	2	7	
2	Economics of generation and economic load dispatch	6	14	14	2	4	4	
3	Transmission of Electrical power	7	16	16	5	1	6	
4	Mechanical design of transmission line	5	12	12	1	4	3	
5	HVDC Transmission	4	10	10	2	2	3	
6	Sub-station	4	10	10	5		2	
7	Power system stability	4	10	10	4	1	2	
8	PLC	4	9	9	1	2	3	
	Total	42	100	100	24	16	30	
	Class Test	3						

11. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM:-

Sl no.	Topics	Objective type				Short answer Type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Generation of Electrical power	2	2		4	1		2		3	1		5		6
2	Economics of generation & economic load dispatch	1	2		3	1	2			3			4		4
3	Transmission of electric power	2			2	2	0	2		4	1	1	4		6
4	Mechanical design of transmission line	1	2		3		2			2			3		3

5	HVDC Transmission	1	2		3					1		3		4
6	Sub –station	2		2	4					3				3
7	Power station stability	2	1		3			2		2	2			2
8	PLC	1	2		3							3		3
	Total				25					14				31

12. Suggested Implementation Strategies:

It is necessary to visit different types of generating station, substation. This is a descriptive and practice oriented course. The field visit will help the students to know the operation of different equipments and devices practically. After the visit, students may be asked to submit report and give seminar.

13. Suggested Learning Resources:

Book List: 1. Power System Operation and Control by S. Sivanagaraju, G. Sreenivasan

2. Electric Power Transmission and Distribution System by S. Sivanagaraju, S. Satyanarayana

3. Electrical Power System - Theory and Practice by M. N. Bandyopadhyay

4. A Text Book on Power System Engineering by Chakraborty, Soni, Gupta,
Bhatnagar

5. Principle of Electrical Power by V. K. Mehta

6. Generation of Electrical Energy by B R Gupta

4. ELECTRICAL POWER LABORATORY

CODE - EI – 501P

Practical Marks =25, Practical assessment = 25 Pass Marks = 17/50

Skill to be developed

1. Intellectual skills:-

1. Interpret results.
2. Identification of equipments and instruments.
3. Selection of equipments and instruments.

2. Motor skills:-

1. Accuracy in measurement.
2. Making proper connection.

List of Experiments:-

1. Open circuit test of a single phase transformer
2. Short circuit test of a single phase transformer
3. Determination of voltage regulation and efficiency of a single phase transformer
4. Polarity test of a single phase transformer
5. Parallel operation of single phase transformer
6. Calibration of current transformer and potential transformer
7. Parallel operation of Shunt generator.
8. Parallel operation of alternator set
9. Transformer oil test
10. Study and connections of 3-phase transformer.

5. Course title- POWER ELECTRONICS

1. Course code- El - 506

2. Semester- Fifth

3. Rationale of the subject – Developments in electronics has their own impact in other fields of engineering. Today all controls and drives for the electrical machines are formed by electronic components and there are many electronic devices available to handle electric power in terms Kilo-Ampere and Kilo- Volts. This subject gives a comprehensive knowledge about the devices and circuits used in electrical power control.

4. Aim:-

- A. The field of electrical engineering is generally segmented into three major areas- Electronics, Power & control.
- B. This subject is the combination of these three areas. Now a days all the industrial drives to run a machine and to control it as per requirement are based on Power electronics.
- C. Understanding of the subject will provide skill to the students for trouble shooting & testing of power semiconductor devices, solid state DC & AC motor drives.

5. Objective- Students will be able to:-

- A. Describe the power semiconductor devices & draw their characteristics.
- B. Describe the inverter, converter & chopper circuit.
- C. Explain the operation in the DC & AC motor drives.

COURSE OUTCOMES:-

- CO506.1 - To enable one to apply the knowledge of safety measures.
- CO506.2 -To enable one to understand the basics of power semiconductor devices.
- CO506.3- To enable one to analyze the working of different inverters.
- CO506.4-To enable one to describe the operations of different power supplies.
- CO506.5-To enable one to explain the operation of power electronics.

6. Pre-requisite:

- A. Knowledge of Applied Electronics.
- B. Knowledge of DC & AC Motor operation to run their drives.

7. Teaching scheme (in hours)

Lecture	Tutorial	Practical	Total
3 hours/week		-	3 hours

8. Examination Scheme

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA		100	3
	TA	HA						
	70	10		20				

1. Detailed Course Content

Chapter no.	Chapter Title	Content	Duration
1.	Thyristor	Construction, Characteristics(Forward and reverse characteristics), concept of holding and latching current, application of SCR, triggering of SCR, methods of triggering a SCR, gate characteristics, general layout of gate triggering circuits, R-C, UJT. Firing circuit, commutation of SCR, methods of commutating a SCR, series and parallel operations of SCR, protection of SCR against overvoltage, over-current, dv/dt and di/dt protection.	9 hours
2.	Power Transistors and Thyristors	Characteristics and application of bipolar junction transistor, power MOSFET (enhancement type), UJT, Gate Turn of Thyristor(GTO), light activated SCR(LASCR) and reverse conducting SCR, characteristics and applications of Diac and Triac	9 hours
3.	Controlled rectifier	Phase controlled rectifier operations on resistive and resistive inductive loads, use of free-wheeling diode, single phase controlled and fully controlled bridge rectifiers, expression for average and rms value of output voltage, simple numerical problems on controlled rectifiers	9 hours

4.	Inverters	Single phase series and parallel inverters, output voltage and current wave forms, principle of operation of bridge inverters, concept of voltage source, current source and pulse width modulated bridge inverters, performance parameters	9 hours
5.	Power supplies	D.C and A.C power supplies, Switched mode power supplies, resonant power supplies	6 hours
6	Class test		3hours

10. TABLE OF SPECIFICATIONS FOR THOERY:-

Sl no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	H A
1	Thyristor	9	21	21	7	6	2	
2	Power transistors & Thyristors	9	22	22	7	2	6	
3	Controlled rectifier	9	22	22	6	7	2	
4	Inverters	9	21	21	7	2	6	
5	Power supplies	6	14	14	3	5	2	
	Total	42	100	100	30	22	18	
	Class test	3						

11. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM:-

Sl no.	Topics	Objective type				Short answer Type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Thyristor	2	2	2	6	3				3	2	4			6
2	Power transistor & Thyristor	4		2	6	2	2			4	1		4		5
3	Controlled rectifier	2	2	2	6	2	3			5	2	2			4
4	Inverter	2		1	3	4		2		6	1	2	3		6
5	Power supplies	2		2	4	1	2			3		3			3
	Total				25					21					24

12. Suggested Implementation Strategies:-

A project work will be assigned to students by the subject faculty. It will be of 10 marks and will be evaluated by the faculty itself. The topic of the subject will be decided by the faculty and students will work in a group of 3-5 on each topic. The topic should be related to the subject taught by the faculty and should have proper utility and importance to enhance his/her practical skill and knowledge.

13. Suggested Learning resources:

1. Power Electronics, Circuit Devices and Applications, by M.H.Rashid, PHI, 1988
2. Power Electronics by V Subrahmanyam, New age Inc. Publishers
3. Power Electronics by P.C. Sen, Tata McGraw Hills

6. Course Title : Microprocessors

1. Course Code : ET-502

2. Semester : 5th Semester

3. Rationale of the Subject/Course:

Microprocessor is the most commonly used component used in all intelligent electronic equipments. The course will give knowledge of the device and its operation. Starting with the 8-bit processor, the students will get knowledge of 16-bit processor and their interfacing also.

4. COs and ILOs:

ET-603	Microprocessor	Course Outcome (CO)	Intended Learning Outcome (ILO)
		CO-1 To become familiar with microprocessor and various Computer languages	For CO1: After completion of this course students will be able to- ILO1: Define microprocessor. ILO 2: State different generations of microprocessor. ILO 3: Explain the Block diagram of Micro Computer system. ILO 4: Define Machine language, Assembly Language & High-level languages. ILO 5: State the memory structure of microprocessor
		CO-2 To become familiar with the architecture and Instruction set of Intel 8085 microprocessor.	For CO-2: After completion of this course students will be able to- ILO 1: Describe 8085 Architecture with its functional components. ILO 2: Explain various types of buses. ILO 3: Describe registers of 8085 along with their functions. ILO 4: Classify the flags of 8085 along

			with their functions. ILO 5: Describe the functions of pins in Pin diagram of 8085 with suitable sketch. ILO 6: State the importance of Demultiplexing of AD0-AD7 bus. ILO 7: State the functions of Read and Write control signals. ILO 8: Define Timing diagram and machine cycles. ILO 9: Classify various instructions of 8085. ILO 10: Describe the Addressing modes of 8085 with examples. ILO 11: Identify Addressing modes of 8085 for given examples.
		CO-3: To provide practical hands on experience with Assembly Language Programming.	For CO-3: After completion of this course students will be able to- ILO 1: Write Assembly language programs for Addition, subtraction, Multiplication, division. ILO 2: Write Assembly language programs for Logic Operations, Block data transfer. ILO 3: Write Assembly language programs for Comparison of numbers. ILO 4: Describe Handling of carry and using flags in programs. ILO 5: Define Subroutine.

		CO-4: To understand the architecture and instruction set of Intel 8086/8088 to utilize it in programming. CO-5: To familiarize with interfacing of various peripheral devices with 8085 microprocessor.	ILO 6: Describe the operation of Subroutine. For CO-4: After completion of this course students will be able to- ILO 1: Describe 8086 Architecture with its functional components. ILO 2: Describe registers and flags of 8086 along with their functions. ILO 3: Explain Special purpose registers. ILO 4: Describe memory segmentation of 8086 microprocessor. ILO 5: State 8086 instructions for Data transfer operation, Arithmetic operation, Logical operation, Branching operation, Machine control operation and String operation. ILO 6: Write simple programs using assemblers For CO-5: After completion of this course students will be able to- ILO 1: Explain the concept of Interfacing I/O Devices. ILO 2: Define Direct I/O & Memory mapped I/O techniques. ILO 3: Describe Modes of operation of Programmable peripheral interface (PPI) 8255 IC with Pin diagram. ILO 4: Describe Programmable DMA controller 8257 with Pin diagram. ILO 5: Explain the DMA operations and DMA channels with suitable sketch.

			ILO 6: Describe the operation of Programmable Interrupt Controller 8259 with Pin diagram. ILO 7: Explain the internal block diagram of Programmable Interrupt Controller 8259 with suitable sketch.

Chapter	ChapterTitle	Content	Duration
1.0	Introduction	1.1.Introduction to microprocessor, Different Generations of microprocessor. 1.2.Blockdiagram of Micro Computer system, description of each block. 1.3.Computerlanguages-Machinelanguage,Assembly language, High-level languages. 1.4. Memory revisit, memory structure, memory expansion, memory organization	3

2.0	8-bit Microprocessor Architecture	2.1. Introduction to 8085 microprocessor, Different Types of bus and their functions. 2.2. Microprocessor operations, descriptions of different control signals. 2.3. Programmable registers of 8085, Accumulator, General-purpose registers, Program counter and stack pointer, Using the stack 2.4. 8085 flags and their utilities. 2.5. Pin diagram of 8085, description of the pins. 2.6. Demultiplexing of AD0-AD7 bus. 2.7. Generation of Read/Write control signals. 2.8. Timing diagram and machine cycles.	10
3.0	Instructions and Programming	3.1. 8085 instructions and their classification; Data transfer, Arithmetic, Logical, Branching and looping, Machine control instructions. 3.2. Writing Assembly language programs for Addition, subtraction, Multiplication, division, Logic operations, Block data transfer, Comparison of numbers, Rotate. 3.3. Handling carry and using flags in programs, Writing programs to use stacks. 3.4. Subroutines, Writing subroutines and calling it in the main program, delay subroutines. 3.5. Addressing modes	10

4.0	16bit Microprocessor 8086	4.1. Introduction to 8086 microprocessor; modes of operations. 4.2. Internal registers of 8086, General purpose registers, Index registers, Pointer registers, Special purpose registers, segment registers and flags. 4.3. Understanding memory segmentation and using register values. 4.4. 8086 instructions for Data transfer operation, Arithmetic operation, Logical operation, Branching operation, Machine control operation and String operation 4.5. Writing simple programs, using assemblers.	10
5.0	Interfacing Peripherals	5.1. Basic Interfacing concepts, Interfacing I/O devices. 5.2. Input/Output techniques, Direct I/O and memory mapped I/O. 5.3. Programmable peripheral interface (PPI) 8255 IC, different ports, Modes of operation, Control word registers. 5.4. Programmable DMA controller 8257, DMA channel and DMA operations. 5.5. Programmable Interrupt Controller 8259, pin diagram, internal block diagram, operations.	9

7. Distribution of Marks:

Chapter	Chapter Title	Type of Question			Total
		Objective Type	Short	Descriptive	
1	Introduction	-	-	4	4
2	8 bit Microprocessor Architecture	8	4	5	17

3	Instructions and Programming	7	4	6	17
4	16bit Microprocessor 8086	6	4	7	17
5	Interfacing Peripherals	4	3	8	15
	Total	25	15	30	70

8.Suggested Learning Resources

Suggested Books:

- i) Microprocessors Architecture Programming and Applications-Gaonkar
- ii) Intel Peripheral Users manual-INTEL.
- iii) Microprocessors & Interfacing to 8085 Introduction to- Douglas V Hall
- iv) Introduction to Microprocessors-Lance A Leventhal
- v) Introduction To Microprocessors- A.P.Mathur

XXXXXXXXXX

6.MICROPROCESSOR LAB

- 1.0** Study of a typical microprocessor trainer kit and its operation
- 2.0** Simple programming examples using 8085 instruction set. To understand the use of various instructions and addressing modes-Monitor routines-at least 20 examples to be completed.
- 3.0** Analog to Digital converter interface.
- 4.0** Analog to Digital converter interface.
- 5.0** Interfacing of different types of EPROM & SRAM.
- 6.0** Keyboard interface.
- 7.0** Serial interface using 8251.
- 8.0** Parallel interface using 8255.
- 9.0** Seven segment display interface.
- 10.0** Interfacing 8255 port to high power devices.

7. NON CONVENTIONAL ENERGY

Subject Title	: No Conventional Energy		
Subject Code	: EI/Me/Au/IPE-505		
Hours Per Week	:	03	
Hours Per Semester	:	45	
Class test	:	03	
Total Hours	:	48	
Full marks(Theory)	:	70	
Sessional Marks	:	30	
Class hours	L	T	P
	3	0	0

Outcome based course objectives

After studying the course the students will be able to

1. Know the details of Non Conventional energy sources and its uses
2. Explain the principle of solar energy collection
3. Apply solar energy storage system for day to day uses
4. Know the principle of wind energy conversion system
5. Explain the principle of ocean thermal energy conversion
6. Explain the principle of biomass conversion for storing and utilizing of energy
7. Know about the geothermal energy
8. Apply the principle of thermal energy storage system
9. Know about the chemical storage system

COURSE CONTENTS

1.0 Introduction to Non-Conventional Energy Sources

- 1.1 Energy consumption
- 1.2 Energy Sources & their Availability
- 1.3 Importance of Non Conventional Energy sources.

2.0 Solar Energy Engineering

- 2.1 Introduction
- 2.2 Solar Constant
- 2.3 Solar Radiation at the Earth's surface
- 2.4 Solar Radiation Measurements
- 2.5 Solar Energy Collectors
 - 2.5.1 Principles of Conversion of Solar Radiation into heat
 - 2.5.2 Flat Plate Collectors – Types, Applications & Advantages
 - 2.5.3 Concentrating Collectors – Focusing & non-focusing types
 - 2.5.4 Advantages & Disadvantages of concentrating collectors over flat plate collectors.

- 2.6 Applications of Solar Energy - Water Heating, Air Heater, Solar Cooker, Solar Pond, Solar Photovoltaic and Solar Distillation.

3.0 Wind Energy Engineering

- 3.1 Introduction
- 3.2 Basic Principles of Wind energy conversion
 - 3.2.1 The nature of wind
 - 3.2.2 The power in the wind (No derivations)
 - 3.2.3 Forces on the Blades (No derivations)
- 3.3 Site Selection considerations
- 3.4 Basic components of a wind energy conversion system (WECS)
- 3.5 Wind energy collectors (Wind mill)
 - 3.5.1 Horizontal Axis Machines
 - 3.5.2 Vertical Axis Machines
- 3.6 Advantages & Limitations of WECS.

4.0 Ocean Energy Engineering

- 4.1 Introduction
- 4.2 Ocean Thermal Energy Conversion (OTEC)
 - 4.2.1 Introduction to OTEC
 - 4.2.2 Methods of OTEC
 - 4.2.3 Site Selection for OTEC
 - 4.2.4 Prospects of OTEC in India.
- 4.3 Tidal Energy
 - 4.3.1 Introduction
 - 4.3.2 Basic Principles of Tidal Power
 - 4.3.3 Components of Tidal Power Plants
 - 4.3.4 Schematic Layout of Tidal Power house
 - 4.3.5 Operation methods of utilization of Tidal energy (single and double basin arrangement)
 - 4.3.6 Advantages & Limitations of Tidal power
 - 4.3.7 Prospects of Tidal Energy in India.

5.0 Geothermal Energy Engineering

- 5.1 Introduction
- 5.2 Nature of Geothermal fields
- 5.3 Geothermal Sources
- 5.4 Hydro thermal Sources
 - 5.4.1 Vapour dominated systems
 - 5.4.2 Liquid dominated systems
- 5.5 Prime movers for geothermal energy conversion

6.0 Bio Energy Engineering

- 6.1 Introduction
- 6.2 Biomass conversion techniques
- 6.3 Biogas Generation.
- 6.4 Factors affecting biogas Generation
- 6.5 Types of biogas plants

6.6 Advantages and disadvantages of types of biogas plants

7.0 Direct Energy Conversion Systems

7.1 Magneto Hydro Dynamic Generator

7.1.1 Introduction

7.1.2 Basic principle

7.1.3 MHD Systems (open cycle & closed cycle)

7.1.4 Advantages of MHD

7.2 Thermo-Electric power

7.2.1 Basic Principles

7.2.2 Thermo electric power generator

7.2.3 Thermo Electric materials & selection of materials

7.3 Thermoionic Generation

7.3.1 Introduction

7.3.2 Thermoionic emission & work function

7.3.3 Basic Thermoionic generator

8.0 Chemical Energy Sources

8.1 Fuel cells

8.1.1 Introduction

8.1.2 Fuel cells – Principles of operation, classification & Types

8.1.3 Applications of fuel cells

8.2 Hydrogen Energy

8.2.1 Introduction

8.2.2 Principles of operation

8.2.3 Applications

Reference:

1. Non conventional Energy sources by G.D.Rai, Khanna Publishers
2. Solar Energy by S P Sukhatme Tata McGraw Hill
3. Solar Energy Utilization G D Rai Khanna Publishers
4. Power Plant Technology by M M El Wakil, Tata McGraw Hill

8. PROFESSIONAL SKILLS –III

5th SEMESTER, ELECTRICAL ENGINEERING

CODE NO= EL-510

TEACHING SCHEME:

Theory: 1hr/week

Practical: 2 hrs/week

EXAMINATION SCHEME:

Practical assessment: 25 marks

Practical: 25 marks

Credit: 2 Pass marks: 17/50

A. RATIONAL:

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through industrial visits, expert lectures, seminars on technical topics and group discussion.

B. AIM:-

Student will be able to:

- a. Acquire information from different sources.
- b. Prepare notes for given topic.
- c. Presentation on given topic in a seminar.
- d. Interact with peers to share thoughts.
- e. Prepare a report on industrial visits and training, expert lecture.

C. PRE- REQUISITE:-

1. Survey of different electrical industries.
2. Knowledge of electrical engineering up to 5th semester.

D. ACTIVITIES

1. Training / Industrial/ Field visits:

Structured training/ field visits be arranged and report of the same should be submitted by the individual student.

- a. 7-10 days compulsory summer training during the end of 5th Semester final examination (during term vacation) in thermal, hydal power generating station/Grid substation.
AND (Any one of the following) - 14hrs
- b. Visit any industry (Cement, Sugar, Gas cracker, oil refinery etc) to observe operation maintenance, safety arrangement on electrical equipments.

- c. Visit to observe nearest transmission line installation / street solar lighting connection/ wiring system of multi-storeyed building
 - d. An electrical machine manufacturing industry
 - e. A wind mill / Hybrid power station of wind and solar
 - f. Industry of power electronics devices.
 - g. Transformer repairing workshop
 - h. Any other technical field area as may be found suitable alternative to above list.
2. Guest lectures by professional/industrial expert :- (any two) -10hrs

- a. Application of sensors and transducer
 - b. Modern trends in AC machine
 - c. Automotive wiring and lighting
 - d. Digital metering
 - e. Mini hydal project on N.E region for power generation.
 - f. Safety precaution and first aids from electrical fire
 - g. Indian electricity rules.
 - h. Social networking- effects and utility.
 - i. Entrepreneurship development and opportunities.
- (Individual report of the above lecture should be submitted by the students.)

3) Information search: - Following (any TWO) topics are suggested for each group of 4-5 students have to search/collect information. -6 hrs

- a. Latest development in construction and operation of DC and AC machine
 - b. Electrical drive and braking system.
 - c. Maintenance and installation of solar equipments.
 - d. Seismic consideration of substation.
- Searching websites: www.electrical4u.com, www.indiabix.com, www.careerride.co

4) Mini project/ seminar/ activity: -(any ONE of each group of 4-5 students) -10hr

- a. Modern House wiring installation and testing.
- b. Dismantling, repairing, rewinding and assembling of 3-phase/1-phase motor.
- c. Take measurement and prepare drawings/sketches of different dismantling machine parts
- d. Seminar on any field of electrical engineering
- e. Survey for energy saving in the institute.
- f. Survey and interview of successful entrepreneurs in nearby areas.
- g. Biomass energy
- h. Automatic speed controller of motor.
- i. Make a market survey of all transducer available, their specification, manufacturers name, cost etc. prepare power point presentation.
- j. Collect information from market regarding specification and cost of items used in electrical wiring for domestic, commercial and industry use.

COURSE STRUCTURE OF 6TH SEMESTER (ELECTRICAL)

Sl no	Code no	Subject	Contact hours /week			Evaluation scheme									
						Theory (Th)				Practical (Pr)			Total Marks (Th+Pr)	Credit	
			L	T	P	ESE	Sessional(SS)			Pass (ESE+SS)	Practical Test(PT)	Practical Assessment (PA)			Pass (PT+PA)
	TA	HA	Total (TA+HA)												
1	HU-601	Industrial Management and Entrepreneurship	3	1		70	10	20	30	33/100				100	3
2	EL-601	Electrical estimating, costing and contracting	4		3	70	10	20	30	33/100	50	50	33/100	200	5
3	EL-602	A.C Distribution & Utilization	3	1		70	10	20	30	33/100				100	3
4	El – 603	Switchgear and Protection	4			70	10	20	30	33/100				100	4
5	EL-604	Installation and Maintenance	3	1		70	10	20	30	33/100				100	3
6	EL-611	Project & Seminar		1	6						100	50	50/150	150	3
7	El-612	General viva		2							50		17/50	50	2
8	El - 610	Professional practices -IV	1		2						25	25	17/50	50	2
Total			19	5	11									850	25
			35												

1.Course Title :Industrial Management and Entrepreneurship

1. Course Code: **Hu – 601**

2. Semester: **VI**

3. **Aim of the Course:**

1. To acquaint the students with managerial activities
2. To provide introductory knowledge of Cost Accounting
3. To introduce students with industrial legislation
4. To explain the scope for self-employment
5. To compare and contrast different forms of business organization
6. To identify the opportunities to start a small scale industry

4. **Course Outcomes:**

On completion of the course on IME, students will be able to

- CO₁ = explain managerial activities.
- CO₂ = describe leadership qualities and decision making process.
- CO₃ = state the elements of costs.
- CO₄ = explain important industrial laws.
- CO₅ = define different forms of business organisations
- CO₆ = identify entrepreneurial abilities for self employment through small scale industries.

5. **Teaching Scheme (in hours)**

Lecture	Tutorial	Practical	Total
42 hrs	3 hrs	--	45 hrs

6. **Examination Scheme:**

Theory				Practical		Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination	Sessional	

70	30	100	33	--	--	--	--	100

7. Detailed Course Content:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
				42 hrs
1.0	Introduction to Management :	i) Meaning and Concept ii) Functions of Management iii) Principles of Management	i) Explain functions and principles of management	3
2.0	Leadership Decision Making & Communication :	i) Definition of Leader ii) Functions of a leader iii) Decision making – Definition iv) Decision making process v) Communication – definition, importance & types	i) Develop leadership qualities ii) Demonstrate decision making abilities	4
3.0	Introduction to Cost :	i) Definition and classification of Cost ii) Elements of Cost iii) Break Even Analysis	i) State elements of costs ii) Explain Break Even Analysis	3
4.0	Human Resource Management:	i) Meaning of manpower planning ii) Recruitment and Selection procedure iii) Payment of wages – factors determining the wage iv) Methods of payment of wages – Time rate and	i) State selection procedure of employees ii) Distinguish Time rate and Piece rate	5

		Piece rate v) Labour Turnover – definition, its causes, impact and remedy	system of wage payments iii) Explain causes and impact of labour turnover	
5.0	Industrial Legislation :	i) Need of Industrial legislation ii) Indian Factories Act – 1948 – Definition of Factory, main provisions regarding health, Safety and Welfare of Workers iii) Industrial Dispute Act – 1947 – Definition of Industrial dispute, Machineries for settlement of Industrial dispute in India	i) Identify the needs and importance of industrial laws	5
6.0	Production Management :	i) Meaning of Production ii) Production Management – definition, objectives, functions and scope iii) Inventory Management, Basic idea	i) State the objectives and functions of Production management	3
7.0	Marketing Management:	i) Meaning and functions of marketing ii) e- Commerce iii) Channels of distribution iv) Wholesale and retail trade	i) state the functions of wholesalers and retailers	2
8.0	Entrepreneur and Entrepreneurship:	i) Definition of Entrepreneur and Entrepreneurship ii) Qualities required by an entrepreneur iii) Functions of an entrepreneur iv) Entrepreneurial motivation	i) State the qualities and functions of an entrepreneur	3

9.0	Forms of Business Organization:	i) Sole Trader – meaning, main features, merits and demerits ii) Partnership – definition, features, merits and demerits iii) Joint Stock Company – Definition, types, features, merits and demerits	i) Differentiate different forms of Business organization ii) compare and contrast features, merits and demerits of different business organizations.	5
10.0	Micro and Small Enterprises:	i) Definition of Micro & Small enterprises ii) Meaning and characteristics of Micro and Small enterprise iii) Scope of SSI with reference to self-employment iv) Procedure to start SSI – idea generation, SWOT analysis v) Selection of site for factories	i) Define micro and small enterprises ii) Explain the procedure to start a small enterprise	4
11.0	Support to Entrepreneurs	a) Institutional support: i) Introduction ii) Sources of information and required application forms to set up SSIs iii) Institutional support of various National & State level organizations – DICC, NSIC, IIE, MSME - DI, Industrial Estates b) Financial support: i) Role of Commercial banks, RRB, IDBI, ICICI, SIDBI, NEDFi, and State Financial Corporations ii) Special incentives and subsidies for Entrepreneurship	i) identify the supporting agencies to entrepreneurs ii) Explain the role of financial support organizations	5

		Development in the North East		
	Class Test			3 hrs
	Total			45 hrs

(9) TABLE OF SPECIFICATIONS for Industrial Management & Entrepreneurship

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Comprehension	Application	HA
1	Introduction to Management	3	7	2	3	0	0
2	Leadership & Decision Making	4	9.5	3	4	0	0
3	Introduction to Cost	3	7	3	2	0	0
4	Human Resource Management	5	12	6	2	0	0
5	Industrial Legislation	5	12	4	4	0	0
6	Production Management	3	7	3	2	0	0
7	Marketing Management	2	5	4	0	0	0
8	Entrepreneur & Entrepreneurship	3	7	3	2	0	0
9	Forms of Business Organization	5	12	3	5	0	0
10	Micro & Small Enterprises	4	9.5	4	3	0	0

11	Support to Entrepreneurs	5	12	4	4	0	0
Total		42	100	39	31	0	70

K = Knowledge C = Comprehension A = Application HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$C = \frac{b}{\sum b} \times 100$$

10. Distribution of Marks:

DETAILED TABLE OF SPECIFICATIONS FOR IME

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	Total
1	Management	1	0	0	1	1	0	0	0	1	0	3	0	0	3	5
2	Leader & Decision	1	0	0	1	2	1	0	0	3	0	3	0	0	3	7
3	Cost	1	1	0	2	2	1	0	0	3	0	0	0	0	0	5
4	HRM	2	1	0	3	1	1	0	0	2	3	0	0	0	3	8
5	Laws	3	0	0	3	0	0	0	0	0	1	4	0	0	5	8
6	Product Manage	2	1	0	3	1	1	0	0	2	0	0	0	0	0	5
7	Market	2	0	0	2	2	0	0	0	2	0	0	0	0	0	4
8	Entrepreneurship	1	1	0	2	2	1	0	0	3	0	0	0	0	0	5
9	Forms of BO	2	1	0	3	0	0	0	0	0	1	4	0	0	5	8
10	MSME	2	0	0	2	0	0	0	0	0	2	3	0	0	5	7

11	Support to Entp.	3	0	0	3	1	0	0	0	1	0	4	0	0	4	8
	Total	20	5	0	25	12	5	0	0	17	7	21	0	0	28	70

K = Knowledge

C = Comprehension

A = Application

HA = Higher Than Application Higher than Application (Analysis, Synthesis, Evaluation) Total

10. Suggested implementation Strategies: Modified syllabus may be implemented with effect from January, 2020 (Starting with the present batch (2018) of 2nd Semester students)

11. Suggested learning Resource:

a. Book list :

Sl. No.	Title of Book	Name of Author(s)	Publisher
1	Industrial Management	S.C. Jain H.S. Bawa	Dhanpat Rai & Co. (P) Ltd. New Delhi-110006
2	Business Organisation and Entrepreneurship Development	S.S. Sarkar R.K. Sharma Sashi K. Gupta	Kalyani Publishers, New Delhi-110002
3	Entrepreneurial Development	S. S. Khanka	S. Chand & Co. Ltd. New Delhi-110055
4	Business Methods	R.K. Sharma Shashi K Gupta	Kalyani Publishers, New Delhi
5	Entrepreneurship Development and Management	Dr. R.K. Singhal	S.K. Kataria & Sons, New Delhi-110002
6	Business Administration & Management	Dr. S. C. Saksena	Sahitya Bhawan, Agra
7			

8			

- b. List of Journals
- c. Manuals
- d. Others

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2. Course title- Electrical Estimating, Costing and Contracting

1. Course code- EL-601
2. Semester- 6th
3. Rationale:—The contents of this subject have been designed to provide knowledge of IE rule, wiring design and design considerations of residential electrical installation, estimate the materials required for different installation.
4. Aim of the subject:-
 - A. Knowledge of electrical engineering drawing, IE rules, different types of electrical installation and their design considerations equip the students with the capability to design and prepare working drawing of different installation projects.
 - B. Understanding of the methods and procedure of estimating the material required will also help the student to work as a supervisors.
5. COURSE OBJECTIVES: – Students will be able to:
 - A. State IE rules related to electrical installation and testing.
 - B. Understand the concept of contracts, contractors, tender and tender document and its related procedures
 - C. State and describe the basic term, general rules, circuit design procedure, wiring design and design considerations of residential electrical installations
 - D. Estimate the quantity of material required for earthing
 - E. Familiarize the types of wiring
 - F. Estimate the materials required for overhead and underground distribution system.
 - G. Estimate the materials required for electrical substation

COURSE OUTCOMES:-

- CO501.1 - To enable one to apply the knowledge of IE rules and summarize the importance of estimation and specification.
- CO501.2 -To enable one to understand the concept of contracts, contractors, tender and tender document and its related procedures.
- CO501.3- To enable one to draw the wiring plan for residential buildings, prepare the schedule of materials with specifications.
- CO501.4-To enable one to estimate the materials required for overhead and underground distribution system.
- CO501.5-To enable one to estimate the materials required for transmission lines and substations.

CO501.6-To enable one to repair the different electrical equipments

6. Pre- requisite:-

- A. Basic electrical engineering
- B. Engineering graphics

7. Teaching scheme (in hours)

Lecture	Tutorial	Practical	Total
4hrs/week	-	3hrs	7hrs/week

8. Examination Scheme

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA	33/100	200	5
	TA	HA						
	70	10	20	50	50			

9. Detailed Course Content

Chapter no.	Chapter Title	Content	Duration(hours)
1.	Elements of estimating	Principles, purpose of estimating and costing, good estimator, items and specifications, essentials of estimating and costing market survey, price list and net prices, preparation of list of materials, calculations of material and labour cost, contingencies, overhead charges, profit and total cost, quotations-comparative statement and orders, purchase procedures.	4 hours
2.	Principles of Contracting	Legal aspects of contract, SOR, tender, tender procedure, guidelines, preparations of a simple tender, process for passing the tender, terms and contradictions of a contract.	4 hours
3	Estimating and Costing of domestic and industrial Wiring	Types of domestic and industrial electrical fittings used including MCB, LED Bulb etc, procedure adopted, comparison and selection of appropriate wiring, looping and ring system, Indian electricity rules, code of practice, selection of number of circuits, size of wire, domestic and industrial wiring, planning for domestic and industrial	8 hours

		wiring, wiring diagrams, estimation of residential wiring and industrial wiring including estimation of earthing.	
4	Estimating and costing of service connection	Procedure for preparing estimate for giving service connection to domestic and industrial consumers including materials, sketches and its cost both for overhead and underground connections. Laying of underground cable.	8hours
5.	Estimation Of overhead and underground Distribution System	Procedure for preparing estimates for overhead and underground distribution system for a given load and for the given distance of distribution line including sketch and list of material required. Main components of overhead lines. Cost of materials and work for overhead and underground lines up to 11 kv only.	8 hours
6.	Estimation of Small Sub-stations	Estimation of materials required for a small distribution substation (indoor and outdoor type-platform and pole mounted). Costing of materials and work of above substations.	5 hours
7.	Estimating and Costing of repair and maintenance and electrical devices and equipments	Estimating the cost of repair including material, labour cost, testing cost, testing cost along with details of fault finding, in case of some domestic appliances like hot plates, electric iron, mixer, fan, single phase transformers, starter, rewinding, etc.	5 hours
8	Class test		3 hours

10. TABLE OF SPECIFICATIONS FOR THOERY

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Elements of estimating	4	10	10	5	0	1	
2	Principles of contracting	4	10	10	5	1	0	
3	Estimating and costing of domestic & industrial wiring	8	19	19	4	1	10	
4	Estimating and costing of service connection	8	19	19	4	1	10	
5	Estimation of overhead and underground distribution system	8	19	19	6	1	8	

6	Estimating of small substation	5	11	11	4			
7	Estimating & costing of repair and maintenance of electrical devices and equipments	5	12	12	1	1	7	
	Total	42	100	100	29	05	36	
	Class test	3						

11. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Elements of estimating	2		1	3	1				1	2				2
2	Principles of contracting	2	1		3	1				1	2				2
3	Estimating & costing of domestic and industrial wiring	2	1	2	5		2			2			8		8
4	Estimating & costing of service connection	2	1	2	5	2				2			8		8
5	Estimating of overhead & underground distribution system	2	1	2	5	2				2		6			8
6	Estimating of small substation	1			1	1				1	2				2
7	Estimating & costing of repair and maintenance of electrical devices and equipments		1	2	3	1				1			5		5
	Total				25					10					35

12. Suggested Implementation Strategies:-

The students should be taken to a newly constructed building to estimate the materials required for wiring. Teacher should encouraged them to draw single line wiring diagram, transmission line, distribution line structure using CAD

13. Reference Books-

1. J.B. GUPTA. “Electrical Installation Estimating and Costing” S.K. Kataria and Sons New Delhi
2. Uppal. “Electrical Installation Estimating And Costing”
3. Surjeet Singh. “Electrical Estimating And Costing” Dhanpat Rai
4. S.K. Bhattacharya, “Electrical Engineering Drawing and Design Estimating”, Wiley Eastern Ltd. New Delhi
5. Surjeet Singh, “Electrical Design and Drawing” S.K. Kataria And Sons New Delhi
6. O.P. Soni, “Electrical Engg. Design And Drawing” Satya Prakashan Delhi

2. Electrical Estimating and Costing Laboratory

Practical: - Full Marks 100 Practical/ Viva= 50, Sessional =50

Pass marks = 33/100

Code EL – 601(P)

1. Drawing, estimating and costing of electrical installation of the institute from suppliers pole to the institution distribution board (service connection)
 2. Designing of light and fan scheme for a institutional or commercial building.
 3. Rewinding & repairing of I-phase & 3-Phase motor.
 4. Rewinding & repairing of fan motor, regulators and other electrical appliances.
 5. Practice on different types of House Wiring installation and testing .
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3. Course Title: AC Distribution and Utilization

1. Course Code: EI- 602

2. Semester: 6th

3. Rationale of the Subject:

The amount of use of electrical energy reflects the economical condition of a nation. The demand of electric energy is gradually increasing in developed countries. Electricity is the basic need of human being as well as industry. Therefore, economical distribution of energy is important. The power station and power industry require skilled technician to distribute electric energy to the consumer. Electric energy is utilized in different ways like heating, welding, illumination, electric drives etc. Therefore students should know the principle, construction, and operation of these. Essential efforts are made to develop above skill in the students.

4. Aim:-

1. To study distribution system and automation of distribution system using SCADA
2. To study different methods of power factor improvement and different methods of tariff.
3. To study the importance of the good illumination.
4. To study electric heating, welding, electric drives and electrochemical works.

5. Objective:- The student will be able to

1. Know the different types of distribution system and role of SCADA in automation of distribution system.
2. Explain the importance of good illumination.
3. Compare different types of electric heating and welding.
4. Know different methods of power factor improvement, tariff and application of tariff to the consumer.

5(a) COURSE OUTCOMES:-

On successful completion of the course the student will be able to –

CO 1: Understand the different types of distribution system and role of SCADA in atomization of distribution system.

CO 2: Know the importance of good illumination.

CO 3: Know different types of electric heating and welding and know to compare them.

CO 4: Understand different types of electric drives and electrochemical power.

CO 5: Know different methods of power factor improvement, tariff and application.

CO 6: Learn construction, laying, advantages and disadvantages of underground cable.

6. Pre-Requisite:-

1. Electrical Technology

2. AC, DC machine

7. Teaching Scheme (in hours per week):

Lecture	Tutorial	Practical	Total
3hrs	1hrs		4 hrs

8. Examination Scheme:

Theory			Pass marks(ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA		100	3
	TA	HA						
	70	10 20						

9. Detailed Course Content:

Chapter No	Chapter Title	Content	Duration (in hours)
1.0	AC Distribution	1.1 Primary and Secondary distribution system, design considerations in a distribution system 1.2 Distribution system losses, factors effecting distribution system losses, methods for reduction of losses 1.3 Scheme of connections, single phase AC distribution fed at one end –	8

		power factor is specified wrt receiving end voltage and power factor refers to the respective load point, simple problem	
2.0	SCADA System for Electrical Distribution	2.1 Introduction to SCADA 2.2 Components of typical SCADA system 2.3 Automation of electrical distribution system 2.4 Advantages of implementing SCADA system for electrical distribution	5
3.0	Power Factor Improvement	3.1 Causes of low power factor, disadvantages of low power factor 3.2 Methods of improving power factor 3.3 Most economical power factor when the KW demand is constant, most economical power factor when the KVA maximum demand is constant	5
4.0	Electrical Tariff	4.1 Points to be considered for fixing a tariff, 4.2 Different types of tariff and calculation	4
5.0	Cables	5.1 General construction of cables, types of cables and application 5.2 Advantages and disadvantages of underground cables over overhead line 5.3 Insulating materials for cables 5.4 Determination of maximum current carrying capacity of cables 5.5 Cables for low voltage AC distribution and service mains 5.6 Laying of cables 5.7 Faults, faults finding methods	5
6.0	Electric Heating and Welding	6.1 Advantages of electric heating 6.2 Different types of electrical heating with principle and comparison 6.3 Design of resistance heating element, 6.4 Construction and application of resistance furnaces, induction heating, dielectric heating, arc furnace, indirect arc furnace 6.5 Heating of building and air-conditioning 6.6 Classification of electric welding and equipments, ultrasonic welding	5
7.0	Electric Drives	7.1 Group and individual drive, advantages of electric drives 7.2 Starting and running characteristics of motor 7.3 Speed control of DC and AC motors 7.4 Selection of motor for different industrial work	4
8.0	Illumination	8.1 Definition of various terms used in illumination and polar curve. 8.2 Laws of illumination, Lambert's law, simple problems 8.3 Requirement for good lighting, scheme for domestic, commercial, industrial, workshop and street lighting	3
9.0	Electro Chemical Power	9.1 Electrolysis, Faraday's laws of electrolysis 9.2 Electroplating, Electro-forming, Electro-typing, Anodizing	3
CLASS TEST			3

10. TABLE OF SPECIFICATIONS FOR THOERY

Slno	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	A.C distribution	8	19	19	4	3	6	
2	SCADA system for electrical distribution	5	12	12	5	1	2	
3	Power factor improvement	5	12	12	3	1	4	
4	Electrical Tariff	4	10	10	4		3	
5	Cables	5	12	12	3	3	3	
6	Electric heating and welding	5	12	12	5		4	
7	Electric drives	4	10	10	4	3		
8	Illumination	3	7	7	3	2		
9	Electro chemical power	3	6	6	4			
	Total	42	100	100	35	13	22	

11. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer Type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	A.C distribution	2	1	2	5	1	2			3	1		4		5
2	SCADA system for electrical distribution	1		2	3	1				1	3	1			4
3	Power factor improvement	2	1		3	1				1			4		4
4	Electrical Tariff	2			2	2		3		5					
5	Cables	1	1		2	1	2			3	1		3		4
6	Electric heating & welding	2		2	4	2		2		4	1				1
7	Electric drives	2	1		3		2			2	2				2
8	Illumination	1	2		3	2				2					
9	Electro- chemical power					2				2	2				2
	Total				25					23					22

12. Suggested Implementation Strategies: Practical examples will help in this course. In classroom teaching, the teacher should show models, charts, video films etc time to time. Visit to industry also helps the students. Students may be given the assignment to draw the layout of distribution system and load survey of local area.

13. Suggested Learning Resources:

Book List:

1. Electrical Power System - Theory and Practice by M. N. Bandyopadhyay
2. Electric Power Transmission and Distribution System by S. Sivanagaraju, S. Satyanarayana
3. Utilisation of Electric power and electric traction by J B Gupta
4. A Text Book on Power System Engineering by Chakraborty, Soni, Gupta, Bhatnagar

4. Course Title: Switchgear and Protection

1. Course Code: EI - 603

2. Semester: 6th

3. Rationale of the Subject:

In a power system, different types of fault occur regularly. There for safety of equipments and human being are the major criteria in a power system. For this reason, switchgear and various protective scheme applied to different equipments, machines, bus bars, transmission line, distribution lines are essential. The technician working in various area of a power system should have operating skill of switchgear and protective scheme. The student will be able to know the working principle, construction and procedural aspects of various equipments, devices etc used in switchgear protection scheme. This course will also help the students in operating various switchgears applied in power system.

4. Aim:-

1. To identify various components of switchgear and protection system.
2. To develop skill in operating various control and switchgear used in power system.
3. To develop skill to take remedial measures for faults/abnormalities developed in power system using appropriate instruments or devices.

5. Objectives:-

The student will be able to

1. Identify various components of switchgear and control panel.
2. Know the construction and working of different components used in protective system.
3. Know the principles, concepts and procedural aspects of switchgear and protective system.
4. Decide the sequence of operation of switchgears.
5. Identify faults and repairs.

5(a) COURSE OUTCOMES:-

On successful completion of the course the student will be able to –

CO 1: Learn to identify various components of switchgear and control panel.

CO 2: Know the construction and working principle of different components, devices used in protective system.

CO 3: Understand the principle, concept and procedural aspects of switchgear and protective system.

CO 4: Know the sequence of operation of switchgear.

CO 5: Identify faults and repair.

CO 6: Get the operating skill of switchgear and protective system.

6. Pre-Requisites:-

1. Power system.

2. Fundamentals of AC, DC machines.

7. Teaching Scheme (in hours per week):

Lecture	Tutorial	Practical	Total
4 hrs	-	-	4 hrs

8. Examination Scheme:

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional(SS)		33/100	PT	PA		100	4
	TA	HA						
	70	10 20						

9. Detailed Course Content:

Chapter No	Chapter Title	Content	Duration (in hours)
1.0	Elements of Protection	1.1 Normal and abnormal condition of power system, effects of abnormality,	

		1.2 Types of fault, causes of fault and its remedies 1.3 Short circuit current, harmful effects of short-circuit current on power system 1.4 Function of protective system, basic elements of protective system, back up protection	4
2.0	Relays	2.1 Concept of term protective relay, general principle of operation of relay – over current, over voltage, earth fault etc , basic terms used in relay operation, time and current setting 2.2 Electromagnetic relays, Induction relays –types, construction and working principle 2.3 Idea of static relay, comparison with electromagnetic relay. 2.4 Construction and working principle of directional relay, non directional relay, power relay, and thermal relay,	8
3.0	Neutral Earthing	3.1 Importance of neutral earthing, methods, comparison of different methods, application	3
4.0	Circuit Interrupting Devices	4.1 Necessity of circuit interrupting devices, different circuit interrupting devices, difference between switch, isolator and circuit breaker 4.2 Isolators, requirement and types 4.3 Function and construction of fuse, HV and LV fuse, their characteristics, types, rewirable, cartridge, HRC fuse.	5
5.0	Arc Formation Process	5.1 Arc phenomenon, principle of arc extinction, method of arc extinction – zero current interruption and other arc interruption process 5.2 Different terms – restriking voltage, arc voltage, recovery voltage, RRRV, current chopping, resistance switching, capacitive current braking, circuit breaker ratings	4
6.0	Circuit Breaker	6.1 Working principle of circuit breaker, 6.2 brief review of air circuit breaker, air blast circuit breaker 6.3 Bulk oil circuit breaker, minimum oil circuit breaker 6.4 SF ₆ circuit breaker, vacuum circuit breaker 6.5 Merits and demerits of different types circuit breaker 6.6 Contacts, classification and application switchgear, specification of CG	8
7.0	Protection Scheme	7.1 Protection of alternator: abnormality and fault in an alternator, over current protection, differential protection, field failure protection, protection against unbalanced loading, Merz price protection 7.2 Protection of transformer: abnormality, over current protection, differential protection, earth fault protection, Buchholz relay 7.3 Transmission line and feeder protection; causes and different types of protection needed, over current protection, differential protection, distance protection for radial, parallel and ring feeder, differential pilot wire protection Translay Scheme	6

8.0	Over Voltage Protection	8.1 Causes of over voltage, damages, method of reducing over voltage, function of ground wire 8.2 Mechanism of lightning 8.3 Construction and application of different type of lightning arresters- rod gap, horn gap thyrite arrester and surge absorber,	4
CLASS TEST			3

10. TABLE OF SPECIFICATIONS FOR THOERY

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Element of protection	4	10	10	4	3		
2	Relays	8	19	19	4	3	6	
3	Neutral earthing	3	7	7	1		4	
4	Circuit interrupting devices	5	12	12	3	5		
5	Arc formation process	4	10	10	4	3		
6	Circuit breaker	8	19	19	5	4	4	
7	Protection scheme	6	14	14	3	7		
8	Over voltage protection	4	9	9	5	2		
	Total	42	100	100	29	27	14	
	Class Test	3						

11. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Elements of protection	2			2	2				2		3			3
2	Relays	2	1	2	5		2			2	2		4		6
3	Neutral earthing			2	2	1		2		3					
4	Circuit interrupting devices	2	2		4	1				1		3			3
5	Arc formation	2	1		3	2				2		2			2
6	Circuit breaker	2	2		4	2				2	1	2	4		7
7	Protection Scheme	2	2		4	1	2			3		3			3
8	Over voltage protection	1			1	1	2			3	3				3
	Total				25					18					27

12. Suggested Implementation Strategies:

Besides the class room activity, field visit will help the students to develop the operating skill on different equipments and devices used in switchgear and protection scheme. Visit to power station, substation and industry helps the students to develop skill in case of switchgear and protection scheme.

13. Suggested Learning Resources:

Book List: Principle of Power System by V K Mehta and Rohit Mehta

Switchgear and Protection by S SRao

Electrical Power System by C L Wadhaw

Power System Engineering by Nagrath& Kothari

Switchgear and Protection by J B Gupta

5. Course title- Installation and maintenance of electrical equipments

1. Course code- EI- 604

2. Semester- Sixth

3. Rationale of the subject:-

Modern industries require highly skilled technicians/engineers basically expert in electrical installation, testing, and commissioning the different electrical machines/equipments. This syllabus has been designed to provide certain guidelines and principles regarding the above activities. Appropriate field trips will reinforce the learning.

4. Aim:-

- A. This is technology level subject with application in industry, commercial, public utility departments such as Electricity Board etc.
- B. After studying this subject, students will be able to inspect, test, install, commission and locate the fault of electrical machines as per IS.

5. Objectives:-

The student will be able to:

- A. Know safety measures and state safety precautions
- B. Test single phase, three phase transformer, DC & AC machine as per IS.
- C. Identify/Locate common troubles in electrical machines & switch gear.
- D. Plan & carry out routine & preventive maintenance.
- E. Install LV switchgear & maintain it.
- F. Ascertain the condition of insulation & varnishing if necessary
- G. Identify faults & measures to repair faults.

COURSE OUTCOMES :-

- CO604.1 - To enable one to apply the knowledge of safety measures and safety precautions in electrical field.
- CO604.2 - To enable one to apply the knowledge of testing of single phase, three phase transformer, DC & AC machine as per IS.
- CO604.3 - To enable one to identify/locate common troubles in electrical machines & switch gear.
- CO604.4 - To enable one to plan & carry out routine & preventive maintenance of different transformers, substations, etc.
- CO604.5 - To enable one to install different types of rotating machines, transformers, switchgear, etc.

- CO604.6-To enable one to identify faults & measures to repair faults.

6 Pre requisite:-

- A. knowledge of basic electrical engineering
- B. Knowledge of electrical equipments

7. Teaching scheme (in hours)

Lecture	Tutorial	Practical	Total
3 hrs/week	1 hr		4 hrs

8 .Examination Scheme:

Theory			Pass marks(ESE+ SS)	Practical		Pass marks(PT+PA)	Total marks (Th+Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA		100	3
	TA	HA						
	70	10	20					

9. Detailed Course Content

Chapter no.	Chapter Title	Content	Durati on (Hours)
1.	Tools and Accessories	Tools, accessories and instruments required for installation, maintenance and repair works, safety codes	02
2	Installation	Inspection procedure of machine/transformer on arrival and before installation, storage Basics of civil foundation of heavy electrical equipments ,installation procedure of rotating machine/equipments, method of drying out of machines,	04
3	Commissioning	Test required before Commissioning of electrical machines a. Mechanical fixture and alignment b. Electrical Tests c. Initial Precaution for Starting or charging	05
4	Earthing	Necessity of earthing, types of earthing, earth electrode,	

		permissible earth resistance, improvement of earth resistance, double earthing, measurement of earth resistance.	05
5	Testing and maintenance of insulation	Instruments used for measuring insulation resistance ,reason for deterioration of insulation resistance ,polarization index ,properties of good insulating oil, filtration of insulating oil, testing of insulating oil a)acidity test b) sludge test c)crackle test d)flash point test . Measurement of internal temperature of winding and vacuum impregnation.	08
6	Maintenance	Types of maintenance, advantages of preventive maintenance , preventive maintenance schedule of transformer, induction motor, transmission line, circuit breaker, underground cable	08
7	Trouble shooting	Trouble shooting, Procedure for analysis of trouble shooting, causes of faults in electrical equipments, common fault in domestic electrical appliances, troubleshooting chart for DC and AC machines, remedial measures to be taken.	05
8	Electrical accidents and safety measures	Causes and effects of and electrical accidents, factors affecting the severity of electric shock, awareness of safety measures , Indian electricity rule-1956, treatment of electric shock, method of artificial respiration, electric safety tools and equipments, classification of fires, firefighting equipments, and application,	05
9	Class test		03

10. TABLE OF SPECIFICATIONS FOR THOERY

Sr no	Topic (a)	Time allotted in hrs (b)	Percentage Weightage (c)	Modified % weightage (d)	K	C	A	HA
1	Tools and accessories	2	5	5	2		1	
2	Installation	4	10	10	8			
3	Commissioning	5	12	12	8	1	1	
4	Earthing	5	12	12	7	1		
5	Testing and maintenance of insulation	8	19	19	8	2	4	
6	Maintenance	8	19	19	9	2	3	
7	Trouble shooting	5	11	11	5	1		
8	Electrical accidents & safety measures	5	12	12	5	1	1	
	Total	42	100	100	52	8	10	
	Class test	3						

11. DETAILED TABLE OF SPECIFICATION FOR THEORY EXAM

Sl no.	Topics	Objective type				Short answer type					Essay type				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Tools and accessories			1	1	2				2					
2	Installation	2			2	2				2	4				4
3	Commissioning	2	1	1	4	2				2	4				4
4	Earthing	2	1		3						5				5
5	Testing & maintenance of insulation	2	2	1	5	2				2	4		3		7
6	Maintenance	2	2	1	5	2		2		4	5				5
7	Trouble shooting	1	1		2						4				4
8	Electrical accidents and safety measures	1	1	1	3						4				4
	Total				25					12					33

12. Suggested implementation strategies—

This subject needs theoretical and practical inputs. Demonstration at actual site may be arranged for conceptual understanding. The student should be taken to actual workplace and explained various test procedures.

13. Suggested learning Resources:

1. Testing, commissioning, operation & maintenance of electrical equipment-S. Rao, Khanna Pub
2. Installation commissioning & maintenance of electrical equipments –Tarlok Singh
3. Operation and maintenance of electrical equipment vol. 1-2—B.S Rao
4. Electrical installation and fault location –McMillan, London

6. Project works for Six Semester.

Code No. Project , Seminar =El – 611

GV= El-612

Total Marks for project , Seminar & GV = 200

Project viva / presentation = 50

General Viva =50

Project assessment: 100

Pass Marks = 66/200

SINoTitle of the project

1. Fabrication of Automatic Star-delta Starter
2. Errection/Installation & commission of rating electrical machines with panel board fittings.
3. Energy audit for the workshop of your institution and to suggested remedies to have low electricity bill.
4. To survey the load of given area in a village or small colony or institute, calculate the effective load and find out the sizes of the cables/conductors and rating of the transformer for the proposed distribution system.
5. To prepare a proposal for substation of your institute, calculating the total load
6. S.C.R. operated illumination controller.
7. S.C.R. based or automatic speed controller for D.C./ A.C motor.
8. Project relating to microprocessor/microcontroller.
9. Project relating to solar energy or other non conventional energy.
10. Project relating to electrical Machines.

Suggestion: The external examiner, preferably, a person from industry/organization, who has been associated with the project oriented professional training of the students, should evaluate the student performance.

7. PROFESSIONAL SKILL-IV

6TH semester, Electrical Engineering

CODE NO: EL-610

TEACHING SCHEME:

EXAMINATION SCHEME:

Theory: 1hr/week

Practical assessment: 25 marks

Practical: 2hrs/week

Practical test: 25 marks

Credit: 2

Pass marks: 17/50

1. RATIONAL:

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through industrial visits, expert lectures, seminars on technical topics and group discussion.

2. AIM:-

- a) Student will be able to:-
 - a) Acquire information from different sources.
 - b) Prepare notes for given topic.
 - c) Presentation on given topic in a seminar.
 - d) Interact with peers to share thoughts.
 - e) Prepare a report on industrial visits, expert lecture.

ACTIVITIES:-

1. INDUSTRIAL /FIELD VISITS: -

-10 hrs

Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a team work. (Any ONE)

- a. Visit to nearest hydro / thermal generating station for operation & maintenance.
- b. Visit to grid substation for transmission and distribution of power and observe the maintenances of circuit breaker and relays, power transformer.
- c. Local electrical equipments manufacturing company.
- d. Visit to locomotive traction substation.

2. Guest lecturers from field / industry / professional. (Any TWO) ----6hrs
- Smart grid substation.
 - Protection of 3-phase induction motor and submersible pump from single phasing.
 - Substation protection
 - SCADA communication protocol.
 - CAD of electrical machine parts.

Individual report of the above lecture should be submitted by the students.

3. Group discussion: - Any two topics by each group of 4-5 students. -10hrs
- Load shading and remedial measures.
 - Disaster management
 - Advantages and disadvantages of big dam for power generation in NE region
 - Transmission and distribution system in NE region.
 - Power Losses in transmission and distribution system
4. Information search: - (Any TWO) ----4 hrs
- Smart feeder
 - Gas insulated transmission line
 - Smart grid substation.
 - PLC in operation of electrical devices.
5. Student activities: - Any ONE activity in a group of 4-5 students -10hrs
- Survey and interviews of successful entrepreneurs in nearby areas.
 - Community development programme in rural areas.
 - Load survey on nearby area for electrification.
 - Repairing of any 1-phase / 3-phase motor.

EXAMINATION SCHEME (Practical assessment)

Total Internal assessment of 25 marks is to be carried out by the teachers.

Distribution of marks: - Activities = 10, Group discussion = 5, field visit =5,

Guest lecture attendance and report =5.

DIRECTORATE OF TECHNICAL EDUCATION,
KAHILIPARA, GUWAHATI-19



**DIPLOMA PROGRAMME IN
CIVIL ENGINEERING
NEW SYLLABUS**

DEPARTMENT OF CIVIL ENGINEERING
UNDER
DIRECTORATE OF TECHNICAL EDUCATION, ASSAM

PROGRAMME OUTCOME (PO)

After the completion of the three-year diploma programme, the diploma holders will have:

- The ability to apply knowledge of mathematics, science and engineering fundamentals to the solution of complex engineering problems.
- The ability to communicate technical concepts effectively in both verbal and written form.
- The ability to design and conduct experiments, as well as to analyse and interpret data.
- The ability to identify, formulate, and solve engineering problems.
- The ability to use computer application for engineering works.
- The ability to use drawings as a language of engineers along with the ability to create models of engineering prototypes.
- The ability to apply software engineering principles in product development using engineering technology.
- The ability to communicate effectively.
- The ability to work as an individual, and as a member or leader in diverse teams in multidisciplinary settings.
- An understanding of professional and ethical responsibilities.

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PROGRAMME SPECIFIC OUTCOME (PSO)

After the completion of the three-year diploma programme in Civil Engineering, the diploma holders will:

- Gain the ability to identify, analyse, formulate, and solve different challenging civil engineering problems.
- Be able to apply principles of mechanics and basic sciences to analyse civil engineering structures.
- Develop abilities in the application of the necessary mathematical tools, scientific basics, and fundamental knowledge of civil engineering.
- Be able to survey, map, measure and analyse data for sustainable infrastructure planning.
- Be able to characterize and evaluate materials for adoptability in civil engineering projects.
- Be able to analyse and design concrete and steel structures, earthen embankments, irrigation structures, water supply, waste treatment systems and transport systems.
- Be able to apply best management practices for construction and maintenance of infrastructure facilities.
- Develop professional skills that prepare them for immediate employment or higher studies in civil engineering disciplines.

XXX



THIRD SEMESTER CIVIL ENGINEERING BRANCH



COURSE STRUCTURE OF CIVIL ENGINEERING (3RD SEMESTER)

Subj ect Cod e	Subject	Study Scheme (contact hour/week)			Evaluation Scheme								Total Mark (Th+Pr)	Credi t
					Theory					Practical				
		L	T	P	ESE	Sessional (SS)			Pass (ESE+ SS)	PT	PA	Pass mark(PT +PA)		
TA	HA	Total (TA+H A)												
Co-301	Computer Application & Programming	3	-	3	70	10	20	30	33	25	25	17	150	4
Hu-302	Engineering Economics & Accountancy	3	-		70	10	20	30	33				100	3
El/Et-304	Fundamentals of Electrical & Electronic Engineering	3	-	3	70	10	20	30	33	25	25	17	150	4
CV-301	Water Resource Engineering	4	-		70	10	20	30	33				100	4
CV-302	Building Construction & Materials	3	-	3	70	10	20	30	33	25	25	17	150	4
CV-303	Civil Engineering Drawing			6						100	50	50	150	4
CV-310	Professional Practice-I	1		2						25	25	17	50	2
Total		17		17										
		34			Grand Total =								850	25



1: Course Title – Computer Application & Programming (All Branches)

1: Course Code – Co-301

2: Semester- 3rd

3: Aim of the Course :

- To give basic concepts related to organisation of a computer
- To give fundamental terminologies in networking
- To develop simple programs in C.

4: Course Outcome:

On completion of the course students will be able to:

- Explain the basics of a computer hardware and software
- Solve problems related to number systems
- Define basics of Operating System
- Familiarize with networking components
- Write simple C programs

5: Prerequisites for the Course: Have basic idea about a computer and its functions.

6: Teaching Scheme (in hours):

Teaching Scheme			
L	T	P	Total hours per week
3	0	3	6

7: Examination Scheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	



8: Detailed Course Content:

Unit	Topic/Sub-Topics	Intended Learning Outcome	Hours
1	Computer Architecture: Brief history, Charles Babbage Machine, Von Neuman Architecture, block diagram, memory & it's different types, I/O devices, Role of O.S., computer languages, translator software, editor. Data, different types of data, information and its characteristics	1. Define a computer and identify its parts. 2. Define computer memory & describe its different types. 3. Define computer languages & translators. 4. Describe the characteristics of information.	8
2	Number System and codes: Different number system- decimal, binary, octal, hexadecimal number system, their conversion, 1's and 2's Complement, subtraction using complements. Different codes- ASCII, BCD, Ex-3, Gray. Conversion from Gray to binary and vice-versa, BCD addition.	5. Define decimal, binary, octal & hexadecimal number systems. 6. Convert between different number systems. 7. Define 1's & 2's complements. 8. Subtract using 1's & 2's complements. 9. Describe some different codes.	8
3	Introduction to Operating System: Definition, single user and multi-user OS, different function performs by OS, various popular OS like DOS, Windows, UNIX/LINUX. DOS and UNIX commands.	10. Define operating system. 11. Operate different commands of DOS, Windows & UNIX/ LINUX.	5
4	Computer Network and the Internet: Definition, necessity of network, different types of network-LAN, MAN, WAN, network	12. Define network. 13. Describe different types of	6



	topology, transmission media, different network devices like NIC, hub, bridge, switch, gateway. Introduction to the internet, Internet services, browser, search engine.	network. 14. Define network topology. 15. Describe different network devices. 16. Define internet & describe different internet services. 17. Explain use of different browsers & search engines.	
5	Introduction to C programming: Fundamentals of programming-Algorithm & Flowchart, source code and object code, Basic structure of C programs, Executing a C program, Constants, Variables, and data types. Operators and expression, Input Output function like printf, scanf, getchar, putchar, gets, puts, Decision making and branching using IF..Else, Switch, looping using for, while, and do-while, array.	18. Write algorithm and flow charts for simple programs. 19. Define basic terminology of C language. 20. Write small program using C language. 21. Write diversified solutions using C language. 22. Differentiate between IF..Else and Switch statement.	15
	Internal Assessment		3

Intellectual Skills :

- Logical reasoning
- Relating programming concepts in problem solving

Motor Skills :

- Learn to use and handle a computer and its peripherals.



List of Lab Exercises :**I. Basic commands for computer system maintenance.****II. Preparation of Documents**

Introduction to Word processing, Opening a document, preparing documents, inserting diagrams and tables, Editing document- (a) Character, word and line editing, (b) Margin Setting, Paragraph alignment, (c) Block Operations, (d) Spell Checker, (e) Saving a document, (f) Mailmerge.

III. Information Presentation through Spread Sheet

Application of Spread Sheet, Structure of spreadsheets, Preparing table for simple data and numeric operations, Using formulae and functions in excel operations, Creation of graphs, Pie charts, bar charts.

IV. Preparation of presentation

Creation of electronic slides on any topic, Practice of animation effect, presentation of slides.

V. Programming in C

Editing a C program, defining variables and assigning values to variables

Arithmetic and relational operators, arithmetic expressions and their evaluation

Practice on input/output function like getchar, putchar, gets, puts, scanf, printf etc.

Programming exercise on simple if statement, If..else statement, switch statement

Programming exercise on looping with do-while, while, for loop and array.

9: Distribution of Marks:

Unit	Topic	Type of Question			Total Marks
		Objective	Short	Descriptive	
1	Computer Architecture	6	5	5	16
2	Number System and codes	4	2	8	14
3	Introduction to Operating System	4	2	4	10
4	Computer Network and the Internet	5	3	6	14
5	Introduction to C programming	6	3	7	16
		25	15	30	70



10: Table of specification :

Unit	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Computer Architecture	8	19	✓			
2	Number Systems & Codes	8	19	✓		✓	
3	Introduction to Operating Systems	5	12	✓			
4	Computer Network & the Internet	6	15	✓		✓	
5	Introduction to C Programming	15	35	✓		✓	
Total		Σ b=42	100				

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application (Analysis, Synthesis, Evaluation) $c = \frac{b}{\Sigma b} * 100$

Detailed Table Of Specifications

Unit	Topics	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Computer Architecture	7			7	5				5	4				4
2	Number Systems & Codes	4			4	2				2	4		4		8
3	Introduction to Operating Systems	4			4	2				2	4				4
4	Computer Network & the Internet	5			5	3				3	3		4		7
5	Introduction to C Programming	5			5	3				3	3		4		7
Total		25			25	15				15	18		12		30

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application T = Total

12: Suggested Implementation Strategies:

1: As the subject is taught to the students of all branches, basic knowledge required to



understand the computer hardware and software needs to be emphasised.

- 2: Too much of hardware details could be avoided.
- 3: Programming section theory could be taught side by side in the lab.

13: Suggested Learning Resources :

1. Fundamentals of Computer, Rajaraman, PHI
 2. It Tools and Applications, DOEACC “O” Level, Firewall Media
 3. Let us C by Y. Kanetkar, BPB
 4. Programming in ANSI C / E. Balagurusamy / Tata McGraw-Hill
-



2: Course Title :ENGINEERING ECONOMICS AND ACCOUNTANCY

1. Course Code: **Hu – 302**

2. Semester: **III**

3. Aim of the Course:

1. To introduce the students to some important economic and accounting terms.
2. To acquaint the students with some economic laws and with the functions of money, bank etc.
3. To make the students capable of recording business transaction under double entry system.
4. To introduce the students about financial statements.

5. Course Outcomes:

On completion of the course on EEA, students will be able to

- CO₁ = Define some important economic and accounting terms.
- CO₂ = explain some basic economic laws.
- CO₃ = Describe overall economic environment.
- CO₄ = explain double entry system of book keeping.
- CO₅ = record business transactions under double entry system of book keeping
- CO₆ = define financial statements.

6. Teaching Scheme (in hours)

Lecture	Tutorial	Practical	Total
42hrs	3 hrs	--	45hrs

7. Examination Scheme:

Theory				Practical				Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination		Sessional		
70	30	100	33	--	--	--	--	100



8. Detailed Course Content:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
Part – A : Engineering Economics				21hrs
1.0	Introduction to Economics :	i) Definition of Economics, its utility and scope of study ii) Definition of Engineering Economics ii) Meaning and concepts of Utility, Consumption, Value, Price, Goods and National Income, inflation iii) Wants – Definition and characteristics iv) Wealth & Welfare– Definition, meaning and types	i) explain core economic terms concepts and theories	5
2.0	Demand and Supply :	i) Meaning and types of Demand ii) The Law of Demand, its limitations iii) Preparation of Demand Schedule iv) Meaning of Supply ii) The Law of Supply, its limitations iii) Preparation of Supply Schedule	Define the Laws of Demand and Supply	4
3.0	Production :	i) Meaning and factors of production ii) Factors determining efficiency of labour iii) Savings, investment and capital formation iv) Meaning of production function	i) Define factors of production ii) Explain formation of capital	5
4.0	Money:	i) Meaning of money ii) Types of money iii) Functions of money	i) Understand meaning and functions of money	2
5.0	Banking Organisation :	i) Central Bank – its functions ii) Commercial banks – its functions	i) Distinguish the functions of	3



			different banks	
6.0	Pricing	i) Objectives of pricing policy ii) price determinants iii) Price discrimination	i) explain pricing policy	2
Part – B : Accountancy				21hrs
7.0 (A)	Introduction to Book-Keeping and Accounting:	i) Definition & objectives of Book-keeping ii) Need and advantages of Book-keeping iii) Definition of Accounting iv) Difference between Book-keeping and Accounting v) Double Entry System – main features vi) Advantages and disadvantages of Double Entry System	i) Define Double Entry System of Book Keeping ii) State its objectives, features merits and demerits	3
(B)	Introduction to Computerised Accounting System:	i) Components of Computerised Accounting Software ii) Need for Computerised Accounting iii) Difference between Manual Accounting and Computerised Accounting	i) Identify components of computerized accounting software	2
8.0	Transaction:	i) Definition ii) Meaning of Account iii) Classification of Accounts: - Traditional Approach - Modern Approach iv) Meaning of Debit and Credit v) Rules of Debit and Credit	i) State the meaning and rules of Debit and Credit	2
9.0	Journal and Ledger	i) Meaning Journal ii) Recording of Transactions in Journal iii) Meaning of Ledger	i) Record business transactions under double	4



		iv) Objectives and utility of Ledger v) Posting and balancing of Ledger vi) Distinction between Journal and Ledger vii) Names of different Books of Accounts	entry system in books of accounts	
10.0	Cash Book:	i) Meaning and importance of Cash Book ii) Characteristics and advantages of Cash Book iii) Discount – Trade Discount and Cash Discount iv) Different types of Cash Book: - Single Column Cash Book - Double Column Cash Book - Triple Column Cash Book v) Bank Reconciliation Statement – Basic idea	i) Differentiate different types of Cash Book ii) Record transactions in Cash Book	4
11.0	Trial Balance & Errors in Accounting:	i) Meaning and objects of Trial Balance ii) Main features and advantages of Trial Balance iii) Preparation of Trial Balance iv) Types of errors in Accounting	i) Explain meaning and features of Trial balance	3
12.0	Components of Final Accounts:	i) Meaning and objectives of Trading Account ii) Contents of Trading Account iii) Meaning and objectives of Profit and Loss Account iv) Contents of Profit and Loss Account v) Meaning of depreciation, revenue expenditure and capital expenditure	i) Identify different components of Financial Statements	3



		vi) Contents of Balance Sheet		
	Class Test			3 hrs
	Total			45 hrs

(9) TABLE OF SPECIFICATIONS for Engineering Economics & Accountancy

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Comprehension	Application	HA
1	Introduction to Economics	5	12	5	3	0	0
2	Demand & Supply	4	9	2	4	0	0
3	Production	5	12	6	2	0	0
4	Money	2	5	4	0	0	0
5	Banking Organisation	3	7	3	2	0	0
6	Pricing	2	5	2	2	0	0
7	(A) Introduction to Book-Keeping	3	7	5	0	0	0
	(B) Introduction to Computerised Accounting System	2	5	3	0	0	0
8	Transaction	2	5	2	1	0	0
9	Journal & Ledger	4	9.5	2	2	3	0
10	Cash Book	4	9.5	0	5	2	0
11	Trial Balance & Errors in Accy	3	7	5	0	0	0
12	Components of Final Accounts	3	7	2	3	0	0
Total		42hrs	100	41	24	5	0



K = Knowledge C = Comprehension A = Application
 HA = Higher than Application (Analysis, Synthesis, Evaluation) $C = \frac{b}{\sum b} \times 100$

9. Distribution of Marks:

DETAILED TABLE OF SPECIFICATIONS FOR EEA

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	Total
1	Introduc	3	1	0	4	2	2	0	0	4	0	0	0	0	0	8
2	Demand & Suppl	0	0	0	0	0	0	0	0	0	2	4	0	0	6	6
3	Production	1	0	0	1	2	0	0	0	2	3	2	0	0	5	8
4	Money	2	0	0	2	2	0	0	0	2	0	0	0	0	0	4
5	Banking Organis	1	0	0	1	0	0	0	0	0	2	2	0	0	4	5
6	Pricing	2	2	0	4	0	0	0	0	0	0	0	0	0	0	4
7	Introdu to B K	2	0	0	2	3	0	0	0	3	0	0	0	0	0	5
	Introduc to Comput	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
8	Transact	2	0	0	2	0	1	0	0	1	0	0	0	0	0	3
9	Journal & Ledge	1	0	0	1	0	0	0	0	0	1	2	3	0	6	7
10	Cash Book	0	2	0	2	0	0	0	0	0	0	3	2	0	5	7
11	Trial Balance	3	0	0	3	2	0	0	0	2	0	0	0	0	0	5
12	Componts F/Ac	0	0	0	0	0	0	0	0	0	2	3	0	0	5	5
	Total	20	5	0	25	11	3	0	0	14	10	16	5	0	31	70

K = Knowledge C = Comprehension A = Application
 HA = Higher Than Application T = Total



10. **Suggested implementation Strategies:** Modified syllabus may be implemented with effect from July, 2018 (Starting with the present batch (2018) of 2nd Semester students)

11. **Suggested learning Resource:**

a. Book list

Sl. No.	Title of Book	Name of Author(s)	Publisher
1	Introductory Micro Economics	Sandeep Garg	DhanpatRai Publication Pvt. Ltd. New Delhi
2	Introductory Macro Economics	Sandeep Garg	DhanpatRai Publication Pvt. Ltd. New Delhi
3	Theory and Practice of Accountancy	B. B. Dam R. A. Sarda R. Barman B. Kalita	Capital Publishing Company, Guwahati – 5
4	Book-Keeping & Accountancy	Juneja, Chawla & Saksena	Kalyani Publisher, New Delhi - 110002
5	Tally. ERP 9 For Beginners	Tally Solutions Pvt. Ltd.	Sahaj Enterprises, Bangalore
6			
7			
8			

b. List of Journals

c. Manuals

XXXXXXXXXXXXXXXXXXXXXXXXXXXX



3:Course Title: - FUNDAMENTALS OF ELECTRICAL & ELECTRONICS ENGINEERING

1. Course Code :- El/Et-304
2. Semester :- 3rd (Civil)
3. COURSE OUT COME (CO)

On completion of the course, the student will be able to:

- Define current, voltage, insulator, conductor etc.
- Solve numerical problems using Kirchhoff's law.
- Operate motor and generator.
- Explain briefly the alternating current and transformer
- Explain the use of semiconductor and transistor.
- Guide house wiring
- Explain the fundamental concept of digital electronics correlated to microprocessor with its applications.

CO s and ILOs

CO s	ILO s
CO -1. define current, voltage, insulator, conductor etc	1. Define conductor, insulator, and semiconductor with examples. 2. Define current, voltage, resistance, capacitance 3. Describe the Ohm's law 4. Solve problems related to Ohm's law
CO-2 Solve numerical problems using Kirchhoff's law	1. Explain DC network. 2. Define and explain the Kirchhoff's current and voltage law 3. Solve of critical problems by using Kirchhoff's current and voltage law 4. Use of Wheatstone bridge 5. Determine of unknown resistance by Wheastone bridge
CO-3 operate motor and generator	1. Define DC generator and motor 2. Explain the construction of DC generator and motor 3. Explain the working principle of DC generator and motor 4. Compare the DC motor and generator

	5. Enumerate different types of DC motor and generator 6. Explain use of DC generator and motor
CO -4 Explain briefly the alternating current and transformer	1. Define amplitude, time period, frequency, equation of alternating voltage and current, RMS, average value, instantaneous value, peak factor. 2. Explain RLC circuit 3. Explain inductance of AC circuit 4. Solve numerical problems 5. Explain construction of transformer 6. State operating principle of transformer 7. State type and uses of transformer 8. State step up and step down transformer
CO5- Explain the use of semiconductor and transistor	1. Define semiconductor, energy band, intrinsic and extrinsic semiconductor 2. Doping of semiconductor 3. Explain P-type, N-type semiconductor, 4. Define PN junction diode, forward and reverse biased diode, 5. Explain diode characteristics, application of PN junction diode like Half-wave, Full-Wave rectifier. 6. Explain Transistor: Physical construction of bipolar PNP and NPN transistor. 7. biasing circuit configuration 8. Explain different mode of transistor (CE, CB, CC). 9. State the application of transistor as an amplifier. 10. State elementary ideas of display - LED, LCD, Seven segment display.
CO-6 Guide house wiring	1. Define house wiring 2. Explain different methods of house wiring 3. State the safety and precautionary measure to be taken for electrical shock.



CO-7 Microprocessor	1. Explain the various symbolic representation of logic gates, combinational logic, basic operation of flip-flops, counters and registers. 2. State the fundamental concept of microprocessor and its application in instrumentation, 8085 microprocessor and its operation.

4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
3		3	6

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	4

6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction	Basics of Electricity: Revision of insulators and conductors and their examples ,Definition and units of voltage, current, resistance, inductance, capacitance, different voltage sources, Ohm's law, series & parallel combination of resistance .	4
2	DC network	DC network: Kirchhoff's Law, solving network problem to find current and voltage, Wheatstone bridge and Its problem.	5



3	Generator & motor	Faradays laws of electromagnetic induction, Flemings right hand and left hand rule D.C. generator and motor: Construction, operating principle, types, uses.	4
4	AC fundamental	A. C. Fundamentals: Basic terms-cycle, amplitude, time period, frequency, equation of alternating voltage and current, RMS, average value, instantaneous value, peak factor, form factor, simple problem	5
5	AC circuit	R-L-C series circuit: AC through resistance, capacitance, inductance and their combinations, expression for impedance, reactance, current, power factor, simple problem.	4
6	Transformer	Transformer Construction, operating principle, types and uses.	4
7	Semiconductor	Semiconductor: Definition of semiconductor, energy band diagram, intrinsic and extrinsic semiconductor, doping, P-type, N-type semiconductor, PN junction diode, forward and reverse biased diode, diode characteristics, application of PN junction diode like Half-wave, Full-Wave rectifier.	5
8	Transistor	Transistor: Physical construction of bipolar PNP and NPN transistor, biasing circuit configuration (CE, CB, CC). Application of transistor as an amplifier. Elementary ideas of display - LED, LCD, Seven segment display.	5
9	House wiring	9.1 Introduction to house wiring 9.2 Methods of house wiring 9.3 Safety and precautions measures against electrical hazard.	2



10	Microprocessor	1. Symbolic representation of logic gates, combinational logic, basic operation of flip-flops, counters and registers. 2. Fundamental concept of microprocessor and its application in instrumentation, 8085 microprocessor and its operation.	5
8	Class test	Two class test	2

7. Distribution of Marks/ Table of specifications

TABLE OF SPECIFICATIONS FOR THEORY

Sr. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Introduction	4	9	3	0	0	
2	DC net work	5	11	3	0	4	
3	Generator & motor	4	9	3	0	5	
4	AC fundamental	5	11	4	3	4	
5	AC circuit	4	9	3	1	4	
6	Transformer	4	9	3	3	1	
7	Semiconductor	5	11	3	1	3	
8	Transistor	5	11	3	2	1	
9	House wiring	2	4	2	0	4	
10	Microprocessor	5	11	4	0	3	
11	Class test	2	4				
	Total	$\Sigma b=45$	100	31	10	29	

K = Knowledge C = Comprehension A = Application
 HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{b}{\Sigma b} \times 100$$



10. Details Table of Specification for Theory

Sl. no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1			1	2				2
2	DC net work	1		1	2	2		3		5
3	Generator & motor	1		2	3	2		3		5
4	AC fundamental	2	1	1	4	2	2	3		7
5	AC circuit	1	1	1	3	2		3		5
6	Transformer	1		1	2	2	3			5
7	Semiconductor	1	1	1	3	2		2		4
8	Transistor	1	1	1	3	2	1			3
9	House wiring	1		1	2	1		3		4
10	Microprocessor	1		1	2	3		2		5
	Total				25					45

K = Knowledge C = Comprehension A = Application

HA = Higher Than Application T = Total

N.B.:- 1. The question pattern will be as per the instruction of SCTE or as per existing rules.

2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type.

3. Optional question (if any) may be from the same topic in the form of either or type like below
QNo. Explain the properties of conductor

Or

Explain the properties of insulator

11. Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector, Smart board, Video etc for effective teaching learning process .

12. Ref Books:

I. A text book of Electrical Technology Vol – I, B. L. Theraja & A. K. Theraja, S. Chand.

II. Principle of Electronics, V. K. Mehta, S. Chand.

III. Electronic Principle, A.P. Malvino, Tata McGraw-Hill

IV. Electronic Devices & Circuits, Millman & Halkias, Tata McGraw-Hill

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3.Course Title :- FUNDAMENTAL OF ELECTRICAL & ELECTRONIC ENGINEERING (PRACTICAL)

1.Course Code :- El/Et-304

2.Semester :- 3rd (Civil)

INTELLECTUAL SKILLS

- a. Identify the properties of generator, ammeter, voltmeter, transformer
- b. Interpret the working principle of equipment
- c. Interpret the test results
- d. Follow the IS procedure of testing

MOTOR SKILLS

- a. Measure the quantities accurately
- b. Identify the instruments properly
- c. Handle the equipment carefully.

LIST OF PRACTICAL

(Students are to perform minimum six experiments)

1. Verification of KCL and KVL
2. Study of DC shunt generator.
3. Milli ammeter as a Voltmeter.
4. Milli voltmeter as an ammeter.
5. Study of RLC series circuit.
6. Study of single phase transformer.
7. Determination of semi-conductor diode characteristic.
8. Study of transistor configuration (CE,CB.CC) (Project base)
9. Study of transistor as an amplifier. (Project base)
10. Hands on activity on house wiring (Mini project work on simple house wiring involving one light point, one fan point, one power socket, one MCB on a wooden or ply board



4: Course Title :- BUILDING MATERIALS & CONSTRUCTION

1. Course Code :- Cv-302
2. Semester :- 3rd (Civil)
3. Course Objectives (CO s)

On completion of the course, the student will be able to:

- Explain the properties and requirements of all building materials.
- Supervise and implement painting works
- Layout properly the foundation of the building.
- Identify various components of buildings and their functions.
- Mark layout of building on ground.
- Explain the procedure for execution of various constructions activities.
- Check the various construction activities.
- Prepare checklist of operations for supervision of various construction activities.
- Identify & suggest rectification the various defects in civil engineering works.

Pre-Requisite:-

- Student should be able to read the building plans.
- Student should be able to think over the construction problems and their remedies.
- Student should know the basic properties of material being used in the construction of the building.

INTENDED LEARNING OUTCOME (ILO):

CHAPTER TITLE/ CO s	ILO s
Introduction	• Explain different types of building materials used in construction.
Stone and bricks	• Define Various classification of stones and bricks. • Explain Requirements of good building stone and bricks • Explain Different uses of stones and bricks • State Different field test and laboratory test on stones and bricks • Explain Manufacturing process of bricks.
Sand and mortars	• State Various functions of sand in mortar and concrete. • Define Characteristics of good sand for mortar and concrete. • Identify Zoning of sand, fineness modulus of sand and bulking of sand. • Explain Properties of mortar and proportions of cement-sand-mortar



Timber & Miscellaneous materials	• Different uses and characteristics of timber. • Different types of defects in timber. • Uses and brief introduction of various miscellaneous materials like- Steel, glass, aluminum, PVC, resins etc.
Painting and Varnishing	• Characteristics of good paint. • Various methods of painting. • Uses of varnishing
Foundation	• Definitions and purpose of foundation. • Different types of foundation. • Importance of foundation of a building.
Masonry	• Definitions and principles to be observed in brick masonry. • Different types of bonding in brick masonry and their uses. • Definitions of Stone masonry and types of stone masonry. • Comparison between brick masonry and stone masonry.
Doors & windows	• Various classification of doors and their uses at specific location. • Various classification of windows and their functions. • Definition and types of scaffolding.
Damp proofing and floors	• Sources of dampness and its effects. • Methods used for prevention of damping. • Different types of ground floor and various factors affecting selection of suitable type of floor.
Plastering and pointing	• Different types of plaster and pointing • Necessity of plaster and pointing • Defects of plaster.

4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
3		3	6



5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA	17/50	150	4
	TA	HA						
70	10	20		25	25			

6. Course content

Chapter no	Chapter Title	Content	Contact hrs.
1	Introduction	1.1 Different types of materials used in construction 1.2 Description of engineering materials	1
2	Stone& Bricks	2.1 Classification of rock (Physical & chemical); Requirements of good building stone; Dressing of stone; Testing of stone-Water absorption and Impact test on stone; Uses of stone 2.2 Composition of good brick earth, Classification of bricks; Properties of first class brick; Different field and laboratory test on brick; Conventional bricks; Standard bricks; Special bricks- fire clay brick, refractory brick, hollow blocks, fly ash bricks	7
3	Sand & Mortar	3.1 Functions of sand in mortar and concrete, Characteristics of good sand for mortar and concrete work; Grading of fine aggregates; Zoning of sand; fineness modulus of sand , bulking of sand, Effect of bulking of sand in volumetric proportion of mortar and concrete 3.2 Cement–sand –mortar; usual proportions and specific uses; Lime mortar; Composite mortar; Special mortar; properties of mortar	6

4	Timber & Miscellaneous materials	4.1 Use of timber, characteristics of good timber, defects in timber, plywood, particle board, veneer, sun mica, artificial timber, rubber wood 4.2 Use and brief introduction of (Steel, Glass, Aluminum, PVC, CPVC, PPF, Waterproofing and Termite proofing materials, Bonding agents, Epoxy resins, Polishing materials etc) related to civil engineering construction. 4.3 Object and use of false ceiling, materials for false ceiling, methods of providing false ceiling.	7
5	Painting & Varnishing	5.1 Object and characteristics of good paint, composition of oil bound paint base, filler, solvent & pigment, Method of painting 5.2 Object and uses of Varnishing, 5.3 Objects and method of white washing	6
6	Foundation	6.1 Site clearance, preparing job layout, layout of structure by center line and face line method 6.2 Excavation for foundation, timbering and strutting. 6.3 Definitions and purpose of foundation, Essential requirements of foundations ;Type of foundation-deep foundations and shallow foundations and their classifications.	6
7	Masonry	7.1 Definition, technical terms used in brick masonry, General principles to be observed in brick masonry, mortar, tools used in brick masonry Bonding, different types of bonding, their uses at specific locations 7.2 Stone masonry, technical terms used in stone masonry, mortar, tools used in stone masonry; Types of stone masonry-rubble masonry and ashlar masonry, their description with classification 7.3 Comparison between stone masonry and brick Masonry Hollow concrete block Masonry, composite masonry, Cavity wall- purpose and construction	6
8	Doors & Windows	8.1 Functions, locations, sizes of doors ; Classification of doors (description with sketches) and their uses at specific locations 8.2 Functions, locations, Sizes of windows; Classification of windows (description with sketches) and their uses at specific locations. 8.3 Definition and types of scaffolding, object of scaffolding	6



9	Damp proofing and floors	9.1 Definition of dampness, sources of dampness, effects of dampness 9.2 Methods used for prevention of dampness 9.3 Materials used for damp proofing 9.4 Damp proof course used for basement and at plinth, damp proofing of roofs 9.5 Ground floor-definition, different types of ground floors (name),description of concrete flooring, marble flooring 9.6 Factors affecting the selection of suitable type of floor	5
10	Plastering & pointing	a. Plastering – necessity of plastering, single coat plaster double coat plaster, special plasters, stucco plaster, Plaster board and wall claddings. Precaution to be taken while, Plastering. Defects in plaster. 10.2 Pointing – Necessity, types and procedure of pointing.	4
11	Revision/ Class test/ Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	6

7. Distribution of Marks/ Table of Specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short Questions/	
1	Introduction	1	----	1
2	Stone & Bricks	4	6	10
3	Sand & Mortar	2	6	8
4	Timber & Miscellaneous materials	3	6	9
5	Painting & Varnishing	3	5	8
6	Foundation	3	4	7
7	Masonry	3	5	8



8	Doors & Windows	2	5	7
9	Damp proofing and floors	2	5	7
10	Plastering & pointing	2	3	5
Total		25	45	70

9.0 Table of Specification for Theory(Building Materials and construction)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction to Building materials	1	2	1	1	-	-
2	Stones and Bricks	7	13	1	2	5	-
3	Sand and Mortars	6	11	1	3	5	-
4	Timber and Miscellaneous Materials	7	13	1	2	5	-
5	Painting and varnishing	6	11	1	2	5	-
6	Foundations	6	11	-	2	5	-
7	Masonry	6	11	2	1	6	-
8	Doors and Windows	6	11	2	1	5	
9	Damp Proofing and Floors	5	9	1	-	5	-
10	Plastering and pointing	4	8		1	4	
		$\Sigma b=54 \text{ hrs} + 6 \text{ hrs}$ internal assessment	100	10	15	45	-



10 .0 Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE/ SHORT ANSWER TYPE									ESSAY TYPE				
		K	C	A	T	K	C	A	H A	T	K	C	A	H A	T
1	Introduction to Building materials	1			1		1			1					
2	Stones and Bricks	1			1	1		1		2		5			5
3	Sand and Mortars		1		1	1	1	-		2			6		6
4	Timber and Miscellaneous Materials	1			1	1	-		-	1	-	3	3	0	6
5	Painting and varnishing	-	1		1	-	1	1		2	0	3	2		5
6	Foundations	1		-	1	-	1			1	2	3			5
7	Masonry	1			1		1	1		2	3	3			6
8	Doors and Windows	1			1	1	1	-		2			5		5
9	Damp Proofing and Floors	-	1		1		1			1			4		4
10	Plastering and pointing		1		1			1		1			3		3
					10					15					45

N.B.:- 1. The question pattern will be as per the instruction of SCTE or as per existing rules.

2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short

answer type

3. Optional question (if any) may be from the same topic in the form of either or type like below

Q:- Explain the necessity of plastering

Or

Explain the object of pointing

11.0 Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector, Smart board, Video etc for effective teaching learning process.

12.0 Text Books:-

<u>Name of books</u>	<u>Name of author</u>	<u>Edition</u>	<u>Name of the Publisher</u>
Construction Materials	D.N. Ghose		Tata McGraw-Hill
Building materials	Amarjit Agrawal		New India Publication
Building materials	S. K. Duggal		New Age International



Engineering materials	Sharma	PHI Publication
Building Construction	S. P. Arora and Bindra	Dhanpat Rai Publication
Building Construction	S. C. Rangawala	Charotar Publication
Building Construction	Sushil Kumar	Standard Publication
Building Materials & Construction	Saurabh Kr Soni	S K Kataria & Sons

Handbooks:

Sr. No.	Title	Author	Publisher
01	PWD Handbooks for -Materials - Masonry -Building -Plastering and Pointing - Foundation	AICTE	AICTE
02	Practical Civil Engineering Handbook	Khanna	Khanna Publication

BIS/ International Codes of Practice:

<u>Sl. No.</u>	<u>Title</u>
01	National Building Code
02	962-1973 Code of Architectural and Building Drawing

XXXXXXXXXXXXXXXXXXXXXXXXXXXX



4: Course Title :- BUILDING MATERIALS & CONSTRUCTION (PRACTICAL)

Total Contact Hr = 45 hrs.

Skills to be developed

INTELLECTUAL SKILLS

1. Identify the properties of building materials
2. Interpret the quality of materials
3. Interpret the test results
4. Follow the IS procedure of testing

MOTOR SKILLS

1. Measure the quantities accurately
2. Identify the instruments properly
3. Handle the equipment carefully.

LIST OF PRACTICAL

A. BRICK TEST

1. Determination of water absorption
2. Determination of compressive strength
3. Determination of efflorescence
4. Determination of dimension

B. STONE TEST

1. Determination of water absorption
2. Determination of impact value
3. Determination of specific gravity
4. Sieve analysis of coarse aggregate (Stone)

C. SAND TEST

1. Determination of bulking of sand
2. Determination of specific gravity
3. Determination of surface moisture
4. Determination of fineness modulus and zone by sieve analysis.

D. Visit of brick field nearby.

Note: Video cassettes or cd's of below experiments developed by NITTTR (if available) shall be shown to the students on T. V. / L.C.D. projector prior to the conductance of above experiments.

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5:Course Title :- WATER RESOURCE ENGINEERING

1. Course Code :- Cv-301
2. Semester :- 3rd (Civil)
3. Course Outcome (CO)

On completion of the course, the student will be able to:

- Define irrigation and its necessity
- Define delta, duty, base period and establish relation between them.
- Explain hydrological cycle and its importance
- Apply integrated approach to watershed
- Apply techniques of soil and water conservation in watershed management
- Use peoples participation in local watershed management and development
- Explain various head works in irrigation
- Guide in construction of dams

INTENDED LEARNING OUTCOME(ILO)

Sl.No.	Course outcomes/ CHAPTER	Intended Learning
1.	CO-1:Introduction Sources of water, Definition of irrigation, Necessity of irrigation, Advantages of irrigation, Types of irrigation, Brief description of each type of irrigation.	1. Explain the sources of water 2. Define irrigation. 3. Define Necessities of irrigation 4. State the advantages of irrigation 5. State the types of irrigation 6. Explain each type of irrigation.
2.	CO-2:Water requirements of crops Delta, Duty, Base period, Relationships of delta, duty and base period, numerical problem.	1. Explains the terms 'Delta', 'Duty' and 'Base period'. 2. Derive a relationship between delta, duty and base period. 3. Solve the numerical problems.

3.	CO-3:Definition of common terms Kor depth, Kor period, Crop ratio, outlet factor, Capacity factor, Cumec Day, GCA,CCA, Intensity of irrigation, Root-Zone-depth, Crop rotation.	1. Define the following- Kor depth, Kor period, Crop ratio, outlet factor, Capacity factor, Cumec Day, GCA,CCA, Intensity of irrigation, Root-Zone-depth, Crop rotation.
4.	CO-4: Hydrological cycles Importance of hydrological cycle, Measurement of precipitation by rain-gauges, Automatic and non - automatic gauges , types of precipitation, Computation of average rainfall over a basin , Factors affecting the run-off, characteristics of catchment surface,	1. Importance of hydrological cycle, 2. Measurement of precipitation by rain-gauges, 3. What are types of rain-gauge. 4. Explain the Automatic and non -automatic gauges 5. Types of precipitation, 6. Computation of average. 7. Define the term Runoff 8. What are Factors affecting the run-off 9. What are the characteristics of catchment surface. 10. Relationship between Rainfall and runoff.
5.	CO-5: Watershed management Introduction and definition of watershed management ,objectives of watershed management, concept of integrated watershed management, causes and prevention of soil erosion	1. Briefly describe the watershed management. 2. What are the objectives of watershed management? 3. What are concept of integrated watershed management? 4. Briefly explain the causes of soil erosion. 5. State the prevention of soil erosion.
6.	CO-6: Head works Component parts of a diversion head work and their	1. What are the Component parts of a diversion head work. 2. Briefly discuss the function of parts of a diversion head work.



	function. Selection site of a head work	3. Selection site of a head work
7.	CO-7: Weir section Weir section showing its different components, Function of Barrage	1. Define weir . 2. Weir section showing its different components. 3. Function of Barrage.
8.	CO-8: Gravity dam Forces acting on a gravity dam , selection of site of a gravity dam, classification of dams, sketch of a gravity dam showing its various components, causes of failure of gravity dam,Earthdam,causes of failure of earth dam and protection work against failure	1. Briefly discuss about the forces acting on a gravity dam. 2. Selection of site of a gravity dam. 3. Classification of dams 4. Sketch of a gravity dam showing its various components. 5. Causes of failure of gravity dam. 6. Define Earth dam. 7. Causes of failure of earth dam. 8. Protection work against failure.
9.	CO-9:Canals Classification of canal,briefly description of contour canal,Ridge canal and watershed canal,purpose of canal lining,types of lining	1. State the classification of canal. 2. Briefly description of contour canal. 3. State the Ridge canal. 4. State the watershed canal. 5. What are the purposes of canal lining. 6. State the types of lining.
10.	CO-10:Cross drainage works Definition, purposes of different cross drainage works with sketches	1. Definition 2. Purposes of different cross drainage works with sketches.
11.	CO-11: Water logging Definition of water logging, ILL effects of water logging,reclamation of waterlogged areas	1. Definition of water logging. 2. ILL effects of water logging. 3. Reclamation of waterlogged areas.



4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
4			4

5. Examination Scheme :

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th)	Credit
ESE	Sessional (SS)		33/100	PT	PA	-----	100	4
	TA	HA						
70	10	20		----	----			

6. Detail course content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction	➤ Sources of Water ➤ Definition of irrigation ➤ Necessity of irrigation ➤ Advantages of irrigation ➤ Types of irrigation ➤ Brief description of each type of irrigation	3
2	Water requirements of crops	➤ Delta ➤ Duty ➤ Base period ➤ Relationships of delta, duty and base period, numerical problems	5
3	Definition of common terms	➤ Kor depth ➤ Kor period ➤ Crop ratio ➤ Outlet factor	3



		➤ Capacity factor ➤ Cumec day ➤ GCA, ➤ CCA ➤ Intensity of irrigation ➤ Root-zone-depth ➤ Crop rotation	
4	Hydrological cycles	➤ Importance of hydrological cycle ➤ Measurement of precipitation by rain-gauges ➤ Automatic and non automatic gauges ➤ Types of precipitation ➤ Computation of average rainfall over a basin ➤ Runoff, factors affecting runoff ➤ Characteristics of catchment area ➤ Rainfall and runoff relationship	8
5	Watershed management	➤ Introduction and definition of watershed management ➤ Objectives of watershed management ➤ Concept of integrated watershed management ➤ Causes and prevention of soil erosion	8
6	Head works	➤ Component parts of a diversion head work and their function ➤ Selection site of a head work	5
7	Weir section	➤ Weir section showing its different components ➤ Function of barrage	2
8	Gravity dam	➤ Forces acting on a gravity dam ➤ Selection of site of a gravity dam ➤ Classification of dams ➤ Sketch of a gravity dam showing its various components ➤ Causes of failure of gravity dam ➤ Earth dam	10



		➤ Causes of failure of earth dam and protection work against failure	
9	Canals	➤ Classification of canal ➤ Brief description of contour canal, ridge canal and watershed canal ➤ Purpose of canal lining ➤ Types of lining	3
10	Cross drainage works	➤ Definition ➤ Purposes of different cross drainage works with sketches	3
11	Water logging	➤ Definition of water logging ➤ Ill effects of water logging ➤ Reclamation of waterlogged areas	3
12	Class test/Revision/Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	7

8. Distribution of Marks/ Table of Specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short Questions/ Descriptive questions	
1	Introduction	1	2	3
2	Water requirements of crops	2	5	7
3	Definition of common terms	2	3	5
4	Hydrological cycles	4	6	10
5	Watershed management	4	6	10



6	Head works and weir section	2	6	8
7	Gravity dam	4	8	12
8	Canals and cross drainage works	3	6	9
9	Water logging	3	3	6
		25	45	70

TABLE OF SPECIFICATIONS FOR THEORY

Sr. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
	Introduction	3	5				
	Water requirements of crops	5	8				
	Definition of common terms	3	5				
	Hydrological cycles	8	13				
	Watershed management	8	13				
	Head works	5	8				
	Weir section	2	4				
	Gravity dam	10	17				
	Canals	3	5				
	Cross drainage works	3	5				
	Water logging	3	5				
	Class test/Revision/Seminar	7	13				
	Total	$\Sigma b=60$	100				

K = Knowledge C = Comprehension A = Application
 HA = Higher Than Application (Analysis, Synthesis, Evaluation)

$$c = \frac{\text{-----}}{\Sigma b} \times 100$$



10. Details Table of Specification for Theory

Sl. no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1			1		2			2
2	Water requirements of crops	1		1	2	2		3		5
3	Definition of common terms	1		1	2		3			3
4	Hydrological cycles	1	1	2	4	2		4		6
5	Watershed management	1	2	1	4	2		4		6
6	Head works and weir section	1		1	2	2	4			6
7	Gravity dam	1	1	2	4	2	2	4		8
8	Canals and cross drainage works	1	1	1	3		3	3		6
9	Water logging	1	1	1	3			3		3
	Total				25					45

K = Knowledge C = Comprehension A = Application
 HA = Higher Than Application T = Total

- N.B.:- 1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type
3. Optional question (if any) may be from the same topic in the form of either or type like below

Q:- Define Duty Or Define Delta



11. Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector, Smart board, Video etc for effective teaching learning process .

12. Text books:

Name of author	Titles of the book	NAME OF PUBLISHER
S.K. Garg	Irrigation and hydraulic structure	Khanna publisher
B.C. Punmia	Irrigation engineering	Laxmi publication
S R Sahasrabudhe	Irrigation Engineering	S K Kataria& Sons
S R Sahasrabudhe	Water Resource Engineering	S K Kataria& Sons

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6: Course Title :- CIVIL ENGINEERING DRAWING

1. Course Code :- Cv-303

2. Semester :- 3rd (Civil)

3. Course Objectives (CO s)

On completion of the course, the student will be able to:

- Read, interpret and draw the building drawings.
- Prepare and submission drawings for the building.
- Prepare working drawings for the building.
- Plan various types of buildings considering the functional requirements.
- Apply the building rules, regulations and byelaws.

CO/ CHAPTER	Intended Learning Outcome (ILO)
CO-1 Read, interpret and draw the building drawings.	1. State the plan, elevation and section of a drawing 2. Explain the importance of drawing in Civil Engg 3. Symbol used in Civil Engg drawing 4. Importance of plan, elevation and section of drawing 5. Execution in field as per drawing
CO-2 Prepare submission drawings for the building.	Preparation and submission of drawing of 1. Partly paneled and partly glazed door 2. Fully paneled Door 3. battened and ledge door 4. Flush door 5. fully glazed window 6. fully paneled window 7. Steel framed glazed window. 8. King post, Queen post, steel truss, stair case
CO-3 Prepare working drawings for the building.	Preparation and submission of 1. Single and two storied residential building (Framed structure type) showing



	a. Plan b. Elevation c. Section d. Foundation plan e. Construction notes f. Site plan g. Area statement 2. Working drawing of above drawing sheet preferably one plan, section through stair case to scale 1:50 3. Pitched roofed residential building (Framed structure type) showing Plans, Elevation, Sections, Foundation Plan, construction notes, Schedule of openings, Site Plan, Area statement etc.
CO-4 Plan various types of buildings considering the functional requirements & CO-5 Apply the building rules, regulations and byelaws.	1. Importance and Principles of planning of Residential and Public building. 2. Hygienic condition of building 3. Standard size of various rooms 4. Building planning as per local building bye laws and its implementation 5. Explain the set back

4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
		6	6

5. Examination Scheme :

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (PT+ PA)	Credit
ESE	Sessional (SS)		-----	PT	PA	50/150	150	4
	TA	HA						
				100	50			



6. Course Contents :

Unit	Topic	Contact hour Th + Pr
1	Getting started: 1.1 importance of drawing (plan, elevation and section) 1.2 Symbols used in Civil Engineering Drawing	5
2	Submission of Drawing :Doors and Window 2.1 Partly paneled and partly glazed door 2.2 Fully paneled Door 2.3 battened and ledge door 2.4 Flush door 2.5 fully glazed window 2.6 fully paneled window 2.7 Steel framed glazed window.	10
3	Submission of Drawing :Roof Truss 3.1 King post, Queen post 3.2 Steel roof Truss	10
4	Planning of Building 4.1 Principles of planning of Residential and Public building. 4.2 Building planning as per local building bye laws and its implementation	10
5	Stair Case 5.1 Draw the plan and section of dog legged and straight stair case (teacher should only discuss other types of stair case as required for site specific condition)	5
6	Submission of Building Drawing 6.1 Draw a single and two storied residential building (Framed structure type) showing Plans , Elevation, Sections, Foundation Plan ,construction notes, Schedule of openings, Site Plan ,Area statement etc. Working drawing of above drawing sheet preferably one plan, section through	30



	stair case to scale 1:50 6.2 Draw a pitched roofed residential building (Framed structure type) showing Plans , Elevation, Sections, Foundation Plan ,construction notes, Schedule of openings, Site Plan ,Area statement etc. Working drawing of above drawing sheet preferably one plan, section to scale 1:50.	
7	8.1 Two point perspective view of a small object like pedestal, step block, small single storied building with flat roof etc.	10
8	Revision/ Class test/ Seminar Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	10

7. MARKS DISTRIBUTION: - *Question setter will try to set question from every chapter. Marks will be allotted logically as per weightage of the chapter.*

N.B.:- 1. The question pattern will be as per the instruction of SCTE or as per existing rules.

2. The objective type questions (if exists) may be in the form of multiple choice, fill up the blanks, true or false or
very short answer type

3. Optional question (if any) may be from the same topic in the form of either or type.

9.0 Table of Specification for Practical (Civil Engineering Drawing)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction to Building Drawing(Getting Started)	5	3	1	2	-	-
2	Doors and Windows	10	12	1	1	15	-
3	Roof Truss	10	12	1	1	15	-
4	Planning of	10	12	1	2	5	-

	Buildings						
5	Stair case	5	6	1	2	10	-
6	Building Drawing	30	33	-	-	30	-
7	Perspective View drawing.	10	12	2	5	-	5
		$\Sigma b=90$ hrs	100	7	13	75	5

11.0 Reference books

Text Books:-

Titles of the Book	Name of Authors	Edition	Name of the Publisher
Text Book of Building Drawing Shah, Kale,	Patki --		
Elements of Building Drawing	D. M. Mahajan --		
Planning and Design of Building.	Y. S. Sane --		
Civil Engineering Drawing	Malik & Mayo		New Asian Publishers, New Delhi

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7: Course Title :- PROFESSIONAL PRACTICE-I

1. Course Code :- Cv-310
2. Semester :- 3rd (Civil)
3. Rationale of the Subject/ Courses :-

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

Course Objective (CO s)

After completion of the course the Student will be able to:

- a) Acquire information from different sources.
- b) Prepare notes for given topic.
- c) Present given topic in a seminar.
- d) Interact with peers to share thoughts.
- e) Prepare a report on industrial visit, expert lecture.

INTENDED LEARNING OUTCOMES (ILO)

Sl.No.	Course outcomes	Indented Learning Outcome
1.	CO-1: Acquire information from different sources	1. Identify the different sources to be visited for knowledge hunting from Civil Engg point of view. 2. State the importance of the source 3. Collect the required information from the source 4. Discuss the details of the source 5. Prepare a report on the source.
2.	CO-2: Prepare notes for given topic.	1. Identification of an important topic 2. Group discussion 3. Note preparation on that topic



3.	CO-3: Present given topic in a seminar	1. State the importance of seminar 2. Preparation of lecture by PPT 3. Fluency in communication 4. Presentation of any topic in front of audiences
4.	CO-4: Interact with peers to share thoughts.	1. Explain the importance of interaction 2. Explain of brain storming 3. Advantage of brain storming. 4. State importance of sharing thoughts
5	CO-5 Prepare a report on industrial visit, expert lecture.	1. Importance of industry institute interaction 2. State relation between industry and technology 3. Structured visit of important industry 4. Acquiring knowledge from expert lecture. 5. Report preparation on brick factory, cement factory etc.

4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
1		2	2

5. Examination Scheme :-

Theory		Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (PT+ PA)	Credit
ESE	Sessional (SS)	-----	PT	PA	17/50	50	2
	TA HA						
			25	25			



6. Course Content

UNIT	TOPIC/ACTIVITIES	CONTACT HRS
1	Industrial visit : Structured industrial visit shall be arranged and report of the same should be submitted by individual student (Any two of the following) 1.1 Nearby Brick manufacturing plant 1.2 Nearby Cement factory 1.3 Nearby irrigation project 1.4 Nearby stone query 1.5 Any other relevant industry/ factory as decided by teachers	10
2	Guest Lectures : Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized from any TWO of the following areas: 2.1 Recent development of building materials 2.2 Firefighting/ Safety precautions/ First aid 2.3 Computer Networking and Security 2.4 Career opportunities. 2.5 Any other topic as decided by concerned teacher	6
3	Group discussion: The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are - 3.1 Current topic related to Civil Engg 3.2 The role of student in the progress of the nation 3.3 Use of internet/ mobile 3.4 Any other relevant topic selected by teaches.	6
4	Student Activities : The students in a group of 3 to 4 will perform any one of the following activities and same will be presented in seminar	8



	4.1 Market survey of building materials 4.2 Study of availability of local construction materials 4.3 Study of locally available timbers 4.4 Any other relevant field selected by teachers	

Remarks

1. The proposed syllabus is the outcome of team work
2. The proposed syllabus has been prepared as per the instructions obtained from the higher authority time to time.

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FOURTH SEMESTER CIVIL ENGINEERING BRANCH



COURSE STRUCTURE OF CIVIL ENGINEERING 4TH SEMESTER

Subject Code	Subject	Study Scheme (contact hour/week)			Evaluation Scheme								Total Mark (Th+Pr)	Credit
					Theory					Practical				
		L	T	P	ESE	Sessional (SS)			Pass (ESE+S S)	PT	PA	Pass mark(PT+ PA)		
						TA	HA	Total(TA +HA)						
CV-401	Surveying	3		3	70	10	20	30	33	25	25	17	150	4
CV-402	Structural Mechanics	3			70	10	20	30	33				100	3
CV-403	Hydraulics	3		3	70	10	20	30	33	25	25	17	150	4
CV-404	Estimating-I	3			70	10	20	30	33				100	3
CV-405	Computer Aided Drafting & Drawing			6						100	50	50	150	4
CV-406	Concrete Technology	3		3	70	10	20	30	33	25	25	17	150	5
CV-410	Professional Practice-II	1		2						25	25	17	50	2
Total		16		17										
		33			Grand Total =								850	25

Variations :- New subject Concrete Technology has been added in place of Water Resource Engg. Civil Engineering Drawing-II has been renamed as Computer Aided Drafting & drawing as because some topics related to the Computer Aided Design has been proposed in new syllabus. Content of almost all subjects have been modified.

Important:-Evaluation Process for the subject Computer Aided Drafting & Drawing (Cv-405) :- Students will be evaluated through continuous process by entrusting some practical work related to CAD. For evaluation of theory Knowledge seminar may be conducted. Evaluation shall be done at Institute level. No question paper will be set by SCTE.



1: Course Title: - SURVEYING

1. Course Code :- CV-401
2. Semester :- 4th (Civil)
3. Course Outcome (CO)

On completion of the course, the student will be able to:

- Use the surveying instrument.
- Take linear and angular measurement.
- Measure the area of land.
- Prepare lay out and maps and Set out alignment for roads, railways, canal, tunnels, pipelines, etc.
- Use the surveying instrument like theodolite and plane table.

CO/ CHAPTER	Intended Learning Objectives (ILO)
CO-1 Use the surveying instrument.	1. Define surveying 2. Explain the objective and classification of survey 3. State the principles of surveying 4. Measuring distances by various methods 5. Familiar with different surveying instruments 6. Solving numerical problems
CO-2 Take linear and angular measurement	1. Direct measurement- Pacing, Passometer, Pedometer, Odometer, Speedometer, Perambulator, Chain and Tape 2. State types of chain and testing of chain. 3. Errors due to incorrect chain. 4. Indirect measurement- basic idea of tachometry, electronic distance measurement (EDM). 5. Ranging- direct and indirect ranging. Chaining on sloping ground. 6. Use of compass in surveying 7. Measurement of bearings of a line by compass 8. Traversing by compass 9. Detection and correction of local attraction
CO-3 Measure the area of land.	1. State the area of land 2. Measure the area of land after traversing by

	chain and compass
CO-4 Prepare lay out and maps and Set out alignment for roads, railways, canal, tunnels, pipelines, etc.	1. Preparation of lay out and maps of any project or location 2. Alignment for roads 3. Alignment for canal 4. Alignment for tunnel and pipelines
CO-5 Set up and perform plane table survey	1. Explain of plane table and its accessories 2. Set up the plane table in the field 3. State the Methods of plane table survey 4. Perform Two point and three point problem 5. Explain the Advantages and disadvantages of plane table survey

Pre-requisite:-

- Student should be perfect in drawing and sketching.

4. Teaching Scheme (in hours/week) ;

Lecture	Tutorial	Practical	Total
3		3	6

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA	17/50	150	4
	TA	HA						
70	10	20		25	25			

6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction and overview	➤ Definition and objectives of survey. ➤ Primary division of survey. ➤ Principle of surveying ➤ Classification of surveying ➤ Work of a surveyor	2



2	Measurement of distances	➤ Direct measurement- Pacing, Passometer, Pedometer, Odometer, Speedometer, Perambulator, Chain and Tape ➤ Different types of chain and testing of chain. ➤ Instrument for chaining ➤ Errors due to incorrect chain. ➤ Indirect measurement- basic idea of tachometry, electronic distance measurement (EDM). ➤ Ranging- direct and indirect ranging. Chaining on sloping ground. ➤ Numerical problems related to above problems.	5
3	Chain survey	➤ Basic concept, survey stations, survey lines. ➤ Offsets and number of offsets for locating details ➤ Instruments for setting right angles ➤ Obstacles in chaining, numerical problems ➤ Field book and making entries into a field book and plotting ➤ Computation of area.	6
4	Compass survey	➤ Basic concept, compass and their types and their comparisons. ➤ Open and closed traverse. ➤ Meridians and bearings, designation of bearings, fore and back bearings, numerical problems. ➤ Local attraction and numerical problems related to it. ➤ Methods of traversing with chain and compass, plotting ➤ Closing error and balancing of traverse. ➤ Magnetic declination, agonic and isogonic lines and variations of magnetic declination, dip of the needle, numerical problems.	8
5	Levelling	➤ Definition and terminology ➤ Leveling instruments, modern leveling instruments- a) Automatic level	10

		b) Digital level c) Leveling staff ➤ Temporary adjustment of levels ➤ Basic leveling operation and terminology ➤ Reduced levels and booking of entries in a level page book. ➤ Different methods to determine the reduce level of stations. ➤ Different methods of leveling- a) Fly leveling b) Profile leveling c) Cross sectioning d) Reciprocal leveling ➤ Curvature and refraction error in leveling, dip of horizon, numerical problems	
6	Plane table survey	➤ Principle of plane table and features of its accessories ➤ Setting up the plane table in the field ➤ Methods of plane table survey ➤ Two point and three point problem ➤ Advantages and disadvantages of plane table survey	
7	Revision/ Class test/ Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	6

8. Distribution of Marks / Table of specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Shot/Descriptive Questions	
1	Introduction and overview	2		2
2	Measurement of distances	4	5	9
3	Chain survey	5	6	11
4	Compass survey	5	7	12
5	Levelling	5	15	20
6	Plane table	4	12	16
Total		25	45	70

9. TIME ALLOTMENT TABLE

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction and overview	2	5				-
2	Measurement of distance	5	12				-
3	Chain survey	6	14				-
4	Compass Survey	8	18				-
5	Levelling	10	23				-
6	Plane table	6	14				-
7	Internal assessment	6	14				-
		$\Sigma b=37$ hrs+ 6hrs internal assessment	100				-

10. MARKS DISTRIBUTION TABLE

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction and overview	1	1		2					
2	Measurement of distance	2	2		4	2		3		5
3	Chain survey	2	2	1	5	2		4		6
4	Compass Survey	2	1	2	5	2	2	3	-	7
5	Levelling	1	1	3	5	3	5	7		15
6	Plane table	1		3	4	3	3	6		12
7	Internal assessment									
					25					45

K = knowledge; C= comprehension; A= Application; HA= Higher than application

11. Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector ,Smart board, Video etc for effective teaching learning process .

12. Text books:

Titles of the book	Name of author	NAME OF PUBLISHER
Surveying and leveling Part I & II	T.P.Kanetkar and S.V. Kulkarni	Pune Vidyarthi Griha Prakashan
Surveying and leveling Vol. I & II	Dr. B.C. Punmia	Laxmi Publication
Plane Surveying	A.M.Chandra	New Age International Publishers
Surveying and Levelling	N.N.BASAK	Tata McGraw-Hill
Text book of surveying	S.K.Husain, M.S. Nagaraj	S. Chand and company

Surveying and levelling vol. I and II	S. K. Duggal	TATA MC GRAW-HILL

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type.

N.B:- Optional question may be of same topic in the form of either or type like below

Q no:- Explain briefly the two point problem

Or

Explain briefly the three point problem

XXXXXXXXXXXXXXXXXXXXXXX



Name of course: SURVEYING PRACTICAL

Course code: Cv-401(P)

Duration: 45 hrs.

Teaching scheme

Practical: 3 hrs/week

Practical: 0 hrs/week

Semester: 4th

Maximum Marks: 50

Examination scheme:

Internal assessment: 25 Marks

Practical /viva: 25 Marks

SKILLS TO BE DEVELOPED:

➤ *INTELLECTUAL SKILLS:*

- 1) Identify the different instruments for linear measurement and levelling
- 2) Record and observing necessary observation with the survey instruments
- 3) Classify and discriminating various types of survey instruments.
- 4) Identify the errors of the survey instruments.

MOTOR SKILLS:

1. Measure distances, bearings and finding reduced levels with survey instruments.
2. Prepare drawing using survey data.
3. Prepare traverse of a given terrain/topography.
4. Prepare a level book and calculate the RL of points.

➤ **Instructions:**

- 1) Group size for survey practical work should be maximum 6 students.
- 2) Each student from a group should handle the instrument independently to understand the function of different components and use of the instrument.
- 3) Drawing, plotting should be considered as part of practical.
- 4) One full day per project is required for carrying out project work.

Pre-requisite:-

Student should be perfect in drawing and sketching

Detail course content

Unit	Topic	Hour
1.	Measurement of distance with chain and tape on ground with direct or indirect ranging. Measurement with EDM.	03
2.	Construction & use of optical square & open cross for setting out perpendicular & running survey line for locating details.	03
3	Preparation of chain survey map of a small area available within the campus/vicinity of the institute	06
4	Study of prismatic compass, setting the compass and measuring bearing of lines. Determining angle between two lines.	06



5	Prismatic compass traversing including plotting the traverse and showing graphical adjustment. Use of dumpy level, temporary adjustment of level, taking staff readings, recording records in a level page book	12
6	Longitudinal section including plotting of profile leveling.	06
7	Use of auto level & taking observation.	03
8	Direct and indirect contouring in two separate sheets including sectional views.	06

Note: Video cassettes or cd's of above experiments developed by NITTTR (if available) shall be shown to the students on T. V. / L.C.D. projector prior to the Conductance of above experiments.

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2: Course Title :- STRUCTURAL MECHANICS

1. Course Code :- CV-402
2. Semester :- 4th (Civil)
3. Course Objectives (CO)

After completion of the course the students will be able to:-

- CO1:-** Recognize the concept of one and two dimensional simple and compound stress and strain.
- CO2:-** Identify the stress developed in beams due to forces applied.
- CO3:-** Analyze the slope and deflection of beams.
- CO4:-** Calculate bending moments and shear force and draw SFD and BMD.
- CO5:-** Analyze the columns and struts.
- CO6:-** Analyze the truss.
- CO7:-** Analyze the stability of dam and retaining walls.

Course Outcomes (COs)	Intended Learning Outcomes(ILOs)
CO-1 Recognize the concept of one and two dimensional simple and compound stress and strain.	1. Define stress, strain, Poison's ratio 2. State Hook's law 3. Elastic constants and their relationship 4. Composite sections 5. Effects of temperature on stresses 6. Numerical problems related to the above topics
CO-2 Identify the stress developed in beams due to forces applied.	1. Theory of simple bending 2. Calculating Section modulus for various sections 3. Flitched beam for symmetrical section 4. Formula of Bending stresses in beams- I section and T section 5. Numerical problems related to the above topics
CO-3 Analyze the slope and deflection of beams.	1. Finding Slope and deflection of simply supported beam and cantilever beam 2. Numerical problems related to the above topics
CO-4 Calculate bending moments and shear force and draw SFD and BMD.	1. Different Types of beams and loads(udl and point loads) 2. Definitions of shear force and bending moment and their sign conventions, point of contra flexure and location of maximum bending moment 3. Drawing SFD and BMD for udl and point load for a. Simply supported beam b. Cantilever beam c. Overhanging beam 4. Numerical problems related to the above topics



CO-5 Analyze the columns and struts.	1. Define Long columns and short columns, slenderness ratio, effective length for different end condition 2. Define Buckling load or crippling load 3. Deduce Euler's formula for crippling load and assumptions for Euler's formula 4. Deduce Rankine's formula for long columns 5. Numerical problems related to the above topics
CO-6 Analyze the truss.	1. Different types of truss 2. Analysis of perfect frame by method of joint 3. Numerical problems related to the above topics
CO-7 Analyze the stability of dam and retaining walls.	1. Different forces acting on dam and retaining wall 2. Calculation of stress at the base of dams and retaining walls 3. Analyzing the stability of dam 4. Numerical problems related to the above topics

Pre-requisite:-

Student should be perfect in engineering mechanics

4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
3			3

5. Examination Scheme :

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100				100	3

6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Simple stresses and strains	➤ Definition of stress, strains. - Poisson's ratio ➤ Hook's law ➤ Elastic constants and their relationship(no deduction is required)	4



		➤ Composite sections ➤ Temperature stresses ➤ Numerical problems related to the above topics	
2	Shear force and bending moments	➤ Types of beams and loads(u.d.l. and point loads) ➤ Definitions of shear force and bending moment and their sign conventions, point of contra flexure and location of maximum bending moment ➤ SFD and BMD for udl and point load for - Simply supported beam - Cantilever beam - Overhanging beam ➤ Numerical problems related to the above topics	8
3	Stresses in beams	➤ Theory of simple bending ➤ Section modulus for various sections ➤ Flitched beam for symmetrical section ➤ Bending stresses in beams- I section and T section(no deduction) ➤ Numerical problems related to the above topics	5
4	Slopes and deflection of beams	➤ Slopes and deflections of simply supported beam and cantilever beam (no deduction) ➤ Numerical problems related to the above topics	4
5	Column and struts	➤ Long columns and short columns, slenderness ratio, effective length for different end condition ➤ Buckling load or crippling load ➤ Euler's formula for crippling load and assumptions for Euler's formula	6



		➤ Rankine's formula for long columns ➤ Numerical problems related to the above topics	
6	Analysis of truss	➤ Types of truss ➤ Analysis of perfect frame by method of joint ➤ Numerical problems related to the above topics	6
7	Dams and retaining walls	➤ Forces acting on dam and retaining wall (having vertical face towards soil fill with no surcharge load) ➤ Calculation of stress at the base of dams and retaining walls ➤ Stability analysis of dams ➤ Numerical problems (Simple) related to the above topics	6
8	Class test	➤ Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	6

7. Distribution of Marks/ Table of specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/ Descriptive Questions	
1	Simple stresses and strains	3	5	8
2	Shear force and bending moments	5	8	13
3	Stresses in beams	3	7	10
4	Slopes and deflection of beams	4	6	10
5	Column and struts	3	6	9

6	Analysis of truss	3	7	10
7	Dams and retaining walls	4	6	10
Total		25	45	70

9.0 TIME ALLOTMENT TABLE

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Simple stresses and strains	4	10				-
2	Shear force and bending moments	8	17				-
3	Stresses in beams	5	11				-
4	Slopes and deflection of beams	4	10				-
5	Column and struts	6	13				-
6	Analysis of truss	6	13				-
7	Dams and retaining walls	6	13				-
8	Internal assessment	6	13				
		$\Sigma b = 45$	100				-

10.0 MARKS DISTRIBUTION TABLE

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Simple stresses and strains	1	-	-	1	1	2	2		5
2	Shear force and bending moments	1	1	2	4	2	3	3		8
3	Stresses in beams	1	-	2	3	2	2	3		7
4	Slopes and deflection of beams	1	1	2	4	-	3	3		6
5	Column and struts	1	2	1	4	2	-	4		6
6	Analysis of truss	1	2	2	5	2	2	3		7
7	Dams and retaining walls	1	2	1	4	-	2	4		6
8	Internal assessment									
					25					45

K = knowledge; C= comprehension; A= Application; HA= Higher than application

- 11 . Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector, Smart board, Video etc for effective teaching learning process .



12 Text books:

Titles of the book	Name of author	NAME OF PUBLISHER
Strength of materials	S. Ramamuratham& R. Narayan	Dhanpatrai& Sons
Structural Mechanics	A K Upadhyay	S K Kataria& Sons
Structural Mechanics	R S Khurmi	S. Chand & Company Delhi
Strength of materials	M. Chakraborty	S K Kataria& Sons
Mechanics of Structures volume –I & II	S. B. Junnarkar	Charotar Publishing House, Anand
Strength of Materials	F. L. Singer	Harpe Collins Publishers India ,Delhi

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.

2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

N.B:- Optional question may be from the same topic in the form of either or type like below

Q no:- Define stress and strain
Or
Define Poisson's ratio.

XXXXXXXXXXXXXXXXXXXXXXX



3: Course Title :- HYDRAULICS

1. Course Code :- CV-403

2. Semester :- 4th (Civil)

3. Course Objectives (CO)

On completion of the course, the student will be able to:

- To define the properties of various fluids .
- To name different types of pressures and various pressure measuring devices.
- To calculate hydrostatic forces and pressure on plane surfaces immersed in water.
- To explain types of forces, energy and application of Bernoulli's theorem.
- To describe different types of Orifices and Mouthpieces and to derive discharge formulae and their practical applications.
- To state the different losses of head of flowing liquids in pipes and their equations.
- To describe different types of Notches and Weirs, and deriving the discharge formulas and their Practical applications.
- To describe different types of Channels and their discharge formulas and to determine the condition for maximum discharge
- To explain the construction details, specifications and efficiencies of Reciprocating Pumps and Centrifugal Pumps.

Course Outcome (CO)	Intended Learning outcome (ILO)
CO-1 To define the properties of various fluids	ILOs 1. Define Mass, force, weight ,volume, specific gravity, specific weight, density, relative density, compressibility, viscosity, cohesion, adhesion, capillarity and surface tension, SI Units for area, volume, velocity, acceleration, density, discharge, force, pressure and power.
CO-2 To name different types of pressures and various pressure measuring devices	1 . List out of different pressure measuring instrument 2. State the relation between atmospheric pressure, gauge pressure and vacuum pressure
CO-3 To calculate hydrostatic forces and pressure on plane surfaces immersed in water	1. State the intensity of pressure 2. Conversion from intensity of pressure to pressure head 3 . Measurement of pressure by pressure measuring instrument 4 . Measuring of pressure in horizontal, vertical and inclined plane.
CO-4 To explain types of forces, energy and application of Bernoulli's theorem.	1 . Define laminar flow, turbulent flow, steady flow, unsteady flow, uniform and non uniform flow. 2 . Define continuity of equation and Bernoulli's theorem

	3. State potential, kinetic and pressure energy of liquid 4. Use of venturimeter and pitot tube
CO-5 To describe different types of Orifices and Mouthpieces and to derive discharge formulae and their practical applications	1 . State different types of orifice, vena contracta, hydraulic coefficient. 2 . State the different discharge formula 3. Solving of numerical problems
CO-6 To state the different losses of head of flowing liquids in pipes and their equations	1 . State the different losses in pipe flow 2. Measurement of minor and major losses in pipe flow 3. State Darcy's and Chezy's equation 4. Solving of numerical problems.
CO-7 To describe different types of Notches and Weirs, and deriving the discharge formulas and their Practical applications.	1. Define various types of notches and weirs. 2. Derivation of equation of discharge formula by various notches and weirs 3. Solving of numerical problems.
CO-8 To describe different types of Channels and their discharge formulas and to determine the condition for maximum discharge	1. Definition and Classification of Rectangular and Trapezoidal channels 2. Discharge by Chezy's formula, Bazin's formula and Manning's formula. 3. Importance of Hydraulic mean depth 4. Condition for maximum discharge 5. Solving of numerical problems

4. Teaching Scheme (in hours/week) Total contact hours : L 45 hrs. T 15 hrs. P 45 hrs.

Lecture	Tutorial	Practical	Total
3		3	6

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	4

6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction	Hydraulics – Definition - Properties of fluids - Mass, force, weight ,volume, specific gravity, specific weight,	4

		density, relative density, compressibility, viscosity, cohesion, adhesion, capillarity and surface tension, SI Units for area, volume, velocity, acceleration, density, discharge, force, pressure and power.	
2	Measurement of Pressure	Pressure of liquid – Intensity of pressure - Pressure head of liquid, Conversion from intensity of pressure to pressure head and vice-versa, Formula and Simple problems. Types of pressures – Atmospheric pressure, Gauge pressure, Vacuum pressure and Absolute pressure . Measurement of pressure - Simple mercury Barometer, Pressure measuring devices, Piezometer tube , Simple U-tube manometer , Differential manometer – Micrometer. Simple numerical problems. Pressure on plane surfaces - Horizontal, vertical and inclined surfaces-Total pressure-Centre of pressure - Depth of centre of pressure – Resultant pressure Numerical Problems	6
3	Flow of fluids	Types of flow – Laminar and turbulent flow - Steady and unsteady flow –Uniform and Non-uniform flow - Equation for continuity of flow (law of conservation of mass) – Energy possessed by a fluid body – Potential energy and Potential Head – Pressure energy and Pressure Head - Kinetic Energy and Kinetic Head - Total Energy and Total Head –Bernoulli's theorem – (Proof not necessary) . Practical applications of Bernoulli's theorem – Venturi meter – Orifice meter (Derivation not necessary) - Simple numerical problems. FLOW THROUGH ORIFICES AND MOUTHPIECES Definitions- Types of orifices - Vena contracta and its significance –Hydraulic coefficients Cd, Cv and Cc and their relationship. Simple problems. Large orifice – Definition and Discharge formula – Simple problems – Practical applications of orifices – Types of mouthpieces - External and internal mouthpieces - Discharge formula - Simple problems. FLOW THROUGH PIPES Losses of head in pipes – Major losses - Minor losses - Sudden enlargement, sudden contraction, obstruction in pipes (no proof is necessary) -Simple problems – Energy / Head losses of flowing fluid due to friction Darcy's equation - Chezy's equation (No derivation) – Numerical Problems - Transmission of power through pipes – Efficiency - Pipes in parallel connected to reservoir - Discharge formula - Simple problems. FLOW THROUGH NOTCHES Definitions- Types of notches – Rectangular, Triangular and Trapezoidal notches – Derivation of equations for discharges - Simple problems - Comparison of V-Notch and Rectangular Notch.	16

		FLOW THROUGH WEIRS Definitions - Classification of weirs - Discharge over a rectangular weir and trapezoidal weir – Derivation – Simple problems – End contractions of a weir – Franci's and Bazin's formula – Simple problems - Cippoletti weir –Problems - Narrow crested weir – Sharp crested weir with free over fall - Broad crested weir - Drowned or Submerged weirs - Suppressed weir -Stepped weir – Problems - Definition of terms - Crest of sill, Nappe or Vein,	
4	Flow through Open channel	Definition - Classification - Rectangular and Trapezoidal channels –Discharge – Chezy's formula, Bazin's formula and Manning's formula. Hydraulic mean depth – Problems Conditions of rectangular/trapezoidal sections - Specific energy, critical depth –Conditions of maximum discharge and maximum velocity - Numerical Problems Methods of measurements of velocities – Channel losses - Lining of canals – Advantages of lining of canals - Types of lining- Cement concrete lining with sketches	6
5	Pumps	8.1 Pumps – Definition and types. Centrifugal pump – component parts and their functions, principle of working, priming. Reciprocating pump – component parts and working.Submersible and Jet pump. Selection and choice of pump.Computation of power required for pumps.Turbines – Definition and types.	5
6	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	8

7. Distribution of Marks/ Table of Specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/ Descriptive Questions	
1	Introduction	3	-	3
2	Measurement of Pressure	6	6	12
3	Flow of fluids	7	24	31
4	Flow through open channel	5	10	15
5	Pumps	4	5	9
Total		25	45	70



9.0 TIME ALLOTMENT TABLE

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	4	9				-
2	Measurement of Pressure	6	13				-
3	Flow of fluids	16	36				-
4	Flow through Open channel	6	13				-
5	Pumps	5	11				-
6	Internal assessment	8	18				-
		$\Sigma b = 45$	100				-

10.0 MARKS DISTRIBUTION TABLE

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1	1	2	4	-	-	-		-
2	Measurement of Pressure	1	2	3	6	2	1	3		6
3	Flow of fluids	2	2	2	6	6	6	12		24
4	Flow through Open channel	1	2	2	5	2	3	5		10
5	Pumps	1	1	2	4	-	2	3		5
6	Internal assessment									
					25					45

K = knowledge; C= comprehension; A= Application; HA= Higher than application

11.0 Suggested Implementation Strategies:- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process .

12.0 Suggested Learning Resource :-

12.1 Book list

1. Dr. Jagadish Lal - Hydraulics, Fluid Mechanics and Hydraulic Machines-Metropolitan Book Company- New Delhi

2. P.N. Modi & S.M. Sethi - Fluid Mechanics - Standard Publishers – New Delhi

3. S. Ramamirtham-Hydraulics, Fluid Mechanics and Hydraulic Machines- Dhanpat Rai & Sons, New Delhi

4. K.L. Kumar - Fluid Mechanics – Eurasia Publishing House – New Delhi

5. R.K. Bansal - Fluid Mechanics - Lakshmi Publications

6. Prof. S. Nagarathinam - Fluid Mechanics - Khanna Publishers – New Delhi

7. K.R. Arora - Hydraulics, Fluid Mechanics and Hydraulic Machines – Standard Publishers & Distributors, New Delhi



8. B C S Rao, “Fluid Mechanics and Machinery” Tata-McGraw-Hill Pvt. Ltd., New Delhi
9. Different related Journals/ manuals shall be referred.

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
 2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type
- N.B:- Optional question may be of same topic in the form of either or type like below

Q no:- Differentiate between uniform flow and non uniform flow

Or

Differentiate between laminar flow and turbulent flow.

XXXXXXXXXXXXXXXXXXXXXXXXXXXX



Course Title :- HYDRAULICS (PRACTICAL)

Contact hrs:- 45

Practical to be performed: 08 (Any eight)

SKILLS TO BE DEVELOPED

INTELLECTUAL SKILLS:

- a. Identify the different instruments/ equipment
- b. Interpret test results
- c. Calculate quantities of parameters
- d. Draw graphs

MOTOR SKILLS:

- a. Operate different equipment properly.
 - b. Measure different parameters accurately
 - c. Adjust levels by operating and controlling valves
1. Measurements of pressure and pressure head by Piezometer, U-tube manometer
 2. Measurement of pressure difference by U-tube differential manometer.
 3. Verification of Bernoulli's theorem
 4. Reynolds experiment to study types of flow.
 5. Determination of Darcy's friction factor for given pipe.
 6. Determination of Minor losses pipes (any two)
 7. Demonstration of Hydraulic jump
 8. Determination of coefficient of discharge for given rectangular or triangular notch.
 9. Determination of coefficient of discharge for a given Venturimeter.
 10. Demonstration and use of Pitot tube and current meter.
 11. Determination of hydraulic coefficients for sharp edge orifice.
 12. Study of a model of centrifugal and reciprocating pump.

Note: video cassettes or cd's of above experiments developed by NITTTR (if available) shall be shown to the students on T. V. / L.C.D. projector prior to the conductance of above experiments.

XXXXXXXXXXXXXXXXXXXXX



4: Course Title :- ESTIMATING-I

1. Course Code :- CV-404
2. Semester :-4th (Civil)
3. Objective of the Subject/ Courses :-
On completion of the course, the student will be able to
 - Calculate the approximate cost of civil structure
 - Take measurement of civil engineering work
 - Know about various types of estimates.
 - Calculate different items of work of a building.
 - Calculate approximate cost different item of services.

INTENDED LEARNING OUTCOME (ILO)

SUBJECT NAME: ESTIMATING-I
SUBJECT CODE: CV-404

CHAPTER TITLE	After the completion of the chapter, the students will learn
Introduction	➤ Definition of Estimating and purpose of estimating. ➤ Units of measurement of different items of works. ➤ Rate of payments of different items of works.
Types of estimates	➤ Primary division of estimates ➤ Different types of rough estimates ➤ Different types of detailed estimate ➤ Bill of quantities
Method of building estimate	➤ Center line and long wall and short wall method with example
Different items of work	➤ Calculation of quantity of materials of different items of works viz. cement concrete work, timber work for frame, shutter and trusses, plastering, painting and flooring
Sanitary and plumbing	➤ Unit of measurement and method of estimating sanitary fittings and plumbing works in residential buildings. ➤ Estimate of septic tank.
Estimate of RCC items of works	➤ Estimation of beams, columns and slab showing bar bending schedule ➤ Bar bending schedule for reinforcement calculation in standard Performa. ➤ Calculation of quantity of shuttering for different items of RCC work.



Pre-requisite:-

Student should have basic knowledge about area, volume of objects.

4. Teaching Scheme (in hours/week) Total contact hours : 45 hrs.

Lecture	Tutorial	Practical	Total
3			3

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th)	Credit
ESE	Sessional (SS)		33/100	PT	PA		100	3
	TA	HA						
70	10	20						

6. Detail course content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction	➤ Definition of Estimating and purpose of estimating. ➤ Units of measurement of different items of works. ➤ Rate of payments of different items of works.	3
2	Types of estimates	➤ Primary division of estimates a. Detailed estimate b. Rough estimate ➤ Different types of rough estimates d. Plinth area estimates e. Carpet area estimate f. Cube rate estimate ➤ Different types of detailed estimate a. Detailed estimate b. Revised estimate c. Supplementary estimate d. Annual repair estimate ➤ Bill of quantities	6
3	Method of building estimate	➤ Center line and long wall and short wall method with example (considering isolated footing or combined footing)	8

4	Different items of work	➤ Calculation of quantity of materials of different items of works viz. a. Cement concrete work b. Timber work for frame, shutter and trusses c. Plastering d. Painting e. flooring	10
5	Sanitary and plumbing	➤ Unit of measurement and method of estimating sanitary fittings and plumbing works in residential buildings. ➤ Estimate of septic tank.	4
6	Estimate of RCC items of works	➤ Beams ➤ Columns ➤ Slab showing bar bending schedule ➤ Bar bending schedule for reinforcement calculation in standard Performa. ➤ Calculation of quantity of shuttering for different items of RCC work.	8
7	Revision/Class test/Seminar	➤ Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	6

7. Distribution of marks/ Table of specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/ Descriptive Questions	
1	Introduction	3		3
2	Types of estimates	5	7	12
3	Method of building estimate	5	12	17
4	Different items of work	4	10	14
5	Sanitary and plumbing	3	6	9

6	Estimate of RCC items of works	5	10	15
Total		25	45	70

9.0 TIME ALLOTMENT TABLE

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	3	7				-
2	Types of estimates	6	13				-
3	Method of building estimate	8	18				-
4	Different items of work	10	22				-
5	Sanitary and plumbing	4	9				-
6	Estimate of RCC items of works	8	18				-
7	Internal assessment	6	13				-
		$\Sigma b = 45$	100				-

10.0 MARKS DISTRIBUTION TABLE

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1	2	1	4	-	-	-		-
2	Types of estimates	1	2	2	5	2	2	3		7
3	Method of building estimate	2	1	2	5	2	2	8		12
4	Different items of work	2	2	1	5	3	3	4		10
5	Sanitary and plumbing	1	-	-	1	1	2	3		6
6	Estimate of RCC items of works	-	2	3	5	2	3	5		10
7	Internal assessment									
					25					45

K = knowledge; C= comprehension; A= Application; HA= Higher than application

11. Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector, Smart board, Video etc for effective teaching learning process .



12. Text books:

Titles of the book	Name of author	NAME OF PUBLISHER
Estimating and costing in civil engineering	B.N. Dutta	UBS publication
Civil Engineering contracts and estimates	B.S. Patil	Universities press
Estimating and costing	G.S. Birdie	DhanpatRai and Sons
Civil Estimating & Costing	A.K. Upadhyay	SK kataria& Sons
Estimating & costing	S.C. Rangwala	Charotar Publication Anand

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

N.B:- Optional question may be of same topic in the form of either or type like below

Q no:- What do you mean by detailed estimate ?

Or

What do you mean by revised estimate?

XXXXXXXXXXXXXXXXXX



5: Course Title :- COMPUTER AIDED DRAFTING & DRAWING

1. Course Code :- CV-405
2. Semester :- 4th (Civil)
3. Course Objective (CO)

On completion of the course, the student will be able to:

- a. Apply various commands related to CAD
- b. Develop drawing strategies
- c. Use the software properly
- d. Draw and print various drawing using SOFTWARE/ CAD perfectly.

CO	ILO
CO-1 Apply various commands related to CAD	1 . Explain various commands related to CAD 2 . Explain command window, drop down menu, toolbars 3 . Apply line command, co-ordinates, relative co-ordinates 4 .Explain polar co-ordinates, offset, fillet 5 . Set up Drawing unit, drawing size and scale, the grid, drawing limit, drawing with grid and shape, saving a drawing
CO-2 Develop drawing strategies	1. Develop drawing strategies 2. Use layers to organize drawing 3. Use Blocks and W blocking 4. Generate, plan, elevation and section of a drawing 5. Work with hatches and fills 6. Apply proper dimensioning in drawing 7. Get familiar with proper shape.
CO-3 Use the software properly	1 . Explain various software related to Auto CAD 2 . Handle the software properly 3 . Use the software in generating drawing
CO-4 Draw and print various drawing using AUTO CAD perfectly	1. Explain various paper size 2 . Use the Printer 3 . Print / plot configuration dialog box, device and default information, pen parameter, paper size, and orientation, scale rotation and origin, additional parameters, printing a drawing , determining line weight for a drawing setting up the other parameters for the print, previewing a print, printing a drawing with paper space, printing drawing with multiple viewports, printing site plan

4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
		6	6



5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Pr)	Credit
ESE	Sessional (SS)			PT	PA	50	150	4
	TA	HA		100	50			

7. Content for theory:

Unit	Topic	Contact hour
1	Getting started: Starting up Drafting software , introduction to the graphics window, command window, drop down menus, toolbars (flying out, calling up and arranging etc of toolbars)	2
2	Basic command to get started Point and line command, coordinates, relative coordinates, Cartesian and Polar coordinates, drawing a box (as an example rectangle) by coordinates; offset, fillet, extend, divide and trim commands (use to generate walls and opening as exercise).	4
3	Setting up a drawing Drawing unit, drawing size and scale, the grid, drawing limit, drawing with grid and shape, saving a drawing	3
4	Developing drawing strategies Note: the preliminary exercise should be based on rectangular building because at the initial stage too complex drawing may distract and confuse the students Laying out the walls, exterior walls and interior walls, creating wall opening, creating doors, swing of doors, copying objects, mirroring objects, finishing the swinging doors, drawing a sliding glass door, paneled door (by using fillet command) drawing steps and threshold The balcony (balcony should be circular/elliptical to learn the control over circle and elliptical command) Laying out Kitchen: counter, stove and refrigerator sink ,Constructing bathroom and W.C. (setting and running object shapes): drawing shower unit, bathing block and W.C.	8
5	Using layers to organize drawing Layers as an organizing tool, setting up layers, layers and line-type properties dialog box. Assigning objects to layers. Freezing and turning off layers, drawing the header (portion above opening beneath the ceiling), Drawing the roof, Colour, Line types and layers. Assigning a colour or line-type to an object, Making a colour and a line-type current. Assigning an individual line-type scale factor.	6
6	Using Blocks and W blocking Making a block for a door, Inserting the door block, Finding the block	5



	in a drawing, Using grips to detect a block, Using the list command to detect a block. Using the properties button to detect a block, Creating the window block., inserting the window block, rotating a block during insertion, using guidelines when inserting a block, using point filters to insert a block, using blips to help in inserting block, finishing the windows revising a block, W blocking, inserting a DWG file into a DWG file	
7	Generating elevation Drawing the front elevation, setting up lines for height, trimming lines in elevation, drawing the roof in elevation, putting in the door, step and windows, finishing touches, generating the other elevations, making rear elevation making the left and right elevation, drawing scale consideration, interior elevations/sections	6
8	Working with hatches and fills Ornamenting the front elevation by hatching looking at hatch pattern special effects modifying hatch pattern providing hatch to floor (for ornamentation)	3
9	Controlling drawing texts Setting up text styles, text and drawing scales, defining text styles, using single line text, placing title of views in the drawing, placing room label in the floor plan, using text in a grid, creating a title block and border, using multiline text	3
10	Dimensioning in drawing Dimension styles, making a new dimension style, placing dimension on the drawing, horizontal dimension, vertical dimension, other dimension, radial, leader line, angular and aligned dimension modifying dimension text, dimension overrides, dimensioning short distances	3
11	External references Drawing site plan, using bearings (surveyor's unit), laying out property lines, setting up external reference dialog box, controlling the appearance of an External reference (External reference), Modifying an External reference drawing, application for External reference, additional features of external references, the External reference path, binding External reference, other features of External reference	1
12	Getting families with proper shape Setting up proper space, drawing a border in paper space, designing a title block for paper space, creating floating view path, zooming view part to 1/Xp, working with multiple viewport in paper space, setting u multiple viewports, aligning viewports, finishing drawing setting up viewports to different scale adding text to paper space turning off viewports, tile mode variable and tiled viewpoint	3
13	Printing an auto CAD drawing The print / plot configuration dialog box, device and default information, pen parameter, paper size, and orientation, scale	1



	rotation and origin, additional parameters, printing a drawing , determining line weight for a drawing setting up the other parameters for the print, previewing a print, printing a drawing with paper space, printing drawing with multiple viewports, printing site plan.	
Total		45

Practical:

Unit	Topic	Contact hour
1	Draw a wooden door (2/3 rd glazed and 1/3 paneled using sash-bar) with standard dimension	3
2	Draw a wooden window (raised panel with fanlight) with standard dimension	3
3	Building drawing Single storied building shall comprise of two rooms, bath, WC, kitchen, front verandah with a provision of staircase and mummy for utilization of roof space. Development of line plan – ground floor plan and roof plan with provision for drainage layout. Elevation (front elevation) Two Sectional elevation (section must pass through stair-case, bath WC, kitchen and front verandah) Site plan (to be developed from a Mouza map for conception of location plan) Foundation details (trench plan, section of main wall and a partition wall/ isolated footing with tie beam if provided)	20
4	Septic tank Details of Septic tank along with the connection to latrine and soak pit.	8
5	Culvert Plan, Elevation and Section of Box type culvert and Hume pipe culvert.	7
6	Section of road and railway track	4

8.0 Distribution of marks: No specific marks have been allotted chapter wise. Teachers will evaluate the students through continuous evaluation process.

9.0 TIME ALLOTMENT TABLE

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Getting started	2	5				-
2	Basic command to get started	4	8				-
3	Setting up a drawing	3	6				-
4	Developing drawing strategies	8	17				-
5	Using layers to	6	12				-



	organize drawing						
6	Using Blocks and W blocking	5	10				-
7	Generating elevation	6	12				-
8	Working with hatches and fills	3	6				
9	Controlling drawing texts	3	6				
10	Dimensioning in drawing	3	6				
11	External references	1	3				
12	Getting families with proper shape	3	6				
13	Printing an auto CAD drawing	1	3				
		$\Sigma b = 48$	100				-

10.0 MARKS DISTRIBUTION TABLE

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Getting started									
2	Basic command to get started									
3	Setting up a drawing									
4	Developing drawing strategies									
5	Using layers to organize drawing									
6	Using Blocks and W blocking									
7	Generating elevation									
8	Working with hatches and fills									
9	Controlling drawing texts									
10	Dimensioning in drawing									
11	External references									
12	Getting families with proper shape									
13	Printing an auto CAD drawing									
14	Internal assessment									

K = knowledge; C= comprehension; A= Application; HA= Higher than application

11.0 Suggested Implementation Strategies:- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process . ***All students may be advised to purchase laptop of their own at the beginning of the course.***



12.0 Text Books:-

Name of Books Publisher	Name of the author	Edition	Name of the
Autodesk official training guide	Scott Onstott		Wiley-India
Autodesk official training guide	George Omura		Wiley-India
Engineering Drawing Plus	Venugopal K		New Age International
Auto CAD Building Drawing Reference Manual of AutoCAD	AutoDesk		

Evaluation Process:- Students will be evaluated through continuous process by entrusting some practical work related to CAD. For evaluation of theory Knowledge seminar may be conducted. Evaluation shall be done at Institute level. No question paper will be set by SCTE.

Xxxxxxxxxxxxxxxxxxxxxxx



6: Course Title :- CONCRETE TECHNOLOGY

1. Course Code :- Cv-406
2. Semester :- 4th (Civil)
3. COURSE OUTCOME (CO)

The Students will be able to

- Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests.
- Use different types of cement as per their properties for different fields applications.
- Design economic mix proportion for different exposure conditions and intended purposes.
- Supervise various concreting operations.
- Carry out field and laboratory tests on concrete in plastic and hardened stage.
- Use different types of admixtures to improve the properties of concrete for different field applications.
- Describe different types of concrete.
- Infer the test results as per relevant I.S. provisions.

COURSE OUTCOME (CO)

SUBJECT NAME: CONCRETE TECHNOLOGY
SUBJECT CODE: CV-406

After the completion of this subject, the students will be able to:

- Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregates by conducting different tests.
 - Use different types of cement as per their properties for different field applications.
 - Determine the quality of water to be used in concrete.
 - Use different grades of concrete on the basis of strength as per relevant I.S. provisions.
 - Design economic mix proportion for different exposure conditions and intended purposes.
 - Conduct quality control of concrete.
 - Supervise various concreting operations.
 - Carry out field and laboratory tests on concrete in plastic and hardened state.
 - Use different types of admixtures to improve the properties of concrete for different field applications.
 - Take precautions for extreme weather concreting
 - Describe special types of concrete.
- Infer the test results as per relevant I.S. provisions



INTENDED LEARNING OUTCOME (ILO)

SUBJECT NAME: CONCRETE TECHNOLOGY
SUBJECT CODE: CV-406

CHAPTER TITLE	After the completion of the chapter, the students will learn
Introduction	➤ Definition of cement concrete ➤ Composition of cement concrete ➤ Advantages and disadvantages of concrete Difference between regular concrete and advance concrete
Cement	➤ Composition of cement ➤ Physical properties of Ordinary Portland Cement(OPC) ➤ Definition and process of hydration of cement, ➤ Fineness, initial and final setting times, compressive strength and soundness of cement ➤ Different grades of OPC and their specification as per BIS ➤ Field & Laboratory tests of cement ➤ Storing of cement at site and effect of storage of cement on properties of concrete ➤ Various types of cement ➤ Difference between OPC and PPC ➤ Quality of water to be used in concrete
Properties of concrete	➤ Different grades of concrete (ordinary concrete, standard concrete & high strength concrete as per provisions of IS 456- 2000) ➤ Minimum grade of concrete for different exposure conditions ➤ Minimum grade of concrete for R.C.C. ➤ Durability of concrete ➤ Definition of water-cement ratio and its significance ➤ Selection of w/c ratio for different grades of concrete prepared from different grades of OPC as per graphs specified in IS 10262 -1982 ➤ Maximum w/c ratio for different grades of concrete for different exposure conditions. ➤ Properties of fresh concrete ➤ Definition of workability and factors affecting workability of concrete ➤ Determination of workability of concrete by slump cone test ➤ Range values of workability requirement for different types of concrete works ➤ Concept of cohesiveness, segregation, harshness and bleeding ➤ Properties of hardened concrete

	➤ Definition of compressive strength, impermeability elastic properties of concrete, modulus of elasticity of concrete ➤ Creep and factors affecting creep ➤ Shrinkage and factors affecting shrinkage
Concrete mix design	➤ Objectives of mix design ➤ Mix design procedure by I.S. method as per I.S. 10262-2009 ➤ Testing of concrete and its significance ➤ Determination of compressive strength of concrete cubes at different ages ➤ Non- destructive testing of concrete and its importance and methods of NDT
Quality control of concrete	➤ Batching and types of batching ➤ Different types of mixers and vibrators ➤ Formwork and different types of formworks for different works such as beams, slabs, columns, well foundation ➤ Process of transportation, placing, compaction & finishing of concrete ➤ Definition, necessity and methods of curing of concrete
Extreme weather concreting & chemical Admixture in concrete	➤ Effects of cold and hot weather on concrete and precautions to be taken while concreting in cold and hot weather condition ➤ Properties and applications of different types of admixtures in concrete
Properties of special concrete	➤ Properties, advantages and limitations of special types of concrete

4. Teaching Scheme (in hours/week) Total Contact Hr= L 45 hrs. T 15 hrs. P 45 hrs.

Lecture	Tutorial	Practical	Total
3		3	6

5. Examination Scheme :

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA	17/50	150	5
	TA	HA						
70	10	20		25	25			



6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction	Cement Concrete, Composition of cement Concrete, Advantages and disadvantages of concrete, Regular concrete, Advance Concrete	02
2	Cement	2.1 Cement :- Composition of cement, Physical properties of Ordinary Portland Cement(OPC), Hydration of cement, Fineness, ,initial& final setting times ,compressive strength & soundness, different Grades of OPC& their specification as per BIS ,Field & Laboratory tests of cement, storing of cement at site, effect of storage of cement on properties of concrete. Various type of cement .Differentiate between OPC & PPC 2.2 Water :- Quality of water to be used in concrete.	05
3	Properties of concrete	3.1 Different grades of concrete (ordinary concrete, standard concrete & high strength concrete as per provisions of IS 456- 2000), minimum grade of concrete for different exposure conditions, minimum grade of concrete for R.C.C., durability of concrete 3.2 Water cement ratio, Definition of w/c ratio, significance of w/c ratio, selection of w/c ratio for different grades of concrete prepared from different grades of OPC as per graphs specified in IS 10262 - 1982, maximum w/c ratio for different grades of concrete for different exposure conditions. 3.3 Properties of fresh concrete Definition of workability, factors affecting workability of concrete. Determination of workability of concrete by slump cone test . Range values of workability requirement for different types of concrete works, cohesiveness, segregation, harshness, bleeding. 3.4 Properties of hardened concrete Definition of compressive strength, impermeability elastic properties of concrete, modulus of elasticity of concrete. Creep, factors affecting creep, shrinkage, factors affecting shrinkage	8
4	Concrete mix design	4.1 Objectives of mix design, list of different method of mix design, study of mix design procedure by I.S. method as per I.S. 10262-2009, determination of design mix proportion by mass for M 20 grade of concrete using I.S. Method for given data (such as grading zone of sand, proportion of 20 mm & 10 mm	8

		metals, Specific gravities of cement, sand & aggregate , water absorption of sand & aggregate, compacting factor and exposure condition). 4.2 Testing of concrete Significance of testing, determination of compressive strength of concrete cubes at different ages (Say 7 days and 28 days) interpretation & co-relation of test results 4.3 Introduction to different Non- destructive testing of concrete, Importance of NDT, methods of NDT - rebound hammer test & Determination of rebound index & compressive strength of concrete by rebound hammer test as per I.S. 13311,determination of quality of concrete by ultrasonic pulse velocity test	
5	Quality control of concrete	5.1 Batching, Volume & weight batching, volume batching for nominal mixes & weight batching for design mix concrete Different Types of Mixers & Vibrators , types of mixers (tilting & non-tilting type) Different types of vibrators - needle vibrator, surface vibrator, table vibrator, principle & application of each type of vibrator 5.2 Formwork : formwork for concreting, different types of formworks for different works such as beams, slabs, columns, well foundation, materials used for formwork, requirement of good formwork, stripping time for the removal of formwork as per I.S. 456- 2000 provisions for different structural members. 5.3 Transportation, placing, compaction & finishing of concrete ,Modes of transportation of concrete , precautions to be taken during transportation and placing of concrete in formwork compaction of concrete, methods of compaction, care to be taken during compaction, purpose of finishing, types of finishing & requirement of good finish. 5.4 Curing of concrete : definition of curing, necessity of curing, different methods of curing and their application (spraying water, membrane curing, steam curing, curing by infra red radiations, curing by wet gunny bags, ponding methods).	10
6	Extreme weather concreting & chemical	6.1 Extreme weather concreting Effect of cold weather on concrete, effect of hot weather on concrete, precautions to be taken while concreting in hot & cold weather	03

	Admixture in concrete	condition. 6.2 Chemical admixture in concrete Properties & application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixture, air entraining admixture & super plasticizers.	
7	Properties of special concrete	Properties, Advantages & Limitation of the following types of Special concrete i) Ready mix Concrete ii) Reinforced Concrete iii) Pre stressed Concrete iv) Fiber Reinforced Concrete v) Precast Concrete vi) High performance Concrete	03
8	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	06

7. Distribution of Marks/ Table of specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/Descriptive Questions	
1	Introduction	1		1
2	Cement	4	5	9
3	Properties of concrete	5	10	15
4	Concrete mix design	5	10	15
5	Quality control of concrete	5	12	17
6	Extreme weather concreting & chemical Admixture in concrete	2	5	7
7	Properties of special concrete	3	3	6
		25	45	70

9.0 TIME ALLOTMENT TABLE



Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	2	5				-
2	Cement	5	11				-
3	Properties of concrete	8	17				-
4	Concrete mix design	8	17				-
5	Quality control of concrete	10	23				-
6	Extreme weather concreting & chemical Admixture in concrete	3	7				-
7	Properties of special concrete	3	7				-
8	Internal assessment	6	13				
		$\Sigma b = 45$	100				-

10.0 MARKS DISTRIBUTION TABLE

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1	-	-	1	-	-	-		-
2	Cement	1	2	1	4	1	2	2		5
3	Properties of concrete	1	2	2	5	2	3	5		10
4	Concrete mix design	2	1	2	5	1	2	7		10
5	Quality control of concrete	1	1	2	5	3	3	6		12
6	Extreme weather concreting & chemical Admixture in concrete	1	-	-	1	-	2	3		5
7	Properties of special concrete	1	2	1	4	-	3	-		3
8	Internal assessment									
					25					45

K = knowledge; C= comprehension; A= Application; HA= Higher than application

11.0 Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector ,Smart board, video etc for effective teaching learning process.



12.0 Suggested Learning Resource :-

Book list

Title of Book	Writer	Publisher
Concrete Technology	MS Shetty	S. Chand Publication
Concrete Technology	ML Gambhir	Tata McGraw . Hill Publishing Co. Ltd. New Delhi
Concrete Technology	A. M. Neville& J JBrooks	List of Journals Pearson Education (Singapore) Pyt. Ltd. New Delhi
A Text book of Concrete Technology-	P D Kulkarni	M. H. Ghosh and Phullpublication

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

N.B:- Optional question may be of same topic in the form of either or type like below

Q no:- Explain briefly the properties of fine aggregates

Or

Explain briefly the properties of coarse aggregates.

XXXXXXXXXXXXXXXXXXXXXXXXXXXX



7: Course Title :- PROFESSIONAL PRACTICE-II

1. Course Code :- Cv-410
2. Semester :- 4th (Civil)
3. Objective of the Subject/ Courses :-

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

Course Objectives (CO)

The Student will be able to:

- f) Acquire information from different sources.
- g) Prepare notes for given topic.
- h) Present given topic in a seminar.
- i) Interact with peers to share thoughts.
- j) Prepare a report on industrial visit, expert lecture.

INTENDED LEARNING OUTCOMES (ILO)

Sl.No.	Course outcomes	Indented Learning Outcome
1.	CO-1: Acquire information from different sources	1. Identify the different sources to be visited for knowledge hunting from Civil Engg point of view. 2. State the importance of the source 3. Collect the required information from the source 4. Discuss the details of the source 5. Structured industrial visit and preparation of report of a. Nearby Paver Block manufacturing plant b. Nearby water treatment plant c. Nearby stone crusher plant d. Nearby pre stressed concrete plant
2.	CO-2: Prepare notes for given topic.	1. Identification of an important topic 2. Group discussion 3. Note preparation on that topic 4. Presentation of the selected topic
3.	CO-3: Present given topic in a seminar	1. State the importance of seminar 2. Preparation of lecture by PPT 3. Fluency in communication 4. Presentation of any topic in front of audiences



4.	CO-4: Interact with peers to share thoughts.	1. Explain the importance of interaction 2. Explain of brain storming 3. Advantage of brain storming. 4. State importance of sharing thoughts
5	CO-5 Prepare a report on industrial visit, expert lecture.	1. Importance of industry institute interaction 2. State relation between industry and technology 3. Structured visit of important industry 4. Acquiring knowledge from expert lecture. 5. Report preparation on brick factory, cement factory etc.

4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
1		2	2

5. Examination Scheme :-

Theory		Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (PT+ PA)	Credit
ESE	Sessional (SS)	-----	PT	PA	17/50	50	2
TA	HA						
---	---	---	25	25	17/50	50	2

6. Course content

UNIT	TOPIC/ACTIVITIES	CONTACT HRS
1	Industrial visit : Structured industrial visit shall be arranged and report of the same should be submitted by individual student (Any two of the following) 1.6 Nearby Paver Block manufacturing plant 1.7 Nearby water treatment plant 1.8 Nearby stone crusher plant 1.9 Nearby pre stressed concrete plant 1.10 Any other nearby industry related Civil Engineering.	10
2	Guest Lectures : Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized from any TWO of the following areas: 2.1 Computer aided drafting and design 2.2 Mix design of high strength concrete/ Ready mix concrete	6



	2.3 Building bye laws 2.4 Social responsibilities of Civil Engineer. 2.5. Any other topic as decided by teachers	
3	Individual Assignment: Student will be given some individual assignment and asked to submit them. Any two from the list suggested a) Measure of floor area of all building of the campus b) Preparation of index map of the campus c) High order thinking (HOT) Assignment on Bending moment, Shear force, deflection of beam d) Assignment on flow through pipes, orifices, notches e) Writing of materials specification of all sanitary and plumbing materials f) Estimation of a septic tank g) List out the rate of different main items from PWD (building) schedule. h) Pin point some suitable locations for plantation of trees in your campus i) Any other assignment given by teacher.	6
4	Student Activities : The students in a group of 3 to 4 will perform any one of the following activities and same will be presented in seminar 4.5 List out the different varieties of cement available in the local market with specification and price 4.6 Prepare the concrete block (M-30) and test for compressive strength 4.7 Collect some varieties of bricks and test for different physical properties. 4.8 Using compass ,survey your institute campus 4.9 Any other relevant field selected by teachers	8

xxxxxxx END xxxxxx

Remarks

3. The proposed syllabus is the outcome of team work
4. The proposed syllabus has been prepared as per the instructions obtained from the higher authority time to time.



FIFTH SEMESTER CIVIL ENGINEERING



COURSE STRUCTURE OF CIVIL ENGINEERING

5th SEMESTER

Subject Code	Subject	Study Scheme (contact hour/week)			Evaluation Scheme								Total Mark (Th+Pr)	Credit
					Theory					Practical				
					L	T	P	ESE	Sessional (SS)			Pass (ESE+SS)		
		TA	HA	Total(TA+HA)										
CV-501	Advanced Surveying	3	-	3	70	10	20	30	33	50	50	33	200	4
CV-502	Transportation Engg	3	-	3	70	10	20	30	33	25	25	17	150	4
CV-503	Design of RCC Structure	4	-	2	70	10	20	30	33				100	5
CV-504	Geotechnical & Foundation Engg	3	-	3	70	10	20	30	33	25	25	17	150	4
CV-505	Advance Building Construction & Earthquake Resistant Technology	3	-		70	10	20	30	33				100	3
CV-510	Professional Practice-III	1		2									50	2
OPTIONAL (ANY ONE)														
CV-506	Green Building	3			70	10	20	30	33				100	3
CV-507	Architectural Practices and Interior Deign	3			70	10	20	30	33				100	3
CV-508	Construction Technique & Equipment	3			70	10	20	30	33				100	3
Total		20		13										
		33			Grand Total =								850	25

Variations :- Surveying-II has been renamed as Advanced Surveying as because some advance and modern topics has been included in new syllabus.. Structural Design & drawing(RCC) has been renamed as Design of RCC Structure. Geotechnical Engineering has been renamed as Geotechnical Engineering & Foundation Engg as because some content of foundation has been added in the new syllabus. Advanced Building Construction & Earthquake Engg has been renamed as Advanced Building Construction & Earthquake Resistant Technology as because some topics related to earthquake resistant technology has been added. Three new subjects namely Green Building and Architectural practices and interior design and Construction Technique & Equipment are added as optional subjects. Content of almost all subjects have been modified



1. Course Title :- ADVANCED SURVEYING

1. Course Code :- CV-501
2. Semester :- 5th (Civil)
3. Objective of the Subject/ Courses :-

On completion of the course, the student will be able to:

- Record the data in field book and plot the collected data.
- Find out the vertical and horizontal distances with a tachometer.
- Set out simple curve using theodolite and chain and tape.
- Prepare contour map and Compute area and volume from a given contour map
- Use of modern survey equipment- micro optic theodolite and EDM
- Apply principle of surveying and levelling for civil engineering works.

Pre-requisite:-

- Student should be perfect in drawing and sketching.
- Students should also know the basic principle and purpose of surveying.

COURSE OUTCOME (CO)

After the completion of this subject, the students will be able to:

- Use the surveying instruments like level, plane table and theodolite.
- Set out simple curves using theodolite, chain and tape.
- Find out the vertical and horizontal distances with a tacheometer.
- Use modern survey equipment like EDM.
- Describe the features of Electronic digital theodolite.
- Understand the basic principles of Total station, GPS, GIS and Remote Sensing.
- Apply principle of surveying and levelling for civil engineering works.



INTENDED LEARNING OUTCOME (ILO)

CHAPTER TITLE	After the completion of the chapter, the students will learn
Contouring	➤ Define contouring ➤ Use and handling of levels ➤ Explain the RL ➤ Methods of determining RL ➤ Curvature and refraction correction ➤ Use of contour ➤ Preparation of contour map ➤ computation of volume of earthwork and capacity of a reservoir
Theodolite surveying	➤ Difference between transit and non-transit theodolite ➤ Temporary adjustment, fundamental lines and permanent adjustment of theodolite ➤ Measurement of horizontal angle, vertical angle, interior and exterior angles, magnetic bearings of line, prolonging a line, direct angle and deflection angle ➤ Theodolite traversing by included angle, direct angle and deflection angle ➤ Traverse computation, latitudes and departures, consecutive co-ordinates and independent co-ordinates ➤ Computation of area of the traverse by various methods ➤ Balancing of traverse. ➤ Numerical problems related to theodolites
Curves	➤ Definitions and notations of different types of curves, designation of curve, elements of simple curve and uses of curves ➤ Setting out of simple curves by various methods ➤ Basic ideas of transition curves and vertical curves ➤ Numerical problems related to curves

Tacheometry survey	➤ Principle of tacheometry ➤ Essential requirements of tacheometry. ➤ Use of a theodolite as a tacheometer with staff held in vertical and fixed hair method ➤ Determination of tacheometric constants ➤ Simple numerical problems related to tacheometers
Modern method of surveying	➤ Principle, components, functions and uses of EDM ➤ Electronic digital theodolite and its features ➤ Introduction to Total station ➤ Introduction to GPS ➤ Introduction to GIS and Remote Sensing

4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
3		3	6

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	50	50	33/100	200	4

6. Detail course content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Contouring	➤ Contour and contouring, contour interval and horizontal equivalence. ➤ Characteristics of contours ➤ Uses of contours ➤ Different methods of contouring and	7



		interpolation of contour ➤ Preparing and use of contour maps, computation of volume of earthwork and capacity of a reservoir, numerical problems	
2	Theodolite surveying	➤ Transit and non transit theodolite, terminology. ➤ Temporary adjustment, fundamental lines and permanent adjustment. ➤ Measurement of horizontal angle, vertical angle, interior and exterior angle,s, magnetic bearings of line, prolonging a line, direct angle and deflection angle. ➤ Theodolite traversing by included angle, direct angle and deflection angle. ➤ Traverse computation, latitudes and departures, consecutive co-ordinates and independent co-ordinates, ➤ Computation of area of the traverse by various methods. ➤ Balancing of traverse. ➤ Numerical problems related to theodolites.	13
3	Curves	➤ Definitions and notations, types of curves, designation of curve, elements of simple curve, uses of curves. ➤ Setting out of simple curves by various methods. ➤ Basic ideas of transition curves and	8



		vertical curves. ➤ Numerical problems related to curves.	
4	Tacheometry survey	➤ Principle of tacheometry. ➤ Essential requirement of tacheometry. ➤ Use of a theodolite as a tacheometer with staff held in vertical and fixed hair method (no derivation) ➤ Determination of tacheometric constants. ➤ Simple numerical problems.	5
5	Modern method of surveying	➤ EDM: Principle, component, function and uses. ➤ Electronic digital theodolite and its features. ➤ Introduction to Total station. ➤ Introduction to GPS ➤ Introduction to GIS and Remote Sensing	5
6	Revision/ Class test/ Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	7

7. Distribution of marks

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/Descriptive Questions	
1	Contouring	5	10	15



2	Theodolite surveying	6	14	20
3	Curves	6	10	16
4	Tacheometry survey	3	7	10
5	Modern method of surveying	5	4	9
Total		25	45	70

8. Table of Specification for Theory (ADVANCED SURVEYING)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Contouring	7	16	2	1	4	-
2	Theodolite surveying	13	29	3	3	7	-
3	Curves	8	17	3	2	3	-
4	Tacheometry survey	5	11	2	1	2	-
5	Modern method of surveying	5	11	1	1	3	-
6	Internal assesment	7	16				-
							-
		$\Sigma b=38$ hrs+ 7hrs internal assesment	100				-



9. Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Contouring	2	1	2	5	3	3	4		10
2	Theodolite surveying	2	1	3	6	4	3	7		14
3	Curves	2	1	3	6	3	2	5		10
4	Tacheometry survey	1	1	1	3	2	2	3	-	7
5	Modern method of surveying	2	2	1	5	2	2			4
6	Internal assessment									
7										
8										
9										
10										
					25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

10. Suggested Implementation Strategies:- :- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process .

11. Text books:

Titles of the book	Name of author	NAME OF PUBLISHER
Surveying and leveling Part I & II	T.P.Kanetkar and S.V. Kulkarni	Pune VidyarthiGrihaPrakashan
Surveying and leveling Vol. I & II	Dr. B.C. Punmia	Laxmi Publication
Plane Surveying	A.M.Chandra	New Age International Publishers
Surveying & Levelling	N NBasak	Mcgraw Higher Ed



Surveying	S K Duggal	Mcgraw Higher Ed
Advanced Surveying (Total stn, GIS, Remote Sensing)	SatheesGopi N Madhu	Pearson

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

N.B:- Optional question (if any) may be of same topic in the form of either or type like below

Explain briefly the temporary adjustment of theodolite

OR

Explain briefly the permanent adjustment of theodolite.

XXXXXXXXXXXXXXXXXXXXXXXXXXXX



1: Course Title: ADVANCED SURVEYING PRACTICAL

Marks :- Practical =50 Sessional = 50 Total= 100

SKILLS TO BE DEVELOPED:

INTELLECTUAL SKILL:

- 1) Identify the components of plane table, theodolite, and advanced survey instruments.
- 2) Know the working principles of these survey instruments.
- 3) Finding the horizontal and vertical distances.
- 4) Identifying errors in setting out curve and tabulating elements of a curve.

MOTOR SKILLS:

- 1) Taking and recording the observation in the field book.
- 2) Preparing drawings, maps etc. with the observed data.
- 3) Setting out curve for the given alignment.
- 4) Use Micro optic theodolite, EDM, Total Station, Digital theodolite for finding different parameters.

Instructions:-

- 1) Group size for Practical work should be limited to maximum 6 Students.
- 2) Each student from the group should handle the instrument to understand the function of different components and use of the instrument.
- 3) Drawing, plotting should be considered as part of practical.
- 4) One full day per project is required for carrying out project work, which is to be plotted on a drawing sheet.
- 5) **TERM WORK** SHOULD CONSIST OF RECORD OF ALL PRACTICALS AND PROJECTS, IN FIELD BOOK AND DRAWING SHEETS FOR THE GIVEN PROJECTS.

UNIT	TOPIC	HOURL
1	Plane table Survey :-1. Locating details by radiation and intersection method. 2. Locating details of building, road by radiation and intersection method.	06



2	Theodolite Survey 1. Handling of theodolite, Setting up at Station, Temporary adjustment 2. Measurement of horizontal and vertical angle 3. Measurement of deflection angle. 3. Closed traversing of a plot 4. To set a straight line.	14
3	To find Reduced levels & horizontal distance using theodolite as a Tacheometer.	03
4	To find constant of a given Tacheometer.	06
5	. Setting out simple circular curve by Rankine's method of Deflection angles of a given problem & plotting details of curve	06
6	Handling of a total station & GPS	05
7	Handling and use of Digital Theodolite	05

Note: video cassettes or cd's of below experiments developed by NITTTR (if available) shall be shown to the students on T. V. / L.C.D. projector prior to the conductance of above experiments.

XXXXXXXXXXXXXXXXXX



2. Course Title : TRANSPORTATION ENGINEERING

1. Course Code :- CV-502

1. Semester :- 5th (Civil)

2. COURSE OUTCOME (CO) :-

On completion of the course, the student will be able to:

- Explain the various stages of work for highway alignment.
- Able to design road and interpret the relevant IRC codes and highway project drawings.
- Organize and supervise road projects.
- Identify the suitability of road materials.
- Carry out traffic volume study.
- Organize and coordinate road repairing and maintenance job.

CO	ILO
CO-1 Explain the various stages of work for highway alignment.	1 . Explain the importance of road in India 2 . State the history of road and Road development in India 3 . Classify of roads according to Nagpur Plan and Third development plan . 4 . Explain the IRC specification of roads. 5 . Prepare a road project 6 . Explain and implement the various stages of highway alignment and construction
CO-2 Able to design road and interpret the relevant IRC codes and highway project drawings	1 . Draw road cross sections in embankment and in cutting. 2 . Explain the Cross sectional elements- right of way, boundary line, Building line, control line, carriage way, shoulder, berm. Recommended land width for different classes of roads. Recommended speeds. 3 . Explain Width of roadway for single lane and Two lanes roads in a) Plain and rolling terrain and b) mountainous and steep terrain. Width of carriage way. 4. Explain and design Pavement camber or cross fall (objects and methods), recommended values of camber for different types of roads.

	5 . Explain and design Gradient, classifications of gradients, IRC specification on gradients for roads in different terrain, grade compensation at curves in hill roads. 6 . State Super Elevation, objects, derivation of formula and related problems, Methods of providing Super-elevation
CO-3 Organize and supervise road projects.	1 . Estimate the quantity of materials required in road construction 2. Organize the labour related to the road construction 3 . Supervise the project 4 . Maintain the quality of construction
CO-4 Identify the suitability of road materials.	1 .Explain th types of road material. 2 . Judge the quality of materials in the site 3 . Test the quality of materials and judge its suitability 4 . Perform various test on aggregates like CBR, Impact , Los Angles Abrasion, Water absorption etc and interpret the results.
CO-5 Carry out traffic volume study.	1 . State different traffic control devices 2 . Explain and identify the different road signs 3 . Explain the necessity of traffic island 4 . State road signals and marking 5 . Study the traffic volume.
CO-6 Organize and coordinate road repairing and maintenance job.	1 . Explain the Necessities of maintenance of road 2 . State the Types of maintenance and their operation Maintenance of WBM 3 . Explain the maintenance of Bituminous and cement concrete road. 4 . Estimate the cost of maintenance 5 . State the condition of road surface 6 . Supervise the maintenance work



3. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
3		3	6

4. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	4

5. Course content

unit	Topic	Contact hr
1	Introduction: Importance of road in India ;History of road and Road development in India ;Classification of roads according to Nagpur Plan and Third development plan ;Classification of urban roads as per IRC; IRC specification of roads.	2 hours
2	Investigation for road project : Reconnaissance, Preliminary and location survey for a road project. Detailed Survey for cross drainage L sections and C/S Fixing the alignment of road, factors affecting alignment of road. land acquisition plan; Survey for availability of construction material.	3 hours
3	Geometric Design of Highway: Road cross sections in embankment and in cutting. Cross sectional elements- right of way, boundary line, Building line, control line, carriage way, shoulder, berm. Recommended land width for different classes of roads. Recommended speeds. Width of roadway for single lane and Two lanes roads in a) Plain and rolling terrain and b) mountainous and steep terrain. Width of carriage way.	10 hours



	Pavement camber or cross fall (objects and methods), recommended values of camber for different types of roads. Gradient, classifications of gradients, IRC specification on gradients for roads in different terrain, grade compensation at curves in hill roads. Super Elevation- objects, derivation of formula and related problems, Methods of providing Super-elevation Transition curve, objects of providing transition curves, types of curves used, factors affecting lengths of transition curve. Widening of pavement on curve- its necessity and method of providing it. Vertical curve summit curve and valley curve. Sight distance, perception time, brake reaction time, lag time, lag distance, braking distance. Types of sight distance- stopping sight distance, intermediate sight distance and overlooking sight distance.	
4	Construction of Road Pavements and Materials: Types of road material and Test: Soil, Bitumen, Cement Concrete. Test on soil sub grade: CBR test, Test on aggregate: Los angles Abrasion test, Impact and shape test. Test on bitumen: Penetration, Ductility and softening point test. Pavement- Objective of pavement, structure of pavement, function of pavement components, types of pavement. Water bound Macadam Roads – Definitions, materials, procedure of construction, advantage and disadvantages, quantity estimate. Bituminous Materials- i) bitumen, asphalt and Tar ii) source of bitumen, iii) Types of bitumen- straight run, oxidized, cut back, emulsion and Primer, iv)Types of Tar. Bituminous road construction- Types- i) surface dressing(single coat & two coats)- functions, materials, construction, quantities of materials ii) grouting(semi grout and full grout)- functions, materials, construction and quantities of materials, iii) premix type (premix chipping carpet, premix macadam and premix concrete)- function, materials, construction and quantities of materials, related machineries and plants. Pavement distress- nature, causes and remedies. Cement concrete roads- i) advantages and disadvantages ii) comparisons between bituminous and cement concrete pavements, iii) pavement joint-	11 hours



	necessity, types, joint sealer, joint filler, dowel bar, mud pumping.	
5	Traffic Engineering: Traffic volume study Traffic control devices- road signs, marking, signals, Traffic Island. Road Intersections- intersection at grades and grade separator intersections.	3 hours
6	Hill Roads: Parts and functions of hill road. Components, types of curves, Hill road formation; Section of hill roads.	2 Hours
7	Drainage of roads: Surface drainage- side gutter, catch water drains, surface drainage, necessity. Sub surface drainage- necessity, longitudinal and cross drains	2 Hours
8	Maintenance and repair of roads : Necessities of maintenance of road; Types of maintenance and their operation Maintenance of WBM, Bituminous and cement concrete road.	2 hours
9	Introduction to Airport Engineering : Introduction & Role of Civil Engineer. Terminology. Layout of airport & function of different units. Airport Grading and Drainage	3 hours
10	Revision/ Class test/ Seminar Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	6

6. Distribution of marks:-

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/ Descriptive Questions	
1	Introduction	2		2
2	Investigation for road project	4		4



3	Geometric Design of Highway	5	12	17
4	Construction of Road Pavements and Materials	4	12	16
5	Traffic Engineering	4	6	10
6 & 7	Hill Roads and drainage of road	4	6	10
8 & 9	Maintenance and repair of roads & Introduction to Airport Engineering	2	9	11
Total		25	45	70

9.0 Table of Specification for Theory (TRANSPORTATION ENGINEERING)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	2	5	1	1		-
2	Investigation for road project	3	7	1	2		-
3	Geometric Design of highway	10	22	2	3	5	-
4	Construction of road pavements and materials	11	24	2	4	5	-
5	Traffic Engineering	3	7	1	1	1	-
6	Hill Road	2	5	1		1	-
7	Drainage of Roads	2	5	1		1	-
8	Maintenance and repair of roads	2	5	1		1	
9		Introduction to Airport Engineering	3	7	1	1	1

10		Internal assessment	6	13			
			$\Sigma b=38$ hrs+ 6hrs internal assessment	100			

10. Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1	1		2					
2	Investigation for road project	2	2		4					
3	Geometric design of highway	2	1	2	5	2	3	7		12
4	Construction of road pavements and materials	2	1	1	4	3	2	7	-	12
5	Traffic Engineering	2	1	1	4	2	1	3		6
6&7	Hill roads & Drainage road	2	1	1	4	2	1	3		6
8&9	Maintenance and repair of roads & Introduction to Airport	1	1		2	2	2	5		9
					25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11. Suggested Implementation Strategies:- :- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process .



12. Books:

1. Highway Engineering by Khanna & Justo
2. Transportation engineering by Vazirani&Chandola
3. Road, railways and Bridges by Birdi& Ahuja
4. International Codes IRC 36 – 1970, IRC 16 –1965, IRC 20 -1966

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

N.B:- Optional question may be of same topic in the form of either or type like below

Explain briefly the CBR test

OR

Explain briefly the Impact test.

XXXXXXXXXXXXXXXXXXXXXXX



2: COURSE Title: TRANSPORTATION ENGINEERING PRACTICAL

Marks Practical =25 Sessional=25

Practical

Skills to be developed:

INTELLECTUAL SKILLS:

- a. Identify properties and qualities of road materials.
- b. Interpret test results.
- c. Follow IS procedure of testing.

MOTOR SKILLS:

- a. Measure the quantities accurately.
- b. Handle the instruments carefully.

Instructions:

- # Group size for a particular job be restricted within 3 students.
- # Laboratory sheet is to be submitted immediately after the end of each practical.

Following laboratory are tests to be carried out during the semester.

1. Determination of California Bearing ratio of the sub grade soil
2. Determination of Penetration values of Bitumen
3. Determination of softening point of Bitumen
4. Determination of ductility of bitumen
5. Determination of viscosity of tar/ bitumen.
6. Determination of elongation and flakiness index of road aggregate.
7. Determination of impact value and crushing value of road. aggregate.
8. Determination of abrasion value of road aggregate.

Note: video cassettes or cd's of below experiments developed by NITTTR (if available) shall be shown to the students on T. V. / L.C.D. projector prior to the conductance of above experiments

XXXXXXXXXXXXXXXXXXXXXXX



3. Course Title : DESIGN OF RCC STRUCTURES (duration of Exam= 4 hrs)

2. Course Code: : Cv-503
3. Semester : Fifth
4. Objective of the subject/ Course : Design of RCC structures presents the concept of design and drawing of RCC elements to decide the size, amount of reinforcement required and check whether the adopted section will perform safely and satisfactorily during the intended life.

COURSE OUTCOME AND INTENDED LEARNING OUTCOMES

COURSE OBJECTIVES	INTENDED LEARNING OUTCOMES (<i>After attending the course the students will be able to</i>)	Associated Skill
To make the students familiar with the properties of P.C.C and R.C.C	Define P.C.C and R.C.C	remember
	Differentiate between PCC and RCC	analyse
	Identify situations where PCC and RCC are used	analyze
	State the permissible stresses of construction materials.	understand
To understand the concept of Limit State Design in RCC	Define each types of Limit States	remember
	List the points of difference s between LSD and WSM design	remember
	State the FOS adopted for Material and Loads	understand
	Measure the characteristic strength from a set of strength data of construction materials	evaluate
	State types of loads on a structure.	understand
To familiarize the design considerations of RCC structure	Label the effective depth, neutral axis, concrete cover, Lever arm, effective span for beams and slab.	apply
	Derive expressions for compressive and Tensile forces and ultimate moment capacity of a flexural member.	create
	justify the benefit of LSM over WSM in a flexural member.	evaluate
	Pick appropriate clauses relevant to effective depth,	apply

	effective span, control of deflection etc. from IS :456-2000	
	Link concrete cover with durability of Reinforced cement concrete	apply
To be able to analyze and Design RCC beams as per IS:456-2000	Classify under reinforced, Over Reinforced and balanced Sections.	analyze
	Choose the relevant clauses of IS: 456-2000 in analysis of RCC beams.	apply
	Asses the situations for singly reinforced and doubly reinforced sections.	evaluate
	Relate Ultimate Moment capacity, Shear capacity with BM and Shear force respectively for simply supported beams, cantilever beams, Tee beams, L Beams.	apply
	Analyze and design reinforced concrete flexural Members like beams and slabs.	evaluate
	Integrate the design outcomes in drawings.	create
	Modify sections as per situational demand.	create
To be equipped with the knowledge of shear stress and bond stress and codal provision of safety against them	Analyze and Design for vertical and horizontal shear in RCC	evaluate
	Calculate and apply development lengths for compressions and tension reinforcement.	apply
	Organize bar curtailments in beams as per codal provisions.	create
	Calculate anchorage value for tensile reinforcement in beams.	apply
	Compose Limit state of Collapse and Limit state of Serviceability in a complete beam design problem.	create
To be able to perform analysis and design of RCC slab	Explain One way, Two way and Flat slab	remember
	Describe the behavior of One way and Two slab under transverse loading.	understand
	Analyze and design one way and two way reinforced concrete slab	analyze

	Sketch the reinforcement patterns in one way and two way slabs	apply
	Check limit state of serviceability for slab.	analyze
To be able to perform analysis and design of Column	Define Long column and short column.	remember
	Explain the importance of slenderness ratio for compression member	apply
	Calculate the effective length of column from end conditions	analyze
	Analyze and design of short axially loaded square, rectangular and circular column.	analyze
	Draw the detailed drawing using the design outcomes.	apply
To be able to perform analysis and design of Column footing.	State the types of footing and their selection criteria.	remember
	Calculate the soil pressure under footing with the knowledge of bearing capacity	apply
	Perform structural design of isolated footing for BM, One way shear, Punching shear.	analyze
	Draw the detailed drawing using the design outcomes	apply
To develop concept of Pre Stressed Concrete	Define pre stressed concrete.	remember
	Differentiate Pre Stressed concrete from RCC	understand
	State the advantage and disadvantage of pre stressed concrete.	understand
	Illustrate the method of pre tensioning and post tensioning.	understand

5. Teaching Scheme (In hours)

Lecture	Tutorial	Practical	Total
4		---	4



6. Examination Scheme:

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA		100	5
	TA	HA						
70	10	20						

7. Detailed of Course Content:

Chapter No.	Chapter Title	Content	Duration (Hrs)
1.	Properties of Concrete and steel		2
		Function of concrete and steel in R.C.C., Difference between P.C.C. and R.C.C.; Types of bars, available bar diameter, properties of steel, Grades of concrete and steel, Permissible stresses and related terms	
2.	Fundamentals of Limit State Method		3
		Method of design- brief description of Limit state method, working stress method and Method based on experimental approach (as per IS-456-2000). Principle and types of limit states , Assumptions and stress block parameters, Comparison of Limit state method and working stress method, Characteristic strength and loads, Design loads, partial safety factors, Different types of loads as per IS 875.	
3.	General design considerations (IS:456-2000)		2
		Familiarization with IS:456-2000, Effective depth, depth of neutral axis, lever arm, effective span, nominal cover, minimum and maximum reinforcement, Control of deflection,	
4.	Reinforced Concrete beams		14
	4.1	Under reinforced, balanced and over reinforced section, singly reinforced and doubly reinforced sections, necessity of doubly	

		reinforced sections, types of beams, only basic concept of T and L- beams. Basic concept of cantilever beam.	
	4.2	Calculation of Moment of resistance of singly reinforced sections (only simply supported Rectangular sections)	
	4.3	Design for size and area of steel of singly reinforced section and detailing. (only simply supported Rectangular sections)	
	4.4	Calculation of Moment of resistance of doubly reinforced sections(only simply supported Rectangular sections)	
	4.5	Design for size and area of steel of doubly reinforced sections and detailing(only simply supported Rectangular sections)	
5.	Limit state of collapse –Shear and Bond		6
	5.1	Necessity of shear reinforcement, Nominal and permissible shear stress, shear reinforcement: vertical stirrups, lateral ties, bond stress, development length, lap length, curtailment of bars, anchoring of bars (only brief description of all above)	
	5.2	Design of shear reinforcement as per IS:456-2000	
6.	Reinforced Concrete Slabs (only simply supported)		12
	6.1	Brief description of One way and two way slab.	
	6.2	Design for size and area of steel of one way slab and detailing	
	6.3	Design for size and area of steel of two way slab and detailing	
7.	Reinforced Concrete Column (only short and axially loaded column)		8
		Long and short column, slenderness ratio, design and drawing of only axially loaded short square, rectangular and circular column.	
8.	Design of footings		8
		Types of footings, Safe bearing capacity of soil, Design and detailing of square and rectangular isolated footing of uniform thickness	
9.	Basic concept of Pre stressed concrete		2
		Definition, principle, advantages and disadvantages of pre stressed concrete, Materials used in pre stressed concrete, Methods of pre stressing- pre tensioning and post tensioning , tendons (No Numerical)	
9.	Class Test		3



8. Distribution of Marks:

Chapter No.	Chapter Title	Type of question		Total Marks
		Objective type (Compulsory)	Short/Descriptive Questions	
1.	Properties of Concrete and steel	3	--	3
2.	Fundamentals of Limit State Method	4	--	4
3.	General design considerations (IS:456-2000)	3	--	3
4.	Reinforced Concrete beams	5	10	15
5.	Limit state of collapse –Shear and Bond	--	5	5
6.	Reinforced Concrete Slabs	2	10	12
7.	Reinforced Concrete Column	4	10	14
9.	Basic concept of Pre stressed concrete	2	--	2
	Total	25	45	70

9.0 Table of Specification for Theory (DESIGN OF RCC STRUCTURE)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Properties of concrete and steel	2	3	1	1		-
2	Fundamentals of limit state method	3	6	2	1		-



3	General design consideration(IS:456-2000)	2	3	1		1	-
4	Reinforced concrete beams	14	23	3	2	9	-
5	Limit state of collapse –Shear and bond	6	10	2	1	3	-
6	Reinforced concrete slabs(only simply supported)	12	20	1	3	8	-
7	Reinforced concrete column(only short and axially loaded column)	8	13	2	2	4	-
8	Design of footings	8	13	2	2	4	
9	Basic concept of pre-stressed concrete	2	3	1	1		
10	Internal assessment	3	6				
		Σ b=57 hrs and 3 hrs internal assessment	100				-



10.Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Properties of concrete and steel	2	1		3					-
2	Fundamentals of limit state method	2	1	1	4					-
3	General design consideration(IS:456-2000)	1	1	1	3					-
4	Reinforced concrete beams	1	1	3	5	2	2	6		10
5	Limit state of collapse –Shear and bond				-	1	1	3		5
6	Reinforced concrete slabs(only simply supported)	1	1		2	2	2	6		10
7	Reinforced concrete column(only short and axially loaded column	1	1	2	4	2	2	6		10
8	Design of footings	1		1	2	2	3	5		10
9	Basic concept of pre-stressed concrete	1	1		2					-
10	Internal assessment				-					-
					25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

N.B :-

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

11. Suggested Implementation Strategies:-

- a) All the design should be in Limit state method.



- b) The structural detailing should be drawn in the answer script itself (No need of separate drawing sheet).
- c) The duration of each class should not be more than 2hrs.
- d)

12. Suggested Learning Resource: -

Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process. Models of various RCC elements with reinforcement detailing should be shown for better understanding and concept.

RECOMMENDED BOOKS

1. Reinforced Concrete- Limit State Design- Ashok K. Jain
2. R.C.C. Design and Drawing- Neelam Sharma
3. Structural design and drawing- N. Krishna Raju
4. Prestressed Concrete- Krishna Raju
5. IS:456-2000: code of practice for plain and reinforced concrete
6. IS:875-1987: code of practice for design loads
7. SP 34 handbook on concrete reinforcement and detailing
8. IS: 13920-1993: Ductile detailing of reinforced concrete structures subjected to seismic forces- code of practice

***(Answer should be done only on answer script. No drawing sheet shall be supplied.
Exam should be conducted in Class room instead of drawing hall)***

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX



4: Course Title :- GEO TECHNICAL & FOUNDATION ENGINEERING

(Duration of Exam= 3 hrs)

2. Course Code :- CV-504

3. Semester :- 5th (Civil)

4. COURSE OUTCOME (CO)

On completion of the course, the student will be able to:

a	Explain soil as three phase system and establish relationship between properties of soil
b	Determine properties of soil by following standard test., procedure and plot particle size distribution curve
c	Determine permeability by constant head and falling head test using Darcy's Law
d	Obtain OMC & MDD for any soil sample by performing Proctor Compaction test
e	Calculate shear strength of soil, and bearing capacity of soil
f	Collect soil samples in field and test in the laboratory

INTENDED LEARNING OUTCOME (ILO)

CHAPTER TITLE	After the completion of the chapter, the students will learn
Introduction	➤ IS definition of soil ➤ Importance of soil studies in civil engineering as construction material and as foundation bed for structures ➤ Process of formation of soil and different types of soil on the basis of process of formation ➤ Soil map of India
Properties of soil	➤ Soil as a three phase system ➤ Concept of water content and determination of water content by oven drying method as per IS code.

	➤ Definitions of void ratio, porosity and degree of saturation, density index, unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight ➤ Determination of bulk unit weight and dry unit weight by core cutter method and sand replacement method as per IS code ➤ Definition of specific gravity and its determination by pycnometer. ➤ Inter relationship between void ratio, porosity, specific gravity, water content, degree of saturation, unit weight, dry unit weight etc. ➤ Simple numerical problems related to index properties of soil ➤ Consistency of soil, stages of consistency, Atterberg's limits of consistency viz. liquid limit, plastic limit and shrinkage limit, plasticity index, liquidity index, Determination of liquid limit, plastic limit and shrinkage limit as per IS code ➤ Physical significance of consistency limits, simple numerical problems ➤ Particle size distribution, mechanical sieve analysis as per IS code, particle size distribution curve, effective diameter of soil, uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils ➤ Particle size classification of soils and IS classification of soil
Permeability and Seepage analysis	➤ Definition of permeability ➤ Darcy's law of permeability, definition of coefficient of permeability, typical values of coefficient of permeability for different soil ➤ Factors affecting permeability ➤ Determination of coefficient of permeability by constant head and falling head permeability tests, simple problems to determine coefficient of permeability ➤ Definition of seepage velocity, definition of seepage pressure, definition of phreatic line, definition of flow lines and equipotential lines

	➤ Definition of flow net, characteristics of flow net, application of flow net
Shear strength of soil	➤ Definition of shear strength, importance of shear strength, shear failure of soil, field situation of shear failure ➤ Concept of shear strength of soil ➤ Components of shearing resistance of soil – shear parameters, cohesion, internal friction ➤ Coulomb equation for shear strength ➤ Laboratory determination of shear strength of soil – Direct shear test
Bearing Capacity of soil	➤ Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure ➤ Terzaghi's analysis of bearing capacity ➤ Effect of water table on bearing capacity ➤ Field methods for determination of bearing capacity – Plate load test and standard penetration test. Test procedures as Per IS:1888 & IS:2131 ➤ Typical values of bearing capacity from building code IS:1904 ➤ Factors affecting bearing capacity of soil ➤ Definition of active earth pressure and passive earth pressure ➤ Settlement – Definition of uniform and differential settlement, effect of differential settlement on structure ➤ Empirical correlation between bearing capacity and SPT values
Compaction and Stabilization of Soil	➤ Concept of compaction ➤ Necessity of compaction ➤ Difference between compaction and consolidation ➤ Standard proctor test – test procedure as per IS code ➤ Compaction curve, optimum moisture content, maximum dry density, zero air voids line ➤ Modified proctor test ➤ Factors affecting compaction ➤ Field methods of compaction – rolling, ramming and vibration - Determination of field density of soil

	➤ Concept of soil stabilization, necessity of soil stabilization and different methods of soil stabilization – mechanical soil stabilization, lime stabilization, cement stabilization, bitumen stabilization, fly-ash stabilization
Site investigation and Sub Soil Exploration	➤ Necessity of site investigation and sub-soil exploration ➤ Types of exploration – general, detailed ➤ Method of site exploration - open excavation and boring, preparation of bore hole log, criteria for deciding the location and number of test pits and bores holes
Foundation Engineering	➤ Introduction, definitions, objectives and requirements of foundation Criteria for selection of type of foundation ➤ Types of foundations - Shallow and Deep foundations ➤ Shallow foundation - definition and sketch of different shallow foundation ➤ Deep foundation - types and definition of different deep foundation ➤ Pile foundation - Introduction and uses of piles

5. Teaching Scheme (in hours/week)

Total contact hours : L 45 hrs. T 15 hrs. P 45 hrs.

Lecture	Tutorial	Practical	Total
3		3	6

6. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	4



7. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction	1.1 IS definition of soil, Importance of soil studies in Civil Engineering as construction material, as foundation bed for structures, Formation of soil, Residual soil, Transported soil, Soil map of India.	02
2	Properties of soil	2.1 Soil as a three phase system 2.2 Water content, Determination of water content by oven drying method as per IS code. 2.3 Void ratio, porosity and degree of saturation, density index, Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight, Determination of bulk unit weight and dry unit weight by core cutter method and sand replacement method as per IS code, Specific gravity, determination of specific gravity by pycnometer. 2.4 Inter relationship between void ratio, porosity, specific gravity, water content, degree of saturation, unit weight, dry unit weight etc. Simple Numerical problems 2.5 Consistency of soil, stages of consistency, Atterberg's limits of consistency viz. Liquid limit, plastic limit and shrinkage limit, plasticity index. Liquidity index, Determination of liquid limit, plastic limit and shrinkage limit as per IS code. Physical significance of consistency limits. Simple numerical Problem. 2.9 Particle size distribution, mechanical sieve analysis as per IS code, particle size distribution	10

		curve, effective diameter of soil, Uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils. 2.10 Particle size classification of soils & IS classification of soil	
3	Permeability and Seepage analysis	3.1 Definition of permeability 3.2 Darcy's law of permeability, coefficient of permeability, typical values of coefficient of permeability for different soil 3.3 Factors affecting permeability 3.4 Determination of coefficient of permeability by constant head and falling head permeability tests, simple problems to determine coefficient of permeability. 3.5 Definition of seepage velocity, Definition of seepage pressure, Definition of phreatic line, Definition flow lines and equipotential lines. 3.6 Definition Flow net, Characteristics of flow net, application of flow net (No numerical problems)	10
4	Shear strength of soil	4.1 Definition of shear strength, Importance of shear strength, Shear failure of soil, field situation of shear failure 4.2 Concept of shear strength of soil 4.3 Components of shearing resistance of soil – Shear parameters, cohesion, internal friction 4.4 Coulomb equation for Shear strength 4.5 Purely cohesive and cohesion less soils	06



		4.6 Laboratory determination of shear strength of soil – Direct shear test,	
5	Bearing Capacity of soil	Bearing Capacity of Soils 5.1 Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure 5.2 Terzaghi's analysis and assumptions made. 5.3 Effect of water table on bearing capacity 5.4 Field methods for determination of bearing capacity – Plate load test and standard penetration test. Test procedures as Per IS:1888 & IS:2131 5.5 Typical values of bearing capacity from building code IS:1904 5.6 Factors affecting bearing capacity of soil. 5.6 Definition of active earth pressure and passive earth pressure, 5.7 Settlement – Definition of Uniform and Differential Settlement; Effect of differential settlement on structure. 5.8 Empirical correlation between bearing capacity and SPT values.	07
6	Compaction and Stabilization of Soil	6.1 Concept of compaction, Necessity of compaction, Difference between compaction and consolidation 6.2 Standard proctor test – test procedure as per IS code, Compaction curve, optimum moisture content, maximum dry density, Zero air voids line. 6.3 Modified proctor test 6.4 Factors affecting compaction 6.5 Field methods of compaction – rolling,	07



		ramming & vibration and 6.6 Determination of field density of soil. 6.7 Concept of soil stabilization, necessity of soil stabilization 6.8 Different methods of soil stabilization – Mechanical soil stabilization, lime stabilization, cement stabilization, bitumen stabilization, fly-ash stabilization	
7	Site investigation and Sub Soil Exploration	7.1 Necessity of site investigation & sub-soil exploration. 7.2 Types of exploration – General , detailed. 7.3 Method of site exploration open excavation & boring, Preparation of bore hole log . 7.4 Criteria for deciding the location and number of test pits and bores holes 7.5 Disturbed & undisturbed soil samples for lab testing.	06
8	Foundation Engineering	Foundation - Introduction - Definitions - Objectives - Requirements of foundation - Criteria for selection of type of foundation Types of foundations - Shallow and Deep foundations Shallow foundation- Definition and sketch of different shallow foundation Deep foundation :- Types and definition of different deep foundation. Pile foundation :-Introduction - Uses of piles	05
9	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	07



8. Distribution of Marks/ Table of Specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Descriptive Questions	
1	Introduction	1	-	1
2	Properties of Soil	4	10	14
3	Permeability & seepage analysis	4	10	14
4	Shear Strength of soil	2	5	07
5	Bearing Capacity of soil	4	5	09
6	Compaction and Stabilization of Soil	4	5	09
7	Site investigation and Sub Soil Exploration	4	5	09
8	Foundation Engineering	2	5	07
Total		10	45	70

9.0 Table of Specification for Theory (GEOTECHNICAL & FOUNDATION ENGINEERING)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	2	3	1	1		-
2	Properties of soil	10	17	2	3	5	-
3	Permeability and seepage analysis	10	17	2	3	5	-
4	Shear strength of soil	6	10	2	2	2	-



5	Bearing capacity of soil	7	12	2	2	3	-
6	Compaction and stabilization of soil	7	12	2	2	3	-
7	Site investigation and sub soil exploration	6	10	2	1	3	-
8	Foundation engineering	5	7	2	1	2	
9	Internal assessment	7	12	2	2	3	
		$\Sigma b=53$ hrs+ 7hrs internal assessment	100				-

10 Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1			1					-
2	Properties of soil	2	1	1	4	2	2	6		10
3	Permeability and seepage analysis	2	1	1	4	2	2	6		10
4	Shear strength of soil	1	1		2	1	1	3		5
5	Bearing capacity of soil	2	1	1	4	2	1	4		7
6	Compaction and stabilization of soil	1	1	2	4	2	1	6		9
7	Site investigation and sub soil exploration	2	1	1	4	2	1	6		9
8	Foundation engineering	1	1		2	2	1	4		7
9	Internal assessment									



10										
					25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11. Suggested Implementation Strategies:- :- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process .

12. Suggested Learning Resource :-

a. Book list

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Dr. B. C. Punmia	Soil Mechanics & Foundation Engineering		Standard Book house, New Delhi
Murthi	Soil Mechanics & Foundation Engineering		Tata McGraw Hill, New Delhi
B.J. Kasmalkar	Soil Mechanics		Pune vidhyarti Griha, Pune.
Dr Gopalranjan	Soil Mechanics & Foundation Engg		
Dr Alom Singh	Soil Mechanics & Foundation Engineering		
A.K. Upadhyaya	Soil & Foundation Engineering		S.K Kataria & Sons

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

N.B:- Optional question may be of same topic in the form of either or type like below

Explain briefly the Standard Proctor Test

OR

Explain briefly the Modified Proctor Test

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX



4: Course Title :- GEO TECHNICAL & FOUNDATION ENGINEERING (PRACTICAL)

Practical

Skills to be developed:

Intellectual Skills:

- a. Identify properties of soil.
- b. Interpret test results.
- c. Follow IS procedure testing

Motor Skills:

- a. Measure the quantities accurately
- b. Handle the instruments carefully.

List of Practical (any ten)

1. Determination of water content of given soil sample by oven drying method as per IS code.
2. Determination of bulk unit weight dry unit weight of soil in field core cutter method as per IS code
3. Determination of bulk unit weight dry unit weight of soil field by sand replacement method as per IS Code
4. Determination of Liquid limit & Plastic limit of given soil sample as per IS Code.
5. Determination of given size distribution of given soil sample by mechanical sieve analysis as per IS Code.
6. Determination of coefficient of permeability by constant head test
7. Determination of coefficient of permeability by falling head test practical (Live demo or prerecorded demo)
8. Determination of shear strength of soil using direct shear test.
9. Determination of shear strength of soil using Laboratory Vane shear test
10. Determination of MDD & OMC by standard proctor test on given soil sample as per IS Code.
11. Determination of CBR value of given soil sample.



12. Determination of shear strength of soil using unconfined compressive strength.
13. Determination of shear strength of soil using tri-axial shear test.

Note: video cassettes or cd's of below experiments developed by NITTTR (if available) shall be shown to the students on T. V. / L.C.D. projector prior to the conductance of above experiments.

XXXXXXXXXXXXXXXXXXXXX



5: Course Title :-ADVANCED BUILDING CONSTRUCTION & EARTHQUAKE RESISTANT TECHNOLOGY

1. Course Code :- CV-505
2. Semester :- 5th (Civil)
3. COURSE OUTCOME (CO)

On completion of the course, the student will be able to:

a	Set out foundation trenches properly
b	Supervise pile foundation work
c	Plan and orient a building effectively
d	Install firefighting equipment
e	Supervise the reinforcement detailing of structure.
f	Explain and perform retrofitting in structure
g	Use and interpret IS: 13920-1993 code of practice

INTENDED LEARNING OUTCOME (ILO)

CHAPTER TITLE	After the completion of the chapter, the students will learn
Excavation	➤ Setting out foundation trenches. ➤ Excavation of foundation and timbering of trenches. ➤ Methods and precautions including dewatering of foundation trenches.
Pile foundation	➤ Advantages of pile foundation. ➤ Pile driving and about pile driving equipment and accessories. ➤ Methods of pile driving and their suitability in different site conditions.
Building Planning & Orientation	➤ Building bye-laws for different types of buildings in different zones. ➤ National building code 2005. ➤ Principle of planning of building.
Fire Protection	➤ Different fire extinguishing systems and their uses at specific cases.



& Building Acoustics	➤ Fire detection and alarm system. ➤ Fire resistant construction of walls and columns, floors and roofs, wall openings. ➤ Exit requirement of residential and institutional building ➤ Echo, reverberation, sound absorption and absorbents. ➤ Conditions for good acoustics of a hall, treatment of interior surface of hall. ➤ Sound insulation, sound insulating materials, sound insulating wall construction.
Earthquake	➤ Structure of earth. ➤ Seismic Zone of India and its map. ➤ Brief idea of Tectonic plate. ➤ Causes of earthquake. ➤ Magnitude and Intensity of earthquake, Richter scale. ➤ Effect of earthquake.
Seismic Performance of RCC building	➤ Flow of inertia forces. ➤ Strong column weak beam analogy. ➤ Irregularities of building and their effects on performance during earthquake. ➤ Introduction to importance of seismic resistant construction. ➤ Seismic design philosophy. ➤ General principle of earthquake resistant building.
Ductile detailing of RCC building	➤ Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces as per IS: 13920-1993.
Strengthening and retrofitting of existing structure	➤ Introduction and need of retrofitting. ➤ Methodology for seismic retrofitting. ➤ Grouting, Guniting, Shotcrete, Confining the masonry, Inserting new walls, Jacketing of column and beam, Use of fibre reinforced polymer/ plastic (FRP), Adding of shear walls, Infill wall and Bracing.

4. Teaching Scheme (in hours/week)

Total contact hours : Lecture 45 hrs. Tutorial 15 hrs

Lecture	Tutorial	Practical	Total
3			3



5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100				100	3

6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Excavation	1.1 Setting out foundation trenches. 1.2 Excavation of foundation and timbering of trenches. 1.3 Methods and precautions including dewatering of foundation trenches (excavation in Waterlogged areas)	03
2	Pile foundation	2.1 Advantages of pile foundation 2.1 Pile driving and pile driving equipment and accessories 2.2 Methods of pile driving and their suitability in different site conditions	04
3	Building Planning & Orientation	3.1 Building bye-laws for different types of buildings in different zones. 3.2 National building code 2005 3.3 Principle of planning of building	05
4	Fire Protection & Building	4.1 Different fire extinguishing systems and their uses at specific cases	08

	Acoustics	4.2 Fire detection and alarm system 4.3 Fire resistant construction of walls and columns, floors and roofs, wall openings. 4.4 Exit requirement of residential and institutional building 4.5 Echo, reverberation, sound absorption and absorbents. 4.6 Conditions for good acoustics of a hall, treatment of interior surface of hall. 4.7 Sound insulation, sound insulating materials, sound insulating wall construction.	
5	Earthquake	5.1 Introduction to earthquake, Structure of earth, Seismic Zone of India and its map, Brief idea Of Tectonic plate , Causes of earthquake, 5.2 Magnitude and Intensity of earthquake, Richter scale 5.3 Effect of earthquake	05
6	Seismic Performance of RCC building	6.1 Flow of inertia forces 6.2 Strong column weak beam analogy 6.3 Irregularities of building- Vertical and Horizontal , Effect of irregularities on performance during earthquake. 6.4 Introduction to importance of seismic Resistant construction 6.5 Seismic design philosophy 6.6 General principle of earthquake resistant building	10
7	Ductile detailing of	7.1 Through discussion of IS: 13920-1993	10



	RCC building	(code of practice for Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces).	
8	Strengthening and retrofitting of existing structure	8.1 Introduction and need of retrofitting 8.2 Methodology for seismic retrofitting 8.3 Retrofitting of structure- Grouting, Guniting, Shotcrete, Confining the masonry, Inserting new walls, Jacketing of column and beam, Use of fibre reinforced polymer/ plastic (FRP), Adding of shear walls, Infill wall and Bracing.	08
9	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	07

7. Distribution of Marks

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/ Descriptive Questions	
1	Introduction	2	-	2
2	Pile foundation	2	5	7
3	Building Planning & Orientation	3	5	8
4	Fire Protection & Building Accoustics	3	5	8
5	Earthquake	3	5	8
6	Seismic Performance of RCC building	4	10	14
7	Ductile detailing of	4	10	14



	RCC building			
8	Strengthening and retrofitting of existing structure	4	5	9
Total		25	45	70

9.0 Table of Specification for Theory

(ADVANCED BUILDING CONSTRUCTION & EARTHQUAKE RESISTANT TECHNOLOGY)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Excavation	3	5	1	1	1	-
2	Pile foundation	4	7	2	1	1	-
3	Building planning & orientation	5	8	2	1	2	-
4	Fire protection & building acoustics	8	13	2	3	3	-
5	Earthquake	5	8	2	1	2	-
6	Seismic performance of RCC building	10	17	3	2	5	-
7	Ductile detailing of RCC building	10	17	3	2	5	
8	Strengthening and retrofitting of existing structure	8	13	2	2	4	-
9	Internal assessment	7	12	2	2	3	
		Σb=53 hrs+	100				-

		7hrs internal assessment					

10 . Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Excavation	1	1		2					-
2	Pile foundation	1		1	2	2	1	2		5
3	Building planning& orientation	2	1		3	2	1	2		5
4	Fire protection & building acoustics	2	1		3	2	1	2		5
5	Earthquake	2	1		3	2	1	2		5
6	Seismic performance of RCC building	2	1	1	4	3	2	5		10
7	Ductile detailing of RCC building	2	1	1	4	2	3	5		10
8	Strengthening and retrofitting of existing structure	2	1	1	4	2	1	2		5
9	Internal assessment									
10										
					25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11. Suggested Implementation Strategies:- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process.



12. Suggested Learning Resource :-

a. Book list

Name of Authors	Titles of the Book	Edition	Name of the Publisher
NeelamSarma	Earthquake Resistant Building Constructin		SK Kataria& Sons
BL Gupta/ Amit Gupta	Principle of Earthquake Resistant Design of Structure & tsunami		Standard Publisher Distributor.
Krinitzsky	Fundamental of Earthquake Resistant Construction		Wiley
Paulay	Seismic Design of RCC & Masonry Building		Wiley
BIS	Relevant IS Code		BIS

QUESTION PATTERN

N.B:- Optional question may be of same topic in the form of either or type like below

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

Q no:- Explain briefly the process of Grouting

Or

Explain briefly the process of Jacketing a column.

XXXXXXXXXXXXXXXXXXXXXXX



6:Course Title :- PROFESSIONAL PRACTICE-III

1. Course Code :- Cv-510
2. Semester :- 5th (Civil)
3. Rationale of the Subject/ Courses :-

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

Course Objectives (CO)

The Student will be able to:

- k) Acquire information from different sources.
- l) Prepare notes for given topic.
- m) Present given topic in a seminar.
- n) Interact with peers to share thoughts.
- o) Prepare a report on industrial visit, expert lecture.

INTENDED LEARNING OUTCOMES (ILO)

Sl.No.	Course outcomes	Indented Learning Outcome
1.	CO-1: Acquire information from different sources	1. Identify the different sources to be visited for knowledge hunting from Civil Engg point of view. 2. State the importance of the source 3. Collect the required information from the source 4. Discuss the details of the source 5. Structured industrial visit and preparation of report of a. Nearby Road under construction b. Nearby hydroelectric power plant c. Nearby dam or retaining wall d. Nearby RCC Chowkat construction plant

		e. Nearby steel structures
2.	CO-2: Prepare notes for given topic.	1. Identification of an important topic 2. Group discussion 3. Note preparation on that topic 4. Presentation of the selected topic
3.	CO-3: Present given topic in a seminar	1. State the importance of seminar 2. Preparation of lecture by PPT 3. Fluency in communication 4. Presentation of any topic in front of audiences
4.	CO-4: Interact with peers to share thoughts.	1. Explain the importance of interaction 2. Explain of brain storming 3. Advantage of brain storming. 4. State importance of sharing thoughts
5	CO-5 Prepare a report on industrial visit, expert lecture.	1. Importance of industry institute interaction 2. State relation between industry and technology 3. Structured visit of important industry 4. Acquiring knowledge from expert lecture. 5. Report preparation on brick factory, cement factory etc.

4. Teaching Scheme (in hours/week)

Total contact hours : 90 hrs.

Lecture	Tutorial	Practical	Total
1		2	3

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (PT+ PA)	Credit
ESE	Sessional (SS)		-----	PT	PA	17/50	50	2
	TA	HA						
---	---	---		25	25			



UNIT	TOPIC/ACTIVITIES	CONTACT HRS
1	Industrial and site visit : Structured industrial visit and site visit shall be arranged and report of the same should be submitted by individual student (Any two of the following) 1.11 Nearby Road under construction 1.12 Nearby hydroelectric power plant 1.13 Nearby dam or retaining wall 1.14 Nearby RCC Chowkat construction plant 1.15 Nearby steel structures 1.16 Any other nearby industry related Civil Engineering.	10
2	Guest Lectures : Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized from any TWO of the following areas: 2.1 Earthquake resistant technology 2.2 Modern method of surveying 2.3 Modern construction equipment 2.4 Interior design of building 2.5 Non Destructive testing 2.6 Any other relevant topic related to Civil Engg.	6
3	Information search : Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic. Following topics are suggested j) Surveying by total station k) Retrofitting of structures l) Ready mix concrete m) Foundation of structure	6

	n) Seismic performance of RCC building o) Recent trend of green building concept p) Effect of earthquake on structures q) Any other topic suggested by teacher	
4	Student Activities and Seminar : The students in a group of 3 to 4 will perform any one of the following activities and same will be presented in seminar 4.10 Collect all IS code of practices related to Civil Engineering 4.11 Collect soil samples from nearby five locations and test some physical properties and prepare a report 4.12 Use NDT equipment available in your institute in an existing RCC building and prepare a report. 4.13 Discuss the function and performance of heavy equipment used in modern construction 4.14 Handling and use of modern surveying equipment 4.15 Any other relevant field selected by teachers	8

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7: Course Title :- GREEN BUILDING (Elective)

1. Course Code :- CV-507
2. Semester :- 5th (Civil)
3. Course Objective (CO)

On completion of the course, the student will be able to:

a	Explain the benefit of green building conception
b	Design a green building
c	Manage the water and energy
d	Recycle the waste materials
e	Maintained the air quality and hygienic condition inside the building

CO/ CHAPTER	INTENDED LEARNING OBJECTIVE (ILO)
CO-1 Explain the benefit of green building conception	1. Define of Green Building, 2. Explain the benefits of Green Building, 3. Components/features of Green Building 4. Site selection of green building 5. Energy Efficiency, Water Efficiency, Material Efficiency, 6. Indoor Air Quality
CO-2 Design a green building	1. Define Landscaping, 2. Explain the building form, 3. Explain orientation, building envelope and fenestration 4. Passive heating and cooling techniques
CO-3 Manage the water and energy	1. Define Water reducing fixtures, 2. Explain Rainwater harvesting and techniques, 3. Water and waste water management, 4. Management of Solid waste. 5. Explain of renewable energy 6. Use and advantage of solar energy 7. Use of high performance glass

CO-4 Recycle the waste materials	1. Importance of recycle of materials 2. Use of Various types of eco-friendly materials, 3. Use of flyash bricks, recycled ceramic tiles, recycled glass tiles, porcelain tiles, wood, steel, aluminum and renewable materials, agrifibre
CO-5 Maintained the air quality and hygienic condition inside the building	1. Importance of natural air ventilation system in dwelling house 2. Importance of Indoor Air Quality 3. Different types of low VOC materials, 4. Day lighting. 5. Rating system in green building conce

4. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
3			3

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA		100	3
	TA	HA						
70	10	20						

6. Detailed Course Content

Chapter no	Chapter title	Content	Remarks if any
	1.0	Introduction to Green Building 1.1 Definition of Green Building, 1.2 Benefits of Green Building, 1.3 Components/features of Green Building – Site selection, Energy	6 hrs



		Efficiency, Water Efficiency, Material Efficiency, Indoor Air Quality.	
	2.0	Design Features for Green Building 2.1 Landscaping, building form, orientation, building envelope and fenestration 2.2 Passive heating and cooling techniques	6 hrs
	3.0	Water and Waste Water Management 3.1 Water reducing fixtures, 3.2 Rainwater harvesting and techniques, 3.3 Water and waste water management, 3.4 Solid waste management.	6 hrs
	4.0	Energy Management 4.1 Use of renewable energy 4.2 Solar water heating system 4.3 Other energy saving options 4.4 High performance glass	6 hrs
	5.0	Eco-friendly Materials 5.1 Various types of eco-friendly materials, 5.2 Use of recycled materials-: flyash bricks, recycled ceramic tiles, recycled glass tiles, porcelain tiles, wood, steel, aluminium and renewable materials, agrifibre	7 hrs
	6.0	Indoor Air Quality 6.1 Natural air ventilation systems, 6.2 Different types of low VOC materials, 6.3 Day lighting.	6 hrs
	7.0	Rating Systems for Green Building	7hrs

		7.1 Different types of rating systems and their special features	
	8.0	Class Test(three nos)	4 hrs

7. Distribution of marks :- At least 6 marks shall be asked from each chapter

9.0 Table of Specification for Theory (GREEN BUILDING)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction to green building	6	12	2	3	1	-
2	Design features for green building	6	12	2	2	2	-
3	Water and waste water management	6	12	2	1	3	-
4	Energy management	6	12	2	1	3	-
5	Eco-friendly materials	7	16	2	2	3	-
6	Indoor air quality	6	12	2	1	3	-
7	Rating systems for green building	7	16	2	2	2	-
8	Internal assessment	4	8	1	1	2	
		$\sum b=44$ hrs+ 4hrs internal assessment	100				-

Probable Marks distributions are given below (minimum 6 marks from each chapter)



10. Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction to green building	1	1		2	2	1	1		4
2	Design features for green building	2	1		3	1	1	2		4
3	Water and waste water management	2	1	1	4	2	1	2		5
4	Energy management	1	1	1	3	2	1	2		5
5	Eco-friendly materials	2	1	2	5	2	3	5		10
6	Indoor air quality	1	1	2	4	2	3	5		10
7	Rating systems for green building	1	1	2	4	2	2	3		7
8	Internal assessment									
9										
10										
					25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11 . Suggested Implementation Strategies:- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process

N.B:- Optional question may be of same topic in the form of either or type.

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

Reference Books

1. Pradeep Kumar and Amit Kumar Tyagi; Managing Energy Efficiently in Hotels and Commercial Buildings, TERI Publications.
2. M K Halpeth, T Senthil Kumar and G Harikumar; Light Right – A Practising Engineer's Manual on Energy Efficient Lighting, TERI Publications



3. R K Pachauri and ShyamalaAbeyratne; From Sunlight to Electricity – Solar Photovoltaic Applications, TERI Publications.
4. National Rating system-GRIHA, TERI Publications.

XXXXXXXXXXXXXXXXXXXXX



7:Course Title:-ARCHITECTURAL PRACTICES & INTERIOR DESIGN (Elective)

Course Code :- CV-508 Contact hrs :-45 hrs

1. Semester :- 5th (Civil)
2. Rationale of the Subject/ Courses :-

On completion of the course, the student will be able to:

a	Select a proper site with suitable orientation
b	Increase the aesthetic view of a building
c	Design a building
d	Select a suitable and proper material for the building
e	Use all places effectively.

ARCHITECTURAL PRACTICES & INTERIOR DESIGN (CV-508) 5th SEM (CO)COURSE OUTCOME

Diploma in civil Engineering Students will be able to:

- **CO-1:** To select a proper site with suitable orientation.
- **CO-2:** To increase the aesthetic view of a building.
- **CO-3:** To design a building.
- **CO-4:** To select a suitable and proper material for the building.
- **CO-5:** To use all places effectively.

INTENDED LEARNING OUTCOMES (ILO)

Sl.No.	CO/ CHAPTER	Indented Learning (ILO)
1.	CO-1:Architectural design	1. Principles of architecture. 2. Define site selection, climatic conditions, sun control, orientation of building and site. 3. Building by laws and its application.



2.	CO-2:Building aesthetics	1. Explain the feeling for aesthetics and unity, composition, unity, mass composition, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern. 2. State character of building.
3.	CO-3:Design of project	1. A case of study of residential building. 2. A case of study of public and commercial building. 3. Aspect of working drawing- Plan, elevation section.
4.	CO-4:Landscaping	1. State soft and hard landscaping. 2. Define basic principles of landscaping. 3. Explain assessment of land. 4. Design procedure. 5. A case of study of landscape for public and commercial campus.
5.	CO-5:Elements and principles of design	1. Define the elements such as form, texture, light, colour, effect of light on colour and texture, space organization of space in design, space pattern. 2. Explain the importance of colour as art element and various colour scheme.
6.	CO-6: Anthropometrics data	1. Define the relation of human measurement to furniture . 2. Define movement and to circulation patterns.
7.	CO-7:Interior materials	1. Explain the different interior materials, paneling, partitions, finishing materials, furniture. 2. Define false ceiling, flooring, paints.
8.	CO-8:Interior of residential building	1. Define the use of space, circulation and standard size of furniture. 2. Explain the plans and elevation of interior with furniture for living space, dining space, kitchen,



		bed room, guest room etc.
9.	CO-9:Interior of small commercial building	1. Define the planning of interior for small commercial units such as offices, consulting chambers, shops etc. 2. Define the furniture details such as executive table , architectures table etc. used in commercial units.

4. Teaching Scheme (in hours/week)

Total contact hours : 60 hrs.

Lecture	Tutorial	Practical	Total
3			3

5. Examination Scheme :

6. Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA		100	3
	TA	HA						
70	10	20						

7. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Architectural Design:	1.1 Review of principles of Architecture. 1.2 Site selection, climatic conditions, sun control, orientation of building & site. 1.3 Building by laws & its applications.	2
2	Building Aesthetics:	2.1 Feeling for aesthetics and utility, composition, unity, mass composition, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern.	5



		2.2 Character of Building.	
3	Design of Projects	3.1 A case study of residential building. 3.2 A case study of public / commercial building. 3.3 Aspect of working drawing – plan, elevation section	5
4	Landscaping:	4.1 Soft and Hard landscaping. 4.2 Basic Principle of landscaping. 4.3 Assessment of land. 4.4 Design procedure. 4.5 A case study of land scape for public/ commercial building campus.	5
5	Elements and principles of design.	5.1 Elements such as form, texture, light, colour, effect of light on colour and texture, space organization of space in design, space pattern. 5.2 Importance of colour as art element. Various colour scheme.	5
6	Anthropometrics Data:	6.1 Relation of human measurement to furniture and movement and to circulation patterns	2
7	Interior Materials:	7.1 Different interior materials, paneling, partitions, finishing materials, furniture. 7.2 False ceiling, flooring, paints.	4
8	Interior of Residential building:	8.1 Use of space, circulation, standard size of furniture. 8.2 Plans and elevation of interior with furniture for living space, dining space, kitchen, bed room, guest room etc.	5
9	Interior of small	9.1 Planning of interior for small commercial	5

	commercial building:	units such as offices, consulting chambers, shops etc. 9.2 Furniture details such as executive table, architectures table etc. used in commercial units.	
10	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment	07

8. Distribution of Marks/ Table of specifications

Chapter No	Chapter Title	Type of Question			Total Marks
		Objective Type (Compulsory)	Short Questions	Descriptive Questions	
N.B:- At least 5 marks shall be asked from each chapter.					

9. Table of Specification for Theory (ARCHITECTURAL PRACTICES & INTERIOR DESIGN,CV-508)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Architectural design	2	4				-
2	Building aesthetics	5	11				-
3	Design of projects	5	11				-
4	landscaping	5	11				-
5	Elements and principles of design	5	11				-



6	Anthropometrics data	2	4				-
7	Interior materials	4	10				-
8	Interior of residential building	5	11				
9	Interior of small commercial building	5	11				
10	Internal assessment	7	16				
		$\Sigma b=38$ hrs+ 7hrs internal assessment	100				-

10. Suggested Implementation Strategies:- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process. The short question should carry 2 or 3 marks per question and descriptive question may carry minimum 5 marks and maximum 10 marks per question. Objective type question will carry 1 mark per question and it shall be of very short type or multiple choice or fill up the gap type.

11. Suggested Learning Resource :

a. Book list

Name of Author	Name of Book	Edition	Name of publisher
M. G. Shah, C.M. Kale / S.Y. Patiki	Building construction		Tata McGraw hill
Joseph De Chiara, JulinsPanch, martin Zelnik	Time saver standard for interior design & space planning		McGraw hill



Albert O. Halse	The use of colours in interiors		McGraw hill
BousmahaBaiche &Nicholes Walliman	Nwtert – Architects		Black Well Science

b. Manuals National building codes.

- Journals
1. Inside out side
 2. A + D Journal on architecture.
 3. Indian Architects and builders.

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8:Course Title :- CONSTRUCTION TECHNIQUE & EQUIPMENT (ELECTIVE)

1. Course Code :- CV-508
2. Semester :- 5th (Civil)
3. COURSE OBJECTIVES (CO)

On completion of the course, the student will be able to:

Manage and control construction work and valuation of materials
Explain various new method of construction
Control and guide the construction procedure
Use effectively all construction materials
Supervise all construction equipment and machineries.

CO	ILO
CO-1 Manage and control construction work and valuation of materials	Explain the necessity of Scope Human Resources Planning – Selection & Recruitment – Training & Development – Performance Appraisal – Industrial Safety. Explain and perform Time management- Resource management-, Network Techniques & Bar chart- Simple problem. Define the valuation and its necessity Explain scrap value, salvage value, depreciation Estimate the valuation of materials Explain the method of valuation.
CO-2 Explain various new method of construction	1. State the use of Steel Formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork. Slip formwork- meaning, use of slip formwork. Process of concreting with slip forms. 2. Use of lifts, belt conveyors, Pumped concrete, Equipment and machinery required for construction of Multistoried Buildings. Precautions and safety measures.



	3. Explain the various methods of pre-cast and pre-fabrication 4. Explain the Necessity of soil reinforcing, Use of wire mesh and geo-synthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques 5. Explain and use of all modern Hoisting Equipment, Conveying Equipment , Excavation Equipment Compacting Equipment Concrete Mixer, Stone Crushers.
CO-3 Control and guide the construction procedure	1. Select proper equipment for respective work 2. Act as a team leader 3. Follow economical and efficient procedure 4. Ensure proper maintenance and use of equipment 5. Follow proper time management. Pile driving equipment, Pile hammers, selection of hammers.
CO-4 Use effectively all construction materials	1. Explain all construction materials 2. State the use of Steel, Carbon, Glass fibers. Use of fibers as construction materials. Properties of fibers. 3. State and use of PVC, RPVC, HDPE, FRP, GRP etc. Colored plastic sheets. Use of plastic as construction Material 4. Explain the Properties and uses of artificial timber. Types of artificial timber available in market, strength of artificial timber. 5. Explain and use of of acoustics materials, wall claddings, plaster boards, Micro-silica, artificial sand, bonding agents, adhesives etc.
CO-5 Supervise all construction equipment and machineries.	1. State the function and operating procedure of all construction equipment and machineries 2. Guide the operator of all construction equipment and machineries.



Lecture	Tutorial	Practical	Total
3			3

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100				100	3

6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Human Resource Management & Construction Planning	Scope & Functions – Human Resources Planning – Selection & Recruitment – Training & Development – Performance Appraisal – Industrial Safety. Scheduling- Time management- Resource management-, Network Techniques & Bar chart- Simple problem.	6
2	Valuation	Definition of different terms – (i) valuation, (ii) value and cost, (iii) scrap value and salvage value, (iv) assessed value (v) speculative value, (vi) sinking fund, (vii) depreciation and obsolescence. Qualifications and functions of a valuer and governing factors affecting the value of a property. Methods of valuation – rental and depreciation	4

3	Advanced Construction Materials	3.1 FIBERS AND PLASTICS. Types of fibers – Steel, Carbon, Glass fibers. Use of fibers as construction materials. Properties of fibers. Types of Plastics – PVC, RPVC, HDPE, FRP, GRP etc. Colored plastic sheets. Use of plastic as construction Material. 3.2 Artificial Timber Properties and uses of artificial timber. Types of artificial timber available in market, strength of artificial timber. 3.3 Miscellaneous materials Properties and uses of acoustics materials, wall claddings, plaster boards, Micro-silica, artificial sand, bonding agents, adhesives etc.	8
4	Advanced Construction Method	4.1 Formwork Steel Formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork. Slip formwork- meaning, use of slip formwork. Process of concreting with slip forms. 4.2 Construction of Multistoried Buildings Use of lifts, belt conveyors, Pumped concrete, Equipments and machinery required for construction of Multistoried Buildings. Precautions and safety measures. 4.3 Prefabricated Construction Meaning of prefabrication and precast. Methods of prefabrication- plant prefabrication and site prefabrication. Linear members, rigid frames, roofing and flooring members, R.C. Doors and windows, wall panels, Jointing of structural	12



		members. 4.4 Soil Reinforcing techniques Necessity of soil reinforcing, Use of wire mesh and geo-synthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques	
5	Hoisting & Conveying Equipment	5.1 Hoisting Equipment Principle and working of Tower cranes, Crawler cranes, Truck mounted cranes, gantry cranes, Mast cranes, Derricks. 5.2 Conveying Equipment Working of belt conveyors. Types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks	5
6	Earth moving machinery	6.1 Excavation Equipment Use, Working and output of bulldozers, scrapers, graders, and power shovels, JCB, draglines. 6.2 Compacting Equipment Use of rollers, Roller types- Plain rollers , Sheep footed rollers, Vibratory rollers, pneumatic rollers. Rammers- use and working	5



7	Concreting Equipment	7.1 Concrete Mixers Types of concrete mixers. Weigh batching equipment, Equipment for transportation of concrete- trollies, lifts. Transit mixers, Concrete vibrator-Needle vibrators, Screed vibrators. Automatic concrete plants – layout, process and working. 7.2 Stone Crushers Types of stone crushers, capacities and working. Equipment for production of artificial sand.	6
8	Equipment Management	8.1 Miscellaneous Equipment Pile driving equipment, Pile hammers, selection of hammers. Working of hot mix bitumen plant, Bitumen paver. Grouting equipments, Floor polishing machine. 8.2 Equipment Management Standard equipment, Special equipment, Selection of equipment, Owning and operating cost of construction equipment. Economic life of construction equipment. Preventive maintenance of equipment, Break down maintenance of Equipment.	8
8	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	6



7. Distribution of Marks/Table of Specifications

Chapter No	Chapter Title	Type of Question			Total Marks
		Objective Type (Compulsory)	Short Questions	Descriptive Questions	
N.B:- At least 6 marks question shall be asked from each chapter.					

9.0 Table of Specification for Theory (CONSTRUCTION TECHNIQUES AND EQUIPMENTS,CV-508)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Human resource management & construction planning	6	10	2	2	2	-
2	Valuation	4	8	1	1	2	-
3	Advanced construction materials	8	13	2	2	4	-
4	Advanced construction method	12	20	3	4	5	-
5	Hoisting & conveying equipment	5	8	2	2	1	-
6	Earth moving machinery	5	8	2	1	2	-
7	Concreting equipment	6	10	2	2	2	-
8	Equipment management	8	13	2	3	2	

9	Internal assessment	6	10	2	2	2	
		$\Sigma b=54$ hrs+ 6hrs internal assessment	100				-

Probable Marks distributions are given below (minimum 6 marks from each chapter)

10 .Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Human resource management & construction planning	1	2		3	1		2		3
2	Valuation	1		1	2	1	1	2		4
3	Advanced construction materials	1	1	1	3	2	3	5		10
4	Advanced construction method	2	1	2	5	2	1	4		7
5	Hoisting & conveying equipment	1	1	1	3	2	1	2		5
6	Earth moving machinery	1		2	3	2	3	4		9
7	Concreting equipment	1		2	3	1	1	1		3
8	Equipment management	1	1	1	3	2	1	1		4
9	Internal assessment									
10										
					25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

- 11 Suggested Implementation Strategies Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process. The short question should carry 2 or 3 marks per question and descriptive question may carry minimum 5 marks and maximum 10



marks per question. Objective type question will carry 1 mark per question and it shall be of very short type or multiple choice or fill up the gap type.

12 Suggested Learning Resource :-

a. Book list

Text Books:			
Name of Authors	Titles of the Book	Edition	Name of the Publisher
R. Chudly	Construction Technology Vol. I to IV		ELBS- Longman Group
R.L. Peurifoy	Construction Planning equipment and methods		McGraw-Hill Co. Ltd.
S. Seetharaman	Construction Engineering and management		Umesh Publication, New Delhi
B. Sengupta and Guha	Construction management and Planning		Tata McGraw Hill
R. Satyanarayana and S. C. Saxena	Construction Planning and Equipment		Standard Publication New Delhi
Mantri Construction	A to Z of Building Construction		Mantri Publication
Govt. of Maharashtra	PWD Handbooks for – Materials - Foundation - Construction equipment		Govt. of Maharashtra

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Remarks

- The proposed syllabus is the outcome of team work
- The proposed syllabus has been prepared as per the instructions obtained from the higher authority time to time.



SIXTH SEMESTER CIVIL ENGINEERING BRANCH



COURSE STRUCTURE OF CIVIL ENGINEERING

6TH SEMESTER

Subject Code	Subject	Study Scheme (contact hour/week)			Evaluation Scheme								Total Mark (Th+Pr)	Credit
					Theory					Practical				
		L	T	P	ESE	Sessional (SS)			Pass (ESE+SS)	PT	PA	Pass mark (PT+PA)		
						TA	HA	Total(TA+HA)						
Hu-601	Industrial management & Entrepreneurship	3			70	10	20	30	33				100	3
CV-601	Design of Steel Structure	4	1		70	10	20	30	33				100	4
CV-602	Estimating-II	3			70	10	20	30	33				100	3
CV-603	Environmental Engineering & Pollution Control	3	1	3	70	10	20	30	33	25	25	17	150	4
Cv-611	Project & Seminar			6						100	50	50	150	3
Cv-612	General Viva		2							50		17	50	2
CV-610	Professional Practice-IV	1		2						25	25	17	50	2
OPTIONAL (ANY ONE)														
CV-604	Building Repair & Maintenance	3		3	70	10	20	30	33	25	25	17	150	4
CV-605	Railway Bridge & Tunnel Engineering	3		3	70	10	20	30	33	25	25	17	150	4
Total		18	3	14										
		35			Grand Total =								850	25



1: Course Title :Industrial Management and Entrepreneurship

4. Course Code: **Hu – 601**

5. Semester: **VI**

6. Aim of the Course:

1. To acquaint the students with managerial activities
2. To provide introductory knowledge of Cost Accounting
3. To introduce students with industrial legislation
4. To explain the scope for self-employment
5. To compare and contrast different forms of business organization
6. To identify the opportunities to start a small scale industry

7. Course Outcomes:

On completion of the course on IME, students will be able to

- CO₁ = explain managerial activities.
- CO₂ = describe leadership qualities and decision making process.
- CO₃ = state the elements of costs.
- CO₄ = explain important industrial laws.
- CO₅ = define different forms of business organisations
- CO₆ = identify entrepreneurial abilities for self employment through small scale industries.

8. Teaching Scheme (in hours)

Lecture	Tutorial	Practical	Total
42hrs	3 hrs	--	45 hrs



9. Examination Scheme:

Theory				Practical				Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination		Sessional		
70	30	100	33	--	--	--	--	100

10. Detailed Course Content:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
				42 hrs
1.0	Introduction to Management :	i) Meaning and Concept ii) Functions of Management iii) Principles of Management	i) Explain functions and principles of management	3
2.0	Leadership Decision Making & Communication :	i) Definition of Leader ii) Functions of a leader iii) Decision making – Definition iv) Decision making process v) Communication – definition, importance & types	i) Develop leadership qualities ii) Demonstrate decision making abilities	4
3.0	Introduction to Cost :	i) Definition and classification of Cost	i) State elements of costs ii) Explain	3

		ii) Elements of Cost iii) Break Even Analysis	Break Even Analysis	
4.0	Human Resource Management:	i) Meaning of manpower planning ii) Recruitment and Selection procedure iii) Payment of wages – factors determining the wage iv) Methods of payment of wages – Time rate and Piece rate v) Labour Turnover – definition, its causes, impact and remedy	i) State selection procedure of employees ii) Distinguish Time rate and Piece rate system of wage payments iii) Explain causes and impact of labour turnover	5
5.0	Industrial Legislation :	i) Need of Industrial legislation ii) Indian Factories Act – 1948 – Definition of Factory, main provisions regarding health, Safety and Welfare of Workers iii) Industrial Dispute Act – 1947 – Definition of	i) Identify the needs and importance of industrial laws	5



		Industrial dispute, Machineries for settlement of Industrial dispute in India		
6.0	Production Management :	i) Meaning of Production ii) Production Management – definition, objectives, functions and scope iii) Inventory Management, Basic idea	i) State the objectives and functions of Production management	3
7.0	Marketing Management:	i) Meaning and functions of marketing ii) e- Commerce iii) Channels of distribution iv) Wholesale and retail trade	i) state the functions of wholesalers and retailers	2
8.0	Entrepreneur andEntrepreneurs hip:	i) Definition of Entrepreneur and Entrepreneurship ii) Qualities required by an entrepreneur iii) Functions of an entrepreneur iv) Entrepreneurial motivation	i) State the qualities and functions of an entrepreneur	3
9.0	Forms of Business Organisation:	i) Sole Trader – meaning, main features, merits and demerits ii) Partnership –	i) Differentiate different forms of Business organization	5

		definition, features, merits and demerits iii) Joint Stock Company – Definition, types, features, merits and demerits	ii) compare and contrast features, merits and demerits of different business organizations .	
10.0	Micro and Small Enterprises:	i) Definition of Micro & Small enterprises ii) Meaning and characteristics of Micro and Small enterprise iii) Scope of SSI with reference to self-employment iv) Procedure to start SSI – idea generation, SWOT analysis v) Selection of site for factories	i) Define micro and small enterprises ii) Explain the procedure to start a small enterprise	4
11.0	Support to Entrepreneurs	a) Institutional support: i) Introduction ii) Sources of information and required application forms to set up SSIs iii) Institutional support of various National & State level organizations – DICCC, NSIC, IIE, MSME - DI, Industrial Estates	i) identify the supporting agencies to entrepreneurs ii) Explain the role of financial support organisations	5



		b) Financial support: i) Role of Commercial banks, RRB, IDBI, ICICI, SIDBI, NEDFi, and State Financial Corporations ii) Special incentives and subsidies for Entrepreneurship Development in the North East		
	Class Test			3 hrs
	Total			45 hrs

(9) TABLE OF SPECIFICATIONS for Industrial Management & Entrepreneurship

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Compre-hension	Application	HA
1	Introduction to Management	3	7	2	3	0	0
2	Leadership & Decision Making	4	9.5	3	4	0	0
3	Introduction to Cost	3	7	3	2	0	0
4	Human Resource Management	5	12	6	2	0	0
5	Industrial Legislation	5	12	4	4	0	0
6	Production Management	3	7	3	2	0	0
7	Marketing Management	2	5	4	0	0	0
8	Entrepreneur & Entrepreneurship	3	7	3	2	0	0
9	Forms of Business	5	12	3	5	0	0



	Organisation						
10	Micro & Small Enterprises	4	9.5	4	3	0	0
11	Support to Entrepreneurs	5	12	4	4	0	0
Total		42	100	39	31	0	70

K = Knowledge C = Comprehension A = Application HA =
Higher Than Application (Analysis, Synthesis, Evaluation)

$$C = \frac{b}{\Sigma b} \times 100$$

10. Distribution of Marks:

DETAILED TABLE OF SPECIFICATIONS FOR IME

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand Total
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	
1	Management	1	0	0	1	1	0	0	0	1	0	3	0	0	3	5
2	Leader & Decisi	1	0	0	1	2	1	0	0	3	0	3	0	0	3	7
3	Cost	1	1	0	2	2	1	0	0	3	0	0	0	0	0	5
4	HRM	2	1	0	3	1	1	0	0	2	3	0	0	0	3	8
5	Laws	3	0	0	3	0	0	0	0	0	1	4	0	0	5	8
6	Product Manage	2	1	0	3	1	1	0	0	2	0	0	0	0	0	5
7	Market	2	0	0	2	2	0	0	0	2	0	0	0	0	0	4
8	Entrepreneurship	1	1	0	2	2	1	0	0	3	0	0	0	0	0	5
9	Forms of BO	2	1	0	3	0	0	0	0	0	1	4	0	0	5	8
10	MSME	2	0	0	2	0	0	0	0	0	2	3	0	0	5	7
11	Support to Entp.	3	0	0	3	1	0	0	0	1	0	4	0	0	4	8
	Total	20	5	0	25	12	5	0	0	17	7	21	0	0	28	70

K = Knowledge C = Comprehension A = Application
HA = Higher Than Application T = Total

Higher than Application (Analysis, Synthesis, Evaluation)

11. Suggested implementation Strategies: Modified syllabus may be implemented with effect from January, 2020 (Starting with the present batch (2018) of 2nd Semester students)



12. Suggested learning Resource:**a. Book list :**

Sl. No.	Title of Book	Name of Author(s)	Publisher
1	Industrial Management	S.C. Jain H.S. Bawa	Dhanpat Rai & Co. (P) Ltd. New Delhi-110006
2	Business Organisation and Entrepreneurship Development	S.S. Sarkar R.K. Sharma Sashi K. Gupta	Kalyani Publishers, New Delhi-110002
3	Entrepreneurial Development	S. S. Khanka	S. Chand & Co. Ltd. New Delhi-110055
4	Business Methods	R.K. Sharma Shashi K Gupta	Kalyani Publishers, New Delhi
5	Entrepreneurship Development and Management	Dr. R.K. Singhal	S.K. Kataria & Sons, New Delhi-110002
6	Business Administration & Management	Dr. S.C. Saxena	Sahitya Bhawan, Agra
7			
8			

b. List of Journals**c. Manuals****d. Others**

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2:Course Title :- ESTIMATING –II

1. **Course Code :- CV-602**
2. **Semester :- 6th (Civil)**
3. **Objective of the Subject/ Courses :-**

Objective:- Student will be able to

- Calculate the approximate cost of civil structure
- Prepare check list of items of construction
- Prepare estimate of civil engineering works.
- Prepare rate analysis of items of construction.
- Specifications of various items of construction works.
- Calculate earth works involved in roads and canals.

Course outcomes :-

After completion of this course, the students will be able to –

CO 1	-	prepare estimates of Civil Engineering works.
CO 2	-	analyze the rates of different items of construction.
CO 3	-	demonstrate the concept of specification required in the course.
CO 4	-	calculate the approximate cost of Civil Engineering structures.
CO 5	-	explain the method of executing Departmental Works
CO 6	-	prepare Measurement Book as PWD hand book.

COs and ILOs of Estimating II

COs	ILOs
1. PREPARE ESTIMATES OF CIVIL ENGINEERING WORKS	1. Calculate the quantity of earth work by a. Mid sectional area method b. Mid depth method c. Prismoidal formula method

COs	ILOs
	2. define lead and lift 3. show the tabular forms of each method of calculation of earth work 4. describe the units of measurement of various items of



	road work. - explain the methods of estimating earth work for road embankment and canal. - find out different items of Hard Crust for bituminous road. - compare the most accurate method of estimating earth work of road/ canal.
2. ANALYSE THE RATES OF DIFFERENT ITEMS OF CONSTRUCTION	- explain the meaning of the term 'rate analysis' - state the main features of rate analysis. - enumerate the factors effecting rate analysis. - Analyze the rate of - Brick work - PPC work - RCC work - Doors and Windows. - Plastering - Cement concrete floor - White washing - Centering and plastering - DPC - Earth work for foundation - Prepare checklist for different types of construction work.
3. DEMONSTRATE THE CONCEPT OF SPECIFICATION REQUIRED IN THE COURSE	- classify specification - distinguish between General specification and Detailed specification. - state general specifications of an RCC building.
	- write the detailed specification of - Earth work in excavation. - First class brickwork - Wood Work in doors and windows



	d. GI sheet and AC sheet roofing e. C.C. Floor f. Tile flooring g. RCC works h. Centering and shuttering i. White washing j. Plastering
4. CALCULATE THE APPROXIMATE COST OF CIVIL ENGINEERING STRUCTURES	1. estimate the approximate cost of a given Civil Engineering structure using the latest PWD schedule of rates
5. EXPLAIN THE METHOD OF EXECUTING DEPARTMENTAL WORKS	1. define the term 'contract' 2. Classify contract. 3. describe in brief Administrative approval, technical sanction contingencies, budget, tender, earnest money, security deposit, running bill and final bill. 4. describe E tendering
6. PREPARE MEASUREMENT BOOK AS PWD HAND BOOK	1. explain the use of Measurement Book 2. make entries in the Measurement Book 3. state the general rules for units of measurement for different items of work as PWD hand book. 4. state in brief about master roll.

Pre-requisite:-

- Student should have basic knowledge about calculation of area, volume of objects.

4. Teaching Scheme (in hours/week)

Total contact hours : Lecture 45 hrs. Tutorial 15 hrs.

Lecture	Tutorial	Practical	Total
3			3



5. Examination Scheme:-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr.)	Credit
ESE	Sessional (SS)		33/100	PT	PA		100	3
	TA	HA						
70	10	20						

6. Detail course content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Earthwork	➤ Method of calculation of quantity of earthwork by a. Mid sectional area method b. Mid depth method c. Prismoidal formula method ➤ Lead and lift ➤ Tabular forms of each method of calculation of earth work.	8
2	Roadwork	➤ Unit of measurement of various items of road work ➤ Method of estimating various items of road work	3
3	Rate analysis	➤ Analysis of rates- its meaning and main features. ➤ Factors effecting rate analysis ➤ Analysis of rate of a. Brick work b. PCC work c. RCC work d. Doors and windows e. Plastering f. Cement concrete floor g. Whitewashing h. Centering and plastering i. DPC j. Earth work for foundation	9
4	Specification	➤ Specification and its type a. General specification b. Detailed specification ➤ General specification of an RCC building	9



		➤ Detailed specification of a. Earth work in excavation b. First class brick work c. Wood work in doors and windows d. CGI sheet and AC sheet roofing e. Cement concrete floor f. Tile flooring g. RCC works h. Centering and shuttering i. White washing j. plastering	
5	Departmental works	➤ Contracts, various types of contract, item rate contract, lump sum contract, labor contract, contract agreement. ➤ Administrative approval, technical sanction, contingencies, budget, tender, earnest money, security deposit, running bill and final bill. ➤ E tendering ➤ Measurement book (MB) use, entries made in MB, general rules for units of measurement for different items of work as PWD hand book. ➤ Master roll	10
6	Revision and Class test	➤ Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	6

7. Distribution of Marks/ Table of specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/ Descriptive Questions	
1	Earthwork	5	7	12
2	Roadwork	2	5	07
3	Rate analysis	5	10	15
4	Specification	5	10	15
5	Departmental works	8	13	21
		25	45	70



9. Table of Specification for Estimating-II (CV-602)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Earthwork	8	18	1	4	7	
2	Roadwork	3	7	1	1	5	
3	Rate analysis	9	20	1	5	9	
4	Specification	9	20	1	5	9	
5	Departmental works	10	22	4	7	10	
6	Internal assessment	6	13	-	-	-	-
		$\Sigma b = 39 \text{ hrs.} + 6 \text{ hrs internal assessment}$	100	8	22	40	

10. Details Table of Specification for Theory

Sl. no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Earthwork	1	2	2	5		2	5		7
2	Roadwork	1	1		2			5		5
3	Rate analysis	1	2	2	5		3	7		10
4	Specification	1	2	2	5		3	7		10
5	Departmental works	2	3	3	8	2	4	7		13
	Total				25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11. Suggested Implementation Strategies :- Teacher will use Black board, OHP, Smart board, Video etc for effective teaching learning process.

12. Text books:

Titles of the book	Name of author	NAME OF PUBLISHER
Estimating and costing in civil engineering	B.N. Dutta	UBS publication
Civil Engineering contracts and estimates	B.S. Patil	Universities press
Estimating and costing	G.S. Birdie	Dhanpat Rai and Sons
Civil Estimating & Costing	A K Upadhyay	S K Kataria & Sons

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.



2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX



3:Course Title :- ENVIRONMENTAL ENGINEERING & POLLUTION CONTROL

1. Course Code :- CV-603

2. Semester :- 6th (Civil)

3. Objective of the Subject/ Courses :-

On completion of the course, the student will be able to:

* Estimate water demands for a certain locality
* Analyze the quality and standard of potable water
* Suggest the treatment required by knowing the quality of water
* Handle the sewerage system.
* Analyze the sewage
* Suggest the waste water treatment
* Suggest the treatment for industrial waste
* Know the solid waste management

CO's and ILO's of ENVIRONMENTAL ENGINEERING & POLLUTION

CONTROL

CHAPTER TITLE	After the completion of the chapter, the students will learn
Introduction	➤ Environmental Pollution and its types. ➤ Causes of Pollution. ➤ Effects of Pollution. ➤ Control of Pollution. ➤ Existing laws related to Environmental Pollution.
Water Supply	➤ Demands of water- Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand, Factors affecting rate of Demand, Variations of water demand. ➤ Forecasting of population, Methods of forecasting of population. ➤ Design period for water supply scheme. ➤ Sources of Water. ➤ Intake Structures- Definition and types. ➤ Ground water recharging – Necessity, importance and advantages. ➤ Need for analysis quality of water. ➤ Characteristics of water- Physical, Chemical and Biological. ➤ Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests. ➤ E coli index, MPN. ➤ Sampling of water. ➤ Water quality standards as per Indian Standard & World Standard (WHO). ➤ Aeration- Objects and methods of aeration. ➤ Plain sedimentation, Sedimentation with coagulation, principles of



	coagulation, types of coagulants, Jar Test, process of coagulation. ➤ Classification of filters- slow sand filter, rapid sand filter, pressure filter, construction and working of slow sand filter and rapid sand filter. ➤ Disinfection- Objects, methods of disinfection. ➤ Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance. ➤ Miscellaneous water Treatments (Water Softening, Defluorination techniques). ➤ Flow diagram of water treatment plants. ➤ Conveyance and Distribution of Water- Layouts of distribution of water- dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.
Domestic Sewage	➤ Importance and necessity of sanitation, Necessity to treat domestic sewage. ➤ Recycling and Reuse of domestic waste. ➤ Definitions- Sewage, sullage, types of sewage. ➤ Definitions of the terms related to Building Sanitation- Building Sanitary fittings- Water closet – Indian and European type, Traps- types, qualities of good trap, Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan). ➤ Systems of Sewerage-Types of Sewers, Systems of Sewerage, Self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers. ➤ Sewer Appurtenances-Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets, Flushing Tanks – manual and automatic. ➤ Analysis of Sewage, Characteristics of sewage, B.O.D./ C.O.D. and significance ➤ Aerobic and anaerobic process. ➤ Treatment of Sewage, Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming. ➤ Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process. ➤ Disposal of sewage, Septic tank, Oxidation pond, Oxidation ditch.
Industrial Waste	➤ Characteristics of industrial waste water from sugar, dairy, distillery, textile, paper and pulp and oil industries and their suggestive treatments.
Environmental Pollution	➤ Sources of Air Pollution and Noise Pollution ➤ Effects and Control of Air Pollution and Noise Pollution ➤ Global warming ➤ Acid Rain ➤ Ozone hole
Solid Wastes from Society	➤ Solid Waste Management. ➤ Definitions- Refuse, Rubbish, Garbage, Ashes. ➤ Constituents of solid wastes. ➤ Sources of solid wastes, Collection of Solid Wastes. ➤ Methods of collection of solid wastes. ➤ Methods of treatment and disposal of solid waste. ➤ Types of hazardous wastes. ➤ Characteristics of hazardous wastes.



	➤ Treatment and disposal of hazardous waste.
Environmental Sanitation	➤ Environmental Sanitation and its necessity and importance. ➤ Types of Privies – Aqua privy and Bore Hole Latrine.

4. Teaching Scheme (in hours/week)**Total contact hours : Lecture 45 hrs. +****Tutorial= 15 hrs.**

Lecture	Tutorial	Practical	Total
3	1	3	7

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr.)	Credit
ESE	Sessional (SS)		33/100	PT	PA	17/50	150	4
	TA	HA						
70	10	20		25	25			

6. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	Introduction	1.1 Introduction Environment, Ecosystem, Environmental Pollution and its types, Causes of Pollution, Effects of Pollution, Control of Pollution, Existing laws related to Environmental Pollution.	2
2	Water Supply	PUBLIC WATER SUPPLY 2.1 Quantity of Water Demands of water: Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand ; Factors affecting rate of Demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, (Numerical Problem), Design period for water supply scheme. 2.2 Sources of Water Surface and Subsurface sources of water, Intake Structures- Definition and types, Ground water recharging – Necessity Importance and advantages. 2.3 Quality of Water	14



		Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli index, MPN, Sampling of water, Water quality standards as per Indian Standard & World Standard (WHO) 2.4 Purification of Water Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, classification of filters : slow sand filter, rapid sand filter, pressure filter, construction and working of slow sand filter and rapid sand filter, Disinfection: Objects, methods of disinfection, Chlorination-Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Miscellaneous water Treatments (Water Softening, Defluorination techniques) , Flow diagram of water treatment plants. 2.5 Conveyance and Distribution of Water - Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages	
3	Domestic Sewage	3.1 Introduction Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste Definitions- Sewage, sullage, types of sewage 3.2 Building Sanitation Definitions of the terms related to Building Sanitation- Building Sanitary fittings- Water closet – Indian and European type, Traps- types, qualities of good trap, Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan) 3.3 Systems of Sewerage-Types of Sewers, Systems of Sewerage, Self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers. 3.4 Sewer Appurtenances Manholes and Drop Manhole-component parts,, location, spacing, construction details, Sewer Inlets , Street Inlets, Flushing Tanks – manual and automatic	10

		3.5 Analysis of Sewage Characteristics of sewage, B.O.D./ C.O.D. and significance., Aerobic and anaerobic process, 3.6 Treatment of Sewage Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage, Septic tank, Oxidation pond, Oxidation ditch	
4	Industrial Waste	4.1 Industrial Waste Water Characteristics of Industrial waste water, from sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments	3
5	Environmental Pollution	5.1 Air Pollution and Noise Pollution Sources, Effects and Control of Air Pollution, Effects and Control of Noise Pollution (only brief idea) Global warming, Acid Rain, Ozone hole	3
6	Solid Wastes from Society	SOLID WASTES FROM THE SOCIETY 6.1 Solid Waste Management Definitions – Refuse, Rubbish, Garbage, Ashes, Constituents of, solid wastes, Sources of solid wastes, Collection of Solid Wastes. Methods of collection of solid wastes Methods of treatment and disposal of solid waste. 6.3 Hazardous Wastes Introduction, Types of hazardous wastes. Characteristics of hazardous wastes. Treatment and disposal of hazardous waste	5
7	Environmental Sanitation	7.1 Environmental Sanitation Necessity and importance, Rural sanitation-Types of Privies – Aqua privy and Bore Hole Latrine.	3
8	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	5



8. Distribution of Marks/ Table of specifications

Chapter No	Chapter Title	Type of Question		Total Marks
		Objective Type (Compulsory)	Short/Descriptive Questions	
1	Introduction	2		2
2	Water Supply	6	15	21
3	Domestic Sewage	5	10	15
4	Industrial Waste	4	6	10
5	Environmental Pollution	4	4	8
6 & 7	Solid Waste from Society & Environmental Sanitation	4	10	14
Total		25	45	70

9. Table of Specification for Environmental Engineering & Pollution Control (CV-603)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	2	4	1	1		
2	Water Supply	14	30	3	5	13	
3	Domestic Sewage	10	22	1	4	10	
4	Industrial Waste	3	7	4	6		
5	Environmental Pollution	3	7	2	6		
6	Solid Waste from Society	5	10	1	6		
7	Environmental Sanitation	3	7	1	6		
8	Internal assessment	6	13	-	-	-	-
		$\sum b = 40 \text{ hrs.} + 6 \text{ hrs internal assessment}$	100	13	34	23	

10. Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1	1		2					
2	Water Supply	1	2	3	6	2	3	10		15
3	Domestic Sewage	1	1	3	5		3	7		10
4	Industrial Waste	2	2		4	2	4			6
5	Environmental Pollution	2	2		4		4			4
6	Solid Waste from Society	1	1		2		5			5
7	Environmental Sanitation	1	1		2		5			5
	Total				25					45

K = knowledge; C= comprehension; A= Application; HA= Higher than application

11. Suggested Implementation Strategies :- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process. Suggested Learning Resource :-

12.Book list

Text Books:			
Name of Authors	Titles of the Book	Edition	Name of the Publisher
Santosh Garg	Environmental Engineering (Volume I & II)		Khanna Publishers
Kamla A. &Kanth Rao D. L.	Environmental Engineering		Tata McGraw Hill
Birdie G. S. Birdie J. S.	Water Supply and Sanitary Engineering		DhanpatRai& Sons
Deolalikar S.G.	Plumbing – Design and Practice		Tata McGraw Hill
Rao M.N. Rao H.V.N.	Air Pollution		Tata McGraw Hill
AK Upadhyay& D Lal	Water Supply & Waste Water Engineering		S K Kataria& Sons

QUESTION PATTERN

1. The question pattern will be as per the instruction of SCTE or as per existing rules.
2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

XXXXXXXXXXXXXXXXXXXX



3:Course Title :- ENVIRONMENTAL ENGINEERING & POLLUTION CONTROL (PRACTICAL)

- ❖ **Contact hrs. :- 45 hrs.**
- ❖ **Course Code :- CV-603**
- ❖ **Semester :- 6th (Civil)**

Practical :

Skills to be developed:

INTELLECTUAL SKILLS:

1. Identify the method for testing of water.
2. Interpret the results

MOTOR SKILLS:

1. Observe chemical reactions
2. Handle instruments carefully.

List of Practical:**Water Supply Engineering:**

- 1) To determine fluoride concentration in given water sample
- 2) To determine the turbidity of the given sample of water.
- 3) To determine residual chlorine in a given sample of water.
- 4) To determine suspended solids, dissolved solid, and total solids of water sample
- 5) To determine the dissolved oxygen in a sample of water
- 6) To determine the optimum dose of coagulant in the given sample by jar test.

Sanitary Engineering:

- 1) To determine the dissolved Oxygen in a sample of waste water.
- 2) To determine B.O.D. of given sample of waste water.
- 3) To determine C.O.D. of given sample of waste water.
- 4) To determine suspended solids, dissolved solids and total solids of waste water sample.
- 5) Design the Septic, Tank for the public building such as hostel or hospital. Draw Plan and section of the same along with the drainage arrangement in soak pit.
- 6) To determine various pollutant levels in the atmosphere using Digital Air Volume sampler.
 - a) Energy generation plants from solid wastes.

XXXXXXXXXXXXXXXXXXXXX



4 Course : DESIGN OF STEEL STRUCTURES

Title (Duration of Exam = 4 hours)

1. **Course Code:** : Cv-601
2. **Semester** : 6th
3. **Objective of the subject/ Course** : Design of steel structures involves planning of structures, proportioning of members of structures for carrying load in an economical manner.

COURSE OUTCOMES AND INTENDED LEARNING OUTCOMES

Subject: Design of Steel Structures

Code: CV-603

COURSE OBJECTIVES	INTENDED LEARNING OUTCOMES (After attending the course the students will be able to.....)	Associated Skill
To make the students understand about structural steel and relevant code of practice	State properties of structural steel .	remember
	Give examples of structural steel.	understand
	Use steel tables for section properties of structural steel.	Apply
	Identify and compute loads in structure as per relevant code of practice.	remember
To develop the concept of Limit State Design in steel design	Define each types of Limit States	remember
	List the points of difference s between LSD and WSM design	remember
	explain the FOS adopted for Material and Loads	understand
	Asses the characteristic strength and characteristic loads.	evaluate
	Describe the various methods of structural analysis	understand
To familiarize with rivets and analysis of riveted joint	State the types of rivets.	remember
	Describe the failure of Riveted joint.	understand
	Show the types of arrangement of rivets in joint.	apply
	Calculate strength and efficiency of riveted joints	apply
	Design riveted joints for given loads.	create
To develop concept of bolted joint.	State the types of bolts.	remember
	Describe the advantage and disadvantage of bolted joint.	understand
	Show the types of arrangement of bolts in joint.	apply
	Describe the failure of bolted joint	understand
	Calculate strength and efficiency of bolted joints	apply
	Design bolted joints for given loads	create
	Detail the bolted connection in sheets.	create
Ability to perform	Differentiate frame and seated connection.	understand



bolted frame and seated connection for steel structures.	Analyze and design of bolted frame connection for beam column and beam - beam connection.	create
	Analyze and design of bolted unstiffened seated connection for beam column connection.	create
To be able to perform analysis and design of welded connection design.	State advantage and disadvantage of welded joint.	remember
	Describe the types welds.	understand
	Apply design considerations for welded joint as per IS 800-2007	Analyze
	Analyze and design welded joint subjected to axial load	Analyze
	Apply fillet weld for beam-column connection.	Analyze
Ability to design and draw tension member	Identify steel sections for tension member	Understand
	State factors affecting design of tension member	Remember
	Describe the failure modes for tension member	Understand
	Analyze and design of tension member simple types	Analyze
	Detail tension member for bolted and welded connection.	Apply
Ability to analyze , design and draw compression member.	Classify compression member depending on slenderness ratio.	Analyze
	Describe the failure modes for compressive member	understand
	Explain the failure modes of compression member.	analyze
	Design compression member for axially loaded member.	Analyze, create
To be able to design simple steel beams.	Illustrate the types of steel beams.	understand
	Classify beam cross sections	Apply
	List factors affecting lateral stability of beam	remember
	Describe the failure modes of beams	Understand
	Determine bending strength of laterally supported beam.	Apply
To understand the use of column bases and their design technique.	Name the types of column bases.	Remember
	Apply codal provisions for minimum thickness and effective area of column base.	Apply
	Design and analyze slab base and gusseted base plate for axial loads only.	Analyze ,create
	Sketch column bases as per design data.	create

5. Teaching Scheme (In hours/week)**Total Contact hr.= 60**

Lecture	Tutorial	Practical	Total
4 hrs./week	1	--	5 hrs



6.Examination Scheme

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA	17/50	150	4
	TA	HA						
70	10	20		25	25			

7.Detailed of Course Content:

Chapter No.	Chapter Title	Content	Duration (Hrs.)
1.	Introduction to steel structure:		2
		Advantage and disadvantage of steel structure as construction material, types of structural steel- mild steel, medium carbon steel, high carbon steel, low alloy steel and high alloy steel. Types of rolled steel sections with geometric shape, Grade of steel (IS:2060). Use of steel tables. Types of load and load combinations as per IS 875-1987. Familiarization with IS:800-2007	
2.	Design considerations(IS:800-2007)		3
		Philosophy of Limit state method of design, Characteristic loads, partial safety factors, characteristic strength, Design strength. Limit state of serviceability, forms of structural stability Deflection limit, vibration limit, Durability consideration, fire resistance, Various Methods of structural analysis (brief descriptions only)	
3.	Riveted Connections		8
		Rivets-their types, definition and terms used in riveting, riveted joints, failure of riveted joint, strength of riveted joint, rivet value, efficiency of riveted joint, design of riveted joint (simple problems)	
4.	Bolted Connections		8
	4.1	Bolts- their types, advantages and disadvantages of bolted connections, definition and terms used in bolt and bolting, failure of bolted connections, Efficiency. Type of joints. Lap and Butt Joint. Arrangement of bolts in connections, Simple problems using Limit State method.	
5.	Simple beam connections		4
	5.1	Framed connections-beam to beam connections, Beam column connections: Seated connections. Simple problems using Limit State method.(Bolted connection only)	
6.	Welded connections		5
		Welding- different types and properties of welds, advantage and Disadvantage of welded connection	

		, welding processes, weld specifications, Calculation of strength of welded joints using LSM, Design of fillet weld for symmetrical and unsymmetrical sections for axial load only	
7.	Design of tension members		7
		Definition of tension members, types, factors affecting Strength of tension members, lug angles, Design of tension member using bolted and welded connections.(simple problems only)	
8.	Design of compression members		7
		Definition, classification of compression members- long, short and intermediate, slender compression members, sections used for compression members, loads on compression members, possible failure modes, Effective length and effective cross sectional area, Modes of failure of axially loaded compression member. Limit of slenderness ratio. Design of compression members.(for axially loads only)	
9.	Design of beams		5
		Types of beams, lateral stability of beams, factors affecting lateral stability, effective length, buckling, bending, maximum deflection, design of beams.	
10.	Design of column bases		5
		Types of column bases ,slab bases and gusseted base plate, Code provision (IS:800-2007) minimum thickness and effective thickness and effective area of base plate, Design of Slab base plate using bolt for axial loads only. (No problems on Gusseted base design)	
11.	Class test and Seminar : Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.		6

8.Distribution of Marks/ Table of specifications

Chapter No.	Chapter Title	Type of question		Total Marks
		Objective type (Compulsory)	Short/Descriptive Questions	
1.	Introduction to steel structure	3	--	3
2.	Design considerations(IS:800-2007)	4	--	4
3,4 &6	Connections : Riveted , Bolted and	5	11	16



	welded			
5.	Simple beam connections	3	11	14
7& 8	Design of tension members and compression members	5	11	16
9 & 10	Design of beams and column bases	5	12	17
	Total	25	45	70

9. Table of Specification for Theory Design of Steel Structure (CV-601)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction to steel structure	2	4	3	2		-
2	Design considerations	3	5	1	4		-
3	Riveted connections	8	13	3	2		-
4	Bolted connections	8	13	1	2	3	-
5	Simple beam connections	4	7	1	3	4	-
6	Welded connections	5	8	1	2	5	-
7	Design of tension members	7	12	1	2	5	-
8	Design of Compression members	7	12	1			6
9	Design of beams	5	8	1	2		6
10	Design of column bases	5	8	1	2	6	
11	Internal assessment	6	10	-	-	-	-
		$\Sigma b=54$ hrs.+ 6hrs internal assessment	100	14	21	23	12

10. Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction to steel structure	1			1	2	2			4
2	Design considerations	1	2		3		2			2
3	Riveted connections	1	2		3	2				2



4	Bolted connections	1	2		3			3		3
5	Simple beam connections	1	1		2		2	4		6
6	Welded connections	1	2		3			5		5
7	Design of tension members	1	2		3			5		5
8	Design of Compression members	1			1				6	6
9	Design of beams	1	2		3				6	6
10	Design of column bases	1	2		3			6		6
	Total				25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11. Suggested Implementation Strategies:-

- All the design should be in Limit state method.
- The structural detailing should be drawn in the answer script itself (No need of separate drawing sheet).
- The duration of each class should not be more than 2hrs.

12. Suggested Learning Resource: -

Teacher will use Black board, OHP, Smart board, video etc. for effective teaching learning process. Models of various rolled steel section should be shown for better understanding and concept.

RECOMMENDED BOOKS

- Dr. N. Subramanian "Design of Steel Structures", Oxford University Press.
- K. S. Sai Ram "Design of Steel Structures" Pearson-Prentice Hall India Pvt Ltd
- M. R. Shiyekar "Limit State Design in Structural Steel", PHI Learning Pvt Ltd, 2011
- S. Ramamrutham "Design of Steel structures" DhanpatRai publishing House.
- Dr. Ramchandra&Gahlot- Design of Steel Structures
- IS:800-2007, IS:875,
- Steel Tables

Question Pattern

- The question pattern will be as per the instruction of SCTE or as per existing rules.
- The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type

Optional questions (if any) may be from the same topic as below

Q: Design a tension member

Or

Design a compression member

(Answer should be done only on answer script. No drawing sheet shall be supplied. Exam should be conducted in Class room instead of drawing hall)

XXXXXXXXXXXXXXXXXXXX



5:Course Title :- PROJECT & SEMINAR

1. **Contact hrs. :- Tutorial 45 hrs. + Practical 45 hrs.**

2. **Course Code :- CV-611**

3. **Semester :- 6th (Civil)**

4. **Objective of the Subject/ Courses :-**

On completion of the course, the student will be able to:

- Collect the information for a given project.
- Apply principles, theorems and bye-laws in the project planning and design.
- Interpret and analyze the data.
- Develop professional abilities such as persuasion, confidence, and perseverance and Communication skill.
- Develop presentation skill.
- Enhance creative thinking.

PROJECT & SEMINAR (CV-611) 6th SEM

(CO)COURSE OUTCOME)

Diploma in civil Engineering Students will be able to:

- **CO-1:** To collect information for a given project.
- **CO-2:** To apply principles, theorems and bye-laws in the project planning and design.
- **CO-3:** To interpret and analyze the data.
- **CO-4:** To develop professional abilities such as persuasion, confidence, and perseverance and communication skill.
- **CO-5:** To develop presentation skill.
- **CO-6:** To enhance creative thinking.

INTENDED LEARNING OUTCOMES (ILO)

Sl.No.	Course outcomes/ Topics	Indented Learning
1.	Intellectual skills	1. To decide and collect data for projects. 2. To read and interpret the drawing, data. 3. To design the components. 4. To apply the principles rules regulations and byelaws.



2.	Motor skills	1. To plan different phases of a task. 2. To prepare drawings for projects. 3. To use of computer for drawing, networking. 4. To work in a group for a given task.
3.	Project work	1. To collect data related to the project work 2. To develop team spirit 3. To write a complete project work 4. To develop confidence and communication skill 5. To draw conclusion and report writing

Pre-Requisite :-

1. Students should have entire knowledge of civil engineering.

5. Teaching Scheme (in hours/week) Total contact hours : Tutorial 60 hrs +Practical 60 hrs

Lecture	Tutorial	Practical	Total
		6	6

6. Examination Scheme :-

Theory			Pass marks (ESE+SS)		Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)				PT	PA			
	TA	HA							
					100	50	50	150	3

7. Examination Scheme :-

Theory			Pass marks (ESE+SS)		Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)				PT	PA			
	TA	HA							
					100	50	50	150	3



Project:

Skills to be developed:

INTELLECTUAL SKILLS:

- 1) Decide and collect data for projects.
- 2) Read and interpret the drawing, data.
- 3) Design the components.
- 4) Apply the principles rules regulations and byelaws.

MOTOR SKILLS:

- 1) Plan for different phases of a task.
- 2) Prepare drawings for project.
- 3) Use of computer for drawing, networking.
- 4) Work in a group for a given task.

LIST OF PROJECTS:

Following is the list /areas of suggested civil engineering projects to be undertaken by a group of 4 to 6 students . A topic for project can be selected on appropriate civil engineering subject or recent development in civil engineering.

The project report shall be in the following format:

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

LIST OF CIVIL ENGINEERING PROJECTS:

- 1) K.T. Weir
- 2) Lift Irrigation scheme.
- 3) Micro irrigation –Drip/Sprinkler Irrigation.
- 4) Junction planning for city roads/planning for roads for congested area/parking Studies etc.
- 5) Water shed development of small catchments.
- 6) Rain water harvesting for domestic or public building.
- 7) Campus development.
- 8) Interior decoration.
- 9) Concrete mix design.
- 10) Bridge design.
- 11) NDT of any RCC building.
- 12) Solid waste management.
- 13) Hospital waste disposal.
- 14) Recycling of resources.
- 15) Manufacturing of Pre cast concrete products.
- 16) Prestressed concrete.
- 17) Non conventional sources of energy.
- 18) Concrete pipe manufacturing unit.



- 19) Advance construction techniques.
- 20) Transfer of technology to villages.
- 21) Planning and design for residential apartments/commercial complex.
- 22) Planning and design of water treatment plant for given data.
- 23) Planning and design of water supply scheme for given lay out.
- 24) Planning and design of sewage treatment plant for given data.
- 25) Planning and design of sanitary scheme for given lay out.
- 26) ***Any other similar project can be selected.***

The Project Group and the faculty guide should be constituted at the beginning of 5th semester and initial work may be started at the 5th semester itself though the final project report has to be submitted at the end of 6th semester. The Project work must be reviewed twice in the same semester. On the basis of performance of students teacher/ guide/team of teacher will evaluate.

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6:Course Title :- PROFESSIONAL PRACTICE-IV

1. **Course Code :- Cv-610**
2. **Semester :- 6th (Civil)**
3. **Rationale of the Subject/ Courses :-**

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

Course objectives (CO)

The Student will be able to:

- p) Acquire information from different sources.
- q) Prepare notes for given topic.
- r) Present given topic in a seminar.
- s) Interact with peers to share thoughts.
- t) Prepare a report on industrial visit, expert lecture.

INTENDED LEARNING OUTCOMES (ILO)

Sl.No.	Course outcomes/ topic/ activities	Indented Learning
1.	CO-1: Industrial and site visit.	Structured industrial visit and site visit shall be arranged and report of the same should be submitted by individual student) 1. Nearby steel structure under construction. 2. Nearby railway bridge under construction. 3. Nearby tunnel under construction. 4. Nearby mega water treatment plant. 5. Nearby multi-storied flat under construction. 6. Any other nearby industry related civil engineering.
2.	CO-2: Guest lectures	Lectures by professional or industrial expert or Student seminars based on information search to be organized from any two the following areas: 1. Entrepreneurship. 2. Self-motivation and career counselling. 3. How to face interview. 4. Building repair and maintenance. 5. CPM and PERT. 6. Any other relevant topic related to civil engineering.



3.	CO-3: Information search	Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic. Following topics are suggested- 1. Job opportunities in different organization. 2. Scope for further higher studies. 3. Maintenance of building 4. Environmental monitoring system. 5. Design of water treatment plant. 6. Design of irrigation project. 7. Construction of tunnel. 8. Any other topic suggested by teacher.
4.	CO-4: Student activities and seminar	The Students in a group of 3 to 4 will perform any one of the following activities and same will be presented in seminar. 1. Visit of an old RCC building to observe defects and to suggest remedial measures. 2. Visit of an nearby factory or industry to study the management system. 3. Visit of the nearby town or city to study the sewage disposal system. 4. Collection of water samples from different sources to study the quality of drinking water. 5. Visiting of a nearby railway station for preparing a report on the station. 6. Any other relevant field selected by teacher.

4. Teaching Scheme (in hours/week)**Total contact hours : 30 hrs.**

Lecture	Tutorial	Practical	Total
		2	2

5. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (PT+ PA)	Credit
ESE	Sessional (SS)		-----	PT	PA	17/50	50	
	TA	HA						
---	---	---		25	25			



7.Detail course content

UNIT	TOPIC/ACTIVITIES	CONTACT HRS
1	Industrial and site visit : Structured industrial visit and site visit shall be arranged and report of the same should be submitted by individual student (Any two of the following) 1.17 Nearby Steel structure under construction 1.18 Nearby Railway bridge under construction 1.19 Nearby Tunnel under construction 1.20 Nearby Mega Water treatment plant 1.21 Nearby multi -storied flat under construction 1.22 Any other nearby industry related Civil Engineering.	10
2	Guest Lectures : Lectures by Professional / Industrial Expert / Student Seminars based on information search to be organized from any TWO of the following areas: 2.1 Entrepreneurship 2.2 Self-motivation and career counselling 2.3 How to face interview 2.4 Building repair and maintenance 2.5 CPM and PERT 2.6 Any other relevant topic related to Civil Engineering	6
3	Information search : Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic. Following topics are suggested r) Job opportunities in different organization s) Scope for further higher studies t) Maintenance of building u) Environmental monitoring system v) Design of Water treatment plant w) Design of irrigation project x) Construction of tunnel y) Any other topic suggested by teacher	6
4	Student Activities and Seminar : The students in a group of 3 to 4 will perform any one of the following activities and same will be presented in seminar 4.16 Visit of an old RCC building to observe defects and to suggest remedial measures 4.17 Visit of an nearby factory or industry to study the management system 4.18 Visit of the nearby town or city to study the sewage disposal system	8



	4.19 Collection of water samples from different sources to study the quality of drinking water. 4.20 Visiting of a nearby railway station for preparing a report on the station. 4.21 Any other relevant field selected by teachers	

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7: Course Title :- BUILDING REPAIR & MAINTENANCE (Optional)

1. **Course Code :- CV-604**
2. **Semester :- 6th (Civil)**
3. **COURSE OUTCOME (CO)**

On completion of the course, the student will be able to:

* Diagnosis the defect of the building
*Identify the causes of defect
* Apply common technique of repair
*Repair RCC element
*Apply common strengthening procedure to the structure

COURSE OUTCOMES AND INTENDED LEARNING OUTCOMES

Course Outcome	Intended Learning Outcomes
CO1-Define the Importance of maintenance, Find out the factors influencing maintenance,	ILOs 1. Define the maintenance 2. State the objectives of maintenance. 3. State the importance of maintenance. 4. State the factors influencing maintenance. 5. State the Life of building.
CO2-State the process of deterioration. Classify the deterioration of buildings. Find out the factors of deterioration. Effect of deterioration on bricks, timber, concrete , paints, glass and plastics.	ILOS 1. State the process of deterioration. 2. Classify the deterioration. 3. List out the process of deterioration. 4. Factors of deterioration. 5. Effect of deterioration on bricks. Timber, concrete, paints , glass and plastics.
CO3-Apply steps for investigation. Objectives of investigation. Sources of information. Investigation kits for diagnosis. List out NDT instruments. Find out causes and symptoms o deterioration.	1. State the objectives of investigation. 2. State the steps for investigation. 3. State the purposes of investigation. 4. Find out the Sources of information. 5. Visual Examination. 6. Investigation kit for diagnosis. 7. List out Non destructive tests instruments. 8. State the merits and demerits of NDT. 9. Uses of NDT. 10. Find the causes and symptoms of deterioration. 11. Causes of defects in foundation , DPC, wall , plaster , columns , Beams, Roofs , R.C.C , paints.



CO4 - Characteristics of repair materials. Find out the factors for selection of materials for repairs. Types of repair materials. Select the commercially available materials for repair.	ILOs 1. State characteristics of repair materials. 2. Find out the factors of materials for repairs. 3. Types of repair materials. 4. Select the commercially available materials for repair.
CO5 - Know the importance of surface preparation. Methods of surface preparation. State the common repair techniques. Common methods of cracks repair. Repair of existing water proofing of flat roof.	ILOs 1.State the importance of surface preparation. 2. State the methods of surface preparation. 3. State the common repair techniques. 4. State the common methods of crack repair. 5. Repairs of existing water proofing of flat roof. 6. State the steps and techniques used in water proofing flat roof by Mudphuska, Lime Terrace and Ferro cement.
CO6 - List out prevention of corrosion in reinforcement. Preparation of RCC for repair. Repair of corroded RCC elements. List out Concrete placement Techniques. Repair of surface defects.	ILOs 1. List out the prevention of corrosion in reinforcement. 2.Preparation of RCC for repair. 3. Repair of corroded RCC elements. 4. List out concrete placement Techniques. 5. repair of surface defects.
CO7 - Stabilization of foundations. Underpinning. Repair of raft slab foundations. Repair of DPC against rising dampness.	ILOs 1. Stabilization of foundations. 2. Underpinning. 3. Foundation support. 4. Repair of raft slab foundations- Edge settlement, interior slab heaving, upheaval. 5. Repair of DPC against rising dampness.
CO8 - State the Importance of finishing. List of repair of mortar joints. Efflorescence of removal.	ILOs 1. State the Importance of finishing. 2. List out repair of mortar joints. 3. Efflorescence of Removal. 4. List out Decorative coatings. 5. Repair of plastering. 6. Repair of paints. 7. Common defects in concrete floors.
CO9 - State the common problems in water supply and sanitary systems. Maintenance of pipes. Repair of Taps. Repairing of WC cisterns. Cleaning of clogged drains. Common defects in overhead and underground water tanks.	ILOs 1.State the common problems in water supply and sanitary systems. 2. Maintenance of pipes. 3. Repair of Taps. 4. Repairing of WC cisterns. 5. Cleaning of clogged drains. 6. Find the common defects in overhead and underground water tanks.



4. Teaching Scheme (in hours/week)
Tutorial 15 hrs.

Total contact hours : Lecture 45 hrs.

Lecture	Tutorial	Practical	Total
3	1		4

5. Examination Scheme :

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA	17/50	150	
	TA	HA						
70	10	20		25	25			

6. Detailed Course Content

Chapter no	Chapter Title	Content	Duration (Hrs.)
1	Introduction	6.1 Introduction of building 6.2 Importance of maintenance 6.3 Definition of maintenance 1.4 Objectives of maintenance 1.5 Factors influencing maintenance 1.6 Life of buildings-physical, functional and economical life.	3
2	Deterioration of buildings	2.1 Process of deterioration 2.2 Classification of deterioration 2.3 Factors of deterioration 2.4 Effect of deterioration on-Bricks, Timber, concrete, Paints, Glass and plastics.	4
3	Investigation and Diagnosis of defects in buildings	3.1 Steps for investigation 3.2 Objectives of investigations 3.3 purposes of investigations 3.4 Sources of information 3.5 Visual Examinations 3.6 Investigation Kits for diagnosis 3.7 Non destructive tests- purposes and lists of NDT instruments, merits and demerits & their uses. 3.8 Causes and Symptoms of deterioration 3.9 Causes of Defects in foundations, DPC, Walls, plaster, columns, Beams, Roofs, RCC, paints.	9



4	Materials for repair	4.1 Characteristics of repair materials 4.2 Factors for Selection of materials for repairs 4.3 Types of repair materials with examples. 4.4 Commercially available repair materials (name only) for rebar primer, Curing compounds, Joint Sealants, protective coatings, Water proofing.	3
5	Common Techniques of Building repairs	5.1 Importance of Surface preparation 5.2 Methods of Surface preparation 5.3 Common repair techniques (brief description only) 5.4 Common methods of Crack repair (brief description only) 5.5 Repairs of existing water proofing of flat roof 5.6 Steps and techniques used in water proofing flat roof by Mud phuska, Lime Terrace and Ferro cement.	5
6	Repair of RCC Elements	6.1 Prevention of corrosion in reinforcement (list only) 6.2 Preparation of RCC for repair 6.3 Repair of Corroded RCC elements. 6.4 Concrete Placement Techniques(list only) 6.5 Repair of Surface defects.	5
7	Repair and Maintenance of Foundations and DPC	7.1 Stabilization of foundations 7.2 Underpinning 7.3 Foundation Support 7.4 Repair of raft slab foundations- Edge settlement, Interior slab heaving, Edge Upheaval. 7.5 Repair of DPC against rising dampness.	4
8	Repair of finishes	8.1 Importance of finishing 8.2 List of repair of mortar joints. 8.3 Efflorescence Removal 8.4 Decorative Coatings(list only) 8.5 Repair of Plastering 8.6 Repair of Paint 8.7 Common defects in concrete floors	4
9	Repair of Water Supply and Sanitary System	9.1 Common Problems in water supply and Sanitary system 9.2 maintenance of Pipes 9.3 Repairs of Taps 9.4 Repairing of WC Cisterns 9.5 Cleaning of clogged drains 9.6 Common defects in overhead and underground water tanks.	4



10	Common Strengthening Techniques	10.1 Importance of Strengthening 10.2 Basic Techniques.	2
11	Revision, Class test and Seminar	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	8

7. Distribution of Marks/ Table of Specifications

Chapter No	Chapter Title	Type of Question			Total Marks
		Objective Type (Compulsory)	Short Questions	Descriptive Questions	
N.B:- At least 5 marks question shall be asked from each chapter.					

9. Table of Specification for BUILDING REPAIR & MAINTENANCE :

Sl. no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Introduction	3	6	1	4	-	-
2	Deterioration of buildings	4	8	1	4	-	-
3	Investigation and Diagnosis of defects in buildings	9	20	4	9	-	-
4	Materials for repair	3	6	1	4	-	-
5	Common Techniques of Building repairs	5	10	1	7	-	-
6	Repair of RCC Elements	5	10	1	7	-	-



7	Repair and Maintenance of Foundations and DPC	4	8	1	7	-	-
8	Repair of finishes	4	8	1	6	-	-
9	Repair of Water Supply and Sanitary System	4	8	1	6	-	-
10	Common Strengthening Techniques	2	4	1	3	-	-
11	Internal assessment	6	12	-	-	-	-
		$\Sigma b=49$ hrs.+ 6hrs internal assessment	100	13	57		

10.Details Table of Specification for Theory

Sl no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1	1		2		3	-	-	-
2	Deterioration of buildings	1	1		2		3	-	-	-
3	Investigation and Diagnosis of defects in buildings	2	2		4	2	7	-	-	-
4	Materials for repair	1	1		2		3	-	-	-
5	Common Techniques of Building repairs	1	2		3		5	-	-	-
6	Repair of RCC Elements	1	2		3		5	-	-	-
7	Repair and Maintenance of Foundations and DPC	1	2		3		5	-	-	-
8	Repair of finishes	1	1		2		5	-	-	-
9	Repair of Water Supply and Sanitary System	1	1		2		5	-	-	-
10	Common Strengthening Techniques	1	1		2		2	-	-	-
	Total				25					45



K = knowledge; C= comprehension; A= Application; HA= Higher than application

8. Suggested Implementation Strategies:- The short question should carry 3 marks per question and descriptive question may carry minimum 5 marks and maximum 10 marks per question. Objective type question will carry 1 mark per question and it shall be of very short type or multiple choice or fill up the gap type.

9. Suggested Learning Resource :-

9.1 Book list

REFERENCE BOOKS-

I) P.S. GAHLOT & SANJAY SHARMA-Building Repair and Maintenance Management.

ii) A.C. PANCHDARI-Maintenance of Buildings

iii) National building agency-Common Building defects.

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7:Course Title :- BUILDING REPAIR & MAINTENANCE (Optional) (PRACTICAL)

1. Course Code :- CV-604

2. Semester :- 6th (Civil)

Practical :

Skills to be developed:

INTELLECTUAL SKILLS:

1. Identify the method for testing of strength of a building
2. Identify the method for repairing and maintenance of the structure
3. Diagnosis the defect of the structure

MOTOR SKILLS:

1. Observe results carefully
2. Handle instruments carefully.

List of Practical:

1. **Determination of strength of concrete by rebound hammer**
2. **Determination of Concrete cover on reinforcement by cover meter**
3. **Use and handling of rebar locator**
4. **Determination of quality of Concrete by chemical reagent**
5. **Determination of strength of concrete by UPV method**
6. **Use and handling of any other NDT equipment.**

OR

Preparation of a mini project report related to

1. **Building repair and maintenance**
2. **Retrofitting of structures**
3. **Repair and maintenance of water supply and sanitary system**
4. **Diagnosis the defects of some nearby RCC building**
5. **Any other related topic suggested by concerned teachers**

XXXXXXXXXXXXXXXXXXXXX



8: Course Title :- RAILWAY BRIDGE & TUNNEL ENGINEERING (Optional)

1. **Course Code :- CV-605**

2. **Semester :- 6th (Civil)**

3. **Objective of the Subject/ Courses :-**

On completion of the course, the student will be able to:

- Explain the various stages of work for Railway alignment.
- Identify and use components of Rail.
- Organize and supervise laying of rail track.
- Select ideal site for Bridge and carry out their maintenance.
- Use drilling Equipment.
- Practice safety in drilling operation.

5.Course Outcomes of Railway Bridge and Tunnel Engineering (Theory).

Sr. No.	Course Outcomes	Intended Learning
1.	CO1- Define the Role of Railway Transportation in the development on nation. State the Modes of Transformation systems. State the importance of each mode and comparison of each mode. State the merits and demerits of each mode.	ILOs- 1. Define the Role of Railway Transportation in the development of nation. 2. State the modes of Transportation system. 3. State the importance of each mode of transportation. 4. Comparison of each mode. 5. State the merits and demerits of each mode. 6. State the necessity and importance of Cross drainage works in railways.
2.	CO2 – Classify Indian Railways. State the zones of Indian Railway. Factors governing rail alignment. Types of Gauges. Factors affecting selection of gauges. Rail Track cross sections. Rails function and types. Rail joints – requirements , types of joints. Sleepers – functions and requirement and types of sleepers. Railway Track Geometrics.	ILO2- 1. Classify the Indian Railways. 2. State the zones of Indian Railway. 3. Factors governing rail alignment. 4. State the types of Gauges. 5. List out Factors affecting selection of gauge. 6. Find the Rail Track cross –sections. 7. Describe the functions of Rails. 8. Describe the types of Rails. 9. Describe the Rail joints. 10. State the functions and requirement of Sleepers. 11. State the types of sleepers. 12. State the Ballast function and types with their properties. 13. State the Rail fixtures and fastenings. 14. Railway Track Geometrics. 15. Define the point and crossing. 16. Sketch of different components of points and crossing lines.

	Branching of Tracks. Station and yards. Track Maintenance.	17. Inspection of points and crossings. 18. Selection of site for Railway Stations. 19. Find the requirement of railway station. 20. State the types of Stations. 21. State the types of station yard. 22. Find the necessity of Track Maintenance. 23. Types of Tools required for Maintenance.
3.	CO3- Site Selection and Investigation of a Bridge . Collection of Design data. Classify bridges. Draw the plan and sectional elevation of bridge showing component parts of substructure and super structure. Define permanent and Temporary bridges. Inspection of Bridges. Maintenance of Bridges.	ILOs- 1.State the factors affecting selection of site of a bridge. 2. Find bridge alignment. 3. Collect design data. 4. Classify bridges according to function , material , span , size , alignment , position of HFL. 5. Draw the plan and sectional elevation of bridge showing component parts of substructure and super structure. 6. State the function and types of foundation of bridges. 7. State the function and types of abutment. 8. State the function and types of wing walls. 9. State the function and types of bearing for RCC and steel bridges. 10. Sketch of culverts , permanent bridges. 11. Temporary bridges. 12. Inspection of bridges. 13. Maintenance of bridges .
4.	CO4- Define Tunnels. Classify Tunnels. Tunnel cross sections for highway and railways. Investigation and surveying. Shaft construction and its purpose. Methods of Tunneling in soft rock-needle beam method. Methods of tunneling in hard rock-full – face heading method. Precautions in construction of tunnels. Drilling equipment. Types of explosives used in tunneling. Tunnel lining and ventilation.	ILOs- 1. Define Tunnels. 2. Find necessity of Tunnels. 3. State the advantages and disadvantages of tunnels. 4. Classify tunnels. Find the shape and size of tunnels. 5. Tunnel cross sections for highway and railways. 6. Investigation and surveying for tunnels. 7. Describe shaft construction and its purpose. 8. Describe the tunneling in soft rock – needle beam methods. 9. Describe the tunneling in hard rock – full – face heading methods. 10. Bench method and Drift method. 11. Take precautions in construction of tunnels. 12. Describe the drills and drilling equipment. 13. Types of explosives used in tunneling. 14. Define tunnel lining and ventilation.

5.Teaching Scheme (in hours/week)
15 hrs

Total contact hours : Lecture 45 hrs. Tutorial

Lecture	Tutorial	Practical	Total
3		3	4



6.Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)		33/100	PT	PA	17/50	150	4
	TA	HA						
70	10	20		25	25			

7.Course Content

Unit	Topic	Contact hr
1	Overview of Transportation Engineering 1.1 Role of Railway transportation in the development of nation. 1.2 Modes of transportation system – roads, railway, airways, waterways, Importance of each mode, comparison and their relative merits and demerits. 1.3 Necessity & importance of Cross drainage works in railways.	2
2	Railway Engineering. 2.1 Alignment and Gauges, Classification of Indian Railways, zones of Indian Railway. Alignment- Factors governing rail alignment. Gauges – types, factors affecting selection of gauge. Rail track cross sections – standard cross section of BG & M.G Single & double line in cutting and embankment. 2.2 Permanent ways Ideal requirement, component parts. Rails – function & its types. Rail Joints – requirements, types, Creep of rail , causes & prevention of creep. Sleepers – functions & Requirement, types – wooden, metal, concrete sleepers their suitability, sleeper density. Ballast – function & different types with their properties, relative merits & demerits. Rail fixtures & fastenings – fish plate, bearing plates, spikes, bolts, keys, anchors & anti creepers. 2.3 Railway Track Geometrics. Coning of wheels, tilting of rails, Gradient & its types, Super elevation, Limits of Super elevation on curves, cant deficiency negative cant, grade compensation on curves. 2.4 Branching of Tracks Definition of point & crossing, a simple split switch turnout consisting of points and crossing lines Sketch showing different components, their functions & working.	18



	Line sketches of track junctions-crossovers, Scissor cross over, Diamond crossing, triangle. Inspection of points and crossings 2.5 Station and Yards : Site selection for railway stations, Requirements of railway station, Types of stations (way side, crossing, junction & terminal), Station yards , types of station yard, Passenger yards, Goods yard, Locomotive yard – its requirements, water column , Marshalling yard – its types. 2.6 Track Maintenance- Necessity, types, Tools required and their function, organization, duties of permanent way inspector, gang mate, key man	
3	Bridge Engineering : 3.1 Site selection and investigation Factors affecting selection of site of a bridge. Bridge alignment, Collection of design data Classification of bridges according to function, material, span, size, alignment, position of HFL. 3.2 Component parts of bridge. Plan & sectional elevation of bridge showing component parts of substructure & super structure. Different terminology such as effective span, clear span, economical span, waterway, afflux, scour, HFL, freeboard, etc. Foundation – function, types, Piers-function, requirements, types. Abutment – function, types Wing walls – functions and types. Bearing – functions, types of bearing for RCC & steel bridges. Approaches –in cutting and embankment. Bridge flooring- open and solid floors 3.3 Permanent and Temporary Bridges- Permanent Bridges - Sketches & description in brief of culverts, causeways, masonry, steel, movable steel bridges, RCC girder bridge, Temporary Bridges- timber, flying, floating bridges 3.4 Inspection & Maintenance Of Bridge. Inspection of bridges, Maintenance of bridges & types – routine & special maintenance.	12
4	Tunnel Engineering. 4.1 Definition, necessity, advantages, disadvantages 4.2 Classification of tunnels. 4.3 Shape and Size of tunnels 4.4 Tunnel Cross sections for highway and railways 4.5 Tunnel investigations and surveying –Tunnel surveying locating	8



	center line on ground, transferring center line inside the tunnel. 4.6 Shaft - its purpose & construction. 4.7 Methods of tunneling in Soft rock-needle beam method, fore-poling method, line plate method, shield method. 4.8 Methods of tunneling in Hard rock-Full-face heading method, Heading and bench method, drift method. 4.9 Precautions in construction of tunnels 4.10 Drilling equipment-drills and drills carrying equipment 4.11 Types of explosives used in tunneling. 4.12 Tunnel lining and ventilation.	
5	Thorough discussion on all topics after finishing the courses. At least two class test and a seminar should be taken for internal assessment.	6

7.Distribution of marks/ Table of specifications

Chapter No	Chapter Title	Type of Question			Total Marks
		Objective Type (Compulsory)	Short Questions	Descriptive Questions	
1	Overview of Transportation Engineering	1	3		4
2	Railway Engineering	1+1+1+1=4	6	20	30
3	Bridge Engineering	1+1+1=3	3	14	20
4	Tunnel Engineering	1+1=2	3	11	16
Total		10	15	45	70

9.Table of Specification for Theory Design of Steel Structure (CV-601)

Sl no	Topic	Time allotted in hours (b)	Percentage Weight age ©	K	C	A	HA
1	Overview of Transportation Engineering	2	4	1	3		
2	Railway Engineering	18	40	7	7	16	
3	Bridge Engineering	12	26	3	7	10	
4	Tunnel Engineering	8	17	3	4	9	
11	Internal assessment	6	13	-	-	-	-
		∑b=46 hrs.+ 6hrs internal assessment	100	14	21	35	



10.Details Table of Specification for Theory

Sl. no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Overview of Transportation Engineering	1	3		4					
2	Railway Engineering	2	2	6	10	5	5	10		20
3	Bridge Engineering	1	2	3	6	2	5	7		14
4	Tunnel Engineering	1	1	3	5	2	3	6		11
	Total				25					45

K = knowledge; C= comprehension; A= Application ; HA= Higher than application

11.Suggested Implementation Strategies :- Teacher will use Black board, OHP, Smart board, video etc for effective teaching learning process.

12.

Text Books: -

<u>Titles of the Book</u>	<u>Name of author</u>	<u>Edition</u>
<u>Name of the Publisher</u>		
Railway Engineering	S.C. Saxena Dhanpatrai& sons	
Railway Track	K.R. Antia The New Book Co. Pvt. Ltd	
Mumbai		
Principles of Railway Engineering	S.C. RangwalaCharotar Publication	
Principles and Practice of Bridge Engineering	S.P.BindraDhanpatrai& sons	
A Text Book of Transportation Engineering	L.Arora and S.P.Luthra	IPH New
Delhi		
Elements of Bridge Engineering	J.S. Alagia	Charotar Publication
Bridge Engineering	D.R. Phatak	Everest Publisher
Elements of Bridges	D. JohnosVictor Oxford & IBH Publishing co.	
Road, Railway and Bridges	Birdi& Ahuja.	Std. Book House
Tunnel Engineering	S.C. Saxena	Dhanpatrai&
sons		
Explosive Engineering	C. B. Navalkar --	

IS / International Codes. : IS 4880, I.S. 5878, Part-I to X.

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8.Course Title :- RAILWAY BRIDGE & TUNNEL ENGINEERING (Optional) (PRACTICAL)

1. Course Code :- CV-605

2. Semester :- 6th (Civil)

Practical :

Skills to be developed:

INTELLECTUAL SKILLS:

1. Identify the method for testing of materials related to Road, Bridge and Tunnel
2. Identify the method for repairing and maintenance of bridge and tunnel
3. Diagnosis the defect of the structure

MOTOR SKILLS:

1. Observe results carefully
2. Handle instruments carefully.

List of practical

1. Determination of Abrasion value of ballast and stone
2. Determination of impact value of stone.
3. Determination of CBR value of soil in the laboratory
4. Determination of CBR value of soil in the field
5. Determination of field density of soil by core cutter method
6. Determination of water content of soil in the field

Or

Preparation of a mini project report related to

1. **Railway bridge**
2. **Ideal railway station**
3. **Geometric design of railway track**
4. **Construction of tunnel**
5. **Inspection and maintenance of tunnel**
6. **Any other related topic suggested by concerned teachers**

XXXXXXXXXXXXX END XXXXXXXXXXXXXXXX

Remarks

7. The proposed syllabus is the outcome of team work
8. The proposed syllabus has been prepared as per the instructions obtained from the higher authority time to time.

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