GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)

(Deemed to be University, Estd. u/s 3 of UGC Act 1956)

VISAKHAPATNAM ★ HYDERABAD ★ BENGALURU

Accredited by NAAC with 'A' Grade

REGULATIONS AND SYLLABUS
of
Bachelor of Technology
in
Civil Engineering

(w.e.f 2015-16 admitted batch)

A University Committed to Excellence

VISION

To become a global leader in higher education.

MISSION

To impart futuristic and comprehensive education of global standards with a high sense of discipline and social relevance in a serene and invigorating environment.

GITAM UNIVERSITY

(Estd. u/s 3 of the UGC Act, 1956)

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A University Committed to Excellence

B.Tech. in Civil Engineering
REGULATIONS
(w.e.f. 2015-16 admitted batch)

1. ADMISSION

1.1 Admission into B.Tech. in Civil Engineering program of GITAM University is governed by GITAM University admission regulations.

2. ELIGIBILITY CRITERIA

2.1 A first class in 10+2 or equivalent examination approved by GITAM University with Physics, Chemistry and Mathematics.

2.2 Admission into B.Tech. will be based on an All India Entrance Test (GAT) conducted by GITAM University and the rule of reservation, wherever applicable, will be followed.

3. CHOICE BASED CREDIT SYSTEM

3.1 Choice Based Credit System (CBCS) is introduced with effect from the admitted Batch of 2015-16 based on UGC guidelines in order to promote:

- Student centered learning
- Cafeteria approach
- Students to learn courses of their choice
- Learning at their own pace
- Interdisciplinary learning

3.2 Learning goals/objectives and outcomes are specified, focusing on what a student should be able to do at the end of the program.

4. STRUCTURE OF THE PROGRAM

4.1 The Program consists of

i) Foundation Courses (compulsory) which give general exposure to a student in communication and subject related area.

ii) Core Courses (compulsory).

iii) Discipline centric electives which

a)	are supportive to the discipline	Programme Electives
b)	give expanded scope of the subject	
c)	give interdisciplinary exposure	Interdisciplinary Electives
d)	nurture the student skills	

iv) Open electives are of general nature either related or unrelated to the discipline.

4.2 Each course is assigned a certain number of credits depending upon the number of contact hours (lectures/tutorials/practical) per week.

4.3 In general, credits are assigned to the courses based on the following contact hours per week per semester.

- One credit for each Lecture/Tutorial hour per week.
- One credit for two hours of Practicals per week.
- Two credits for three (or more) hours of Practicals per week.

4.4 The curriculum of the eight semester B.Tech. program is designed to have a total of 190 credits for the award of B.Tech. degree.

5. MEDIUM OF INSTRUCTION

The medium of instruction (including examinations and project reports) shall be English.

6. REGISTRATION

Every student has to register himself/herself for each semester individually at the time specified by the Institute/University.

7. ATTENDANCE REQUIREMENTS

7.1 A student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend the end - semester examination and he/she will not be allowed to register for subsequent semester of study. He/she has to repeat the semester along with his/her juniors.

7.2 However, the Vice-Chancellor on the recommendation of the Principal / Director of the Institute/School may condone the shortage of attendance of the students whose attendance is between 66% and 74% on genuine grounds and on payment of prescribed fee.

8. EVALUATION

8.1 The assessment of the student's performance in a Theory course shall be based on two components: Continuous Evaluation (40 marks) and Semester-end examination (60 marks).

8.2 A student has to secure an aggregate of 40% in the course in the two components put together to be declared to have passed the course, subject to the condition that the candidate must have secured

a minimum of 24 marks (i.e. 40%) in the theory component at the semester-end examination.

8.3 Practical/ Project Work/ Industrial Training/ Viva voce/ Seminar etc. course is completely assessed under Continuous Evaluation for a maximum of 100 marks, and a student has to obtain a minimum of 40% to secure Pass Grade. Details of Assessment Procedure are furnished below in Table 1.

Table 1: Assessment Procedure

S.No.	Component of Assessment	Marks Allotted	Type of Assessment	Scheme of Evaluation
1	Theory	40	Continuous Evaluation	i) Thirty (30) marks for mid semester examinations. Three mid examinations shall be conducted for 15 marks each; performance in best two shall be taken into consideration. ii) Ten (10) marks for Quizzes, Assignments and Presentations.
		60	Semester-end Examination	Sixty (60) marks for semester-end examinations.
	Total	100		
2	Practicals	100	Continuous Evaluation	i) Fifty (50) marks for regularity and performance, records and oral presentations in the laboratory. Weightage for each component shall be announced at the beginning of the semester. ii) Ten (10) marks for case studies. iii)Forty (40) marks for two tests of 20 marks each (one at the mid-term and the other towards the end of the semester) conducted by the concerned lab Teacher.
3	Project work (VII & VIII Semesters)	100	Continuous Evaluation	i) Forty (40) marks for periodic evaluation on originality, innovation, sincerity and progress of the work, assessed by the Project Supervisor. ii) Thirty (30) marks for mid-term evaluation for defending the Project before a panel of examiners.

				iii)Thirty (30) marks for final Report presentation and Viva-voce, by a panel of examiners.
4	Industrial Training (VII Semester)	100	Continuous Evaluation	i) Thirty (30) marks for Project performance, assessed by the Supervisor of the host Industry Organization. Submission of Project Completion Certificate from host organization is mandatory. ii) Forty (40) marks for Report and Seminar presentation on the training, assessed by the Teacher Coordinator. iii)Thirty (30) marks for presentation on the training, before a panel of examiners.
5	Comprehensive Viva-voce (VIII Semester)	100	Continuous Evaluation	Through five periodic Viva-voce exams for 20 marks each, conducted by a panel of examiners. The course content for Viva exams shall be announced at the beginning of the semester.

9. RETOTALING, REVALUATION & REAPPEARANCE

9.1 Retotaling of the theory answer script of the semester-end examination is permitted on request by the student by paying the prescribed fee within fifteen days of the announcement of the result.

9.2 Revaluation of the theory answer scripts of the semester-end examination is also permitted on request by the student by paying the prescribed fee within fifteen days of the announcement of the result.

9.3.1 A student who has secured 'F' grade in a theory course shall have to reappear at the subsequent semester-end examination held in that course.

9.3.2 A student who has secured 'F' grade in a practical course shall have to attend Special Instruction classes held during summer.

9.3.3 A student who has secured 'F' Grade in project work / Industrial Training / Seminar / Comprehensive Viva-Voce etc shall have to reappear at the time of Special Examination to be conducted in the summer vacation.

10. SPECIAL EXAMINATION

10.1 A student who has completed his/her period of study and still has "F" grade in a maximum of five theory courses is eligible to appear for Special Examination normally held during summer vacation.

11. BETTERMENT OF GRADES

11.1 A student who has secured only a pass or second class and desires to improve his/her class can appear for betterment examinations only in theory courses of any semester of his/her choice, conducted in summer vacation along with the Special Examinations.

11.2 Betterment of Grades is permitted 'only once', immediately after completion of the program of study.

12. GRADING SYSTEM

12.1 Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in Table 2.

Table 2: Grades and Grade Points

S.No.	Grade	Grade Points	Absolute Marks
1	O (Outstanding)	10	90 and above
2	A+ (Excellent)	9	80 to 89
3	A (Very Good)	8	70 to 79
4	B+ (Good)	7	60 to 69
5	B (Above Average)	6	50 to 59
6	C (Average)	5	45 to 49
7	P (Pass)	4	40 to 44
8	F (Fail)	0	Less than 40
9	Ab. (Absent)	0	-

12.2 A student who earns a minimum of 4 grade points (P grade) in a course is declared to have successfully completed the course, subject to securing a GPA of 5 for a pass in the semester.

13. GRADE POINT AVERAGE

13.1 A Grade Point Average (GPA) for the semester will be calculated according to the formula:

$$\text{GPA} = \frac{\Sigma [\, C \times G \,]}{\Sigma\, C}$$

where,

C = number of credits for the course.

G = grade points obtained by the student in the course.

13.2 To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used considering the student's performance in all the courses taken, in all the semesters up to the particular point of time.

13.3 CGPA required for classification of class after the successful completion of the program is shown in Table 3.

Table 3: CGPA required for award of Class

Class	CGPA Required
First Class with Distinction	≥ 8.0*
First Class	≥ 6.5
Second Class	≥ 5.5
Pass Class	≥ 5.0

* In addition to the required CGPA of 8.0 or more, the student must have necessarily passed all the courses of every semester in first attempt.

14. ELIGIBILITY FOR AWARD OF THE B.Tech. DEGREE

14.1 Duration of the program: A student is ordinarily expected to complete the B.Tech. program in eight semesters of four years. However, a student may complete the program in not more than six years including study period.

14.2 However, the above regulation may be relaxed by the Vice-Chancellor in individual cases for cogent and sufficient reasons.

14.3 A student shall be eligible for award of the B.Tech. Degree if he / she fulfills all the following conditions:

a) Registered and successfully completed all the courses and projects.

b) Successfully acquired the minimum required credits as specified in the curriculum in the branch of his/her study within the stipulated time.

c) Has no dues to the Institute, hostels, Libraries, NCC/NSS etc, and

d) No disciplinary action is pending against him/her.

15. DISCRETIONARY POWER

Not withstanding anything contained in the above sections, the Vice-Chancellor may review all exceptional cases, and give his decision, which will be final and binding.

Department of Civil Engineering

(Effective from the academic year 2015-16)

I Semester

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	EMA101	Engineering Mathematics-I	FC(MT)	3	0	0	3	Common to all
2	EHS101	Communicative English I	FC(HS)	3	0	2	4	Common to all
3	EPH101	Engineering Physics	FC(BS)	3	0	0	3	Common to all
4	ECY101	Engineering Chemistry	FC(BS)	3	0	0	3	Common to all
5	EEE103	Basic Electrical and Electronics Engineering	FC(BE)	3	0	0	3	Common to ME
6	EME123	Engineering Graphics	FC(BE)	1	0	3	3	Common to ME
7	EPH121	Engineering Physics Laboratory	FC(BS)	0	0	3	2	Common to all
8	ECE121	Civil Engineering Workshop	PC(CE)	0	0	3	2	
							23	

II Semester

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	EMA102	Engineering Mathematics-II	FC(MT)	3	0	0	3	Common to all
2	EHS102	Communicative English II	FC(HS)	3	0	2	4	Common to all
3	EPHxxx/ ECYxxx	Engineering Physics/ Chemistry(Elective)	FC(BS)	3	0	0	3	Common to all
4	EID101	Programming with C	FC(BE)	3	0	0	3	Common to all
5	ECE102	Engineering Materials	FC(BE)	3	0	0	3	
6	EME102	Engineering Mechanics	FC(BE)	3	1	0	4	Common to ME
7	ECY121	Engineering Chemistry Laboratory	FC(BS)	0	0	3	2	Common to all
8	EID121	Programming with C Laboratory	FC(BE)	0	0	3	2	Common to all
9	EME121	Workshop	FC(BE)	0	0	3	2	Common to ME
							26	

III Semester

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	EMAxxx	Engineering Mathematics-III (Elective)	FC(MT)	3	0	0	3	Common to all
2	EHS201	Environmental Studies	FC(HS)	3	0	0	3	Common to all
3	ECE201	Mechanics of Solids	PC(CE)	3	1	0	4	
4	ECE203	Surveying	PC(CE)	3	0	0	3	
5	ECE205	Engineering Geology	PC(CE)	3	0	0	3	
6	ECE207	Concrete Technology	PC(CE)	3	0	0	3	
7	ECE221	Surveying Laboratory	PC(CE)	0	0	3	2	
8	ECE223	Concrete Technology and NDT laboratory	PC(CE)	0	0	3	2	
9	ECE225	Engineering Geology Laboratory	PC(CE)	0	0	2	1	
							24	

IV Semester

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	EMAxxx	Engineering Mathematics-IV (Elective)	FC(MT)	3	0	0	3	Common to all
2	EOExxx	Open Elective –I	OE(OE)	3	0	0	3	Common to all
3	ECE202	Soil Mechanics	PC(CE)	3	0	0	3	
4	ECE204	Fluid Mechanics	PC(CE)	3	1	0	4	
5	ECE206	Structural Analysis I	PC(CE)	3	0	0	3	
6	ECE208	Highway Engineering	PC(CE)	3	0	0	3	
7	ECE222	Fluid Mechanics Laboratory	PC(CE)	0	0	3	2	
8	ECE224	Mechanics of Solids laboratory	PC(CE)	0	0	3	2	
9	ECE226	Soil Mechanics Laboratory	PC(CE)	0	0	3	2	
							25	

V Semester

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	EOExxx	Open Elective –II	OE(OE)	3	0	0	3	Common to all
2	ECE301	Structural Analysis II	PC(CE)	3	0	0	3	
3	ECE303	Foundation Engineering	PC(CE)	3	0	0	3	
4	ECE305	Environmental Engineering	PC(CE)	3	0	0	3	
5	ECE307f	Design of Reinforced Concrete Structures	PC(CE)	3	1	0	4	
6	ECE309	Water Resource Engineering	PC(CE)	3	0	0	3	
7	ECE321	Architectural Planning and CAD	PC(CE)	1	0	2	2	
8	ECE323	Highway Engineering Laboratory	PC(CE)	0	0	3	2	
9	ECE325	Environmental Engineering Laboratory	PC(CE)	0	0	3	2	
10	ECE327	Survey Camp*	PC(CE)				1	
							26	

*(Survey camp to be conducted at the end of 4th semester)

VI Semester

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	ECExxx	Program Elective – I	PE(PE)	3	0	0	3	
2	ECExxx	Program Elective-II	PE(PE)	3	0	0	3	
3	EIDxxx	Inter-Disciplinary Elective – I	IE(IE)	3	0	0	3	
4	ECE302	Design of Steel Structures	PC(CE)	3	1	0	4	
5	EHS301	Engineering Economics and Management	FC(HS)	3	0	0	3	
6	ECE306	Computational Methods in Civil Engineering	PC(CE)	3	0	0	3	
7	ECE322	Computational Mechanics Laboratory in Civil Engineering	PC(CE)	0	0	3	2	
8	ECE391	Seminar	PC(CE)	0	0	3	2	
							23	

VII Semester

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	ECE401	Design Practice	PC(CE)	1	0	2	2	
2	ECExxx	Program Elective-III	PE(PE)	3	0	0	3	
3	ECExxx	Program Elective-IV	PE(PE)	3	0	0	3	
4	EIDxxx	Inter-Disciplinary Elective-II	IE(IE)	3	0	0	3	
5	ECE403	Cost Estimation of Civil Structures	PC(CE)	3	0	0	3	
6	EHS407	Professional Ethics and Human Values	FC(HS)	1	0	0	1	Common to all
7	ECE421	Computer Application in Civil Engineering Laboratory	PC(CE)	0	0	3	2	
8	ECE491	Mini Project	PP(PW)	0	0	3	2	
9	ECE493	Summer Internship**	PP(PW)				2	
							21	

**-Summer Internship to be completed at the end of VI semester

VIII Semester

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	ECExxx	Program Elective – V	PE(PE)	3	0	0	3	
2	ECExxx	Program Elective-VI	PE(PE)	3	0	0	3	
3	EIDxxx	Interdisciplinary Elective-III	IE(IE)	3	0	0	3	
4	ECE402	Prestressed Concrete	PC(CE)	3	0	0	3	
5	ECE492	Comprehensive Viva	PC(CE)				2	
6	ECE494	Project Work	PP(PW)				8	
							22	

Number of Credits

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	23	26	24	25	26	23	21	22	**190**

Category and Credits:

UGC			AICTE		
Category		Credits	Category		Credits
FC	Foundation Courses	66	HS	Humanities and Social Sciences	15
			BS	Basic Science	13
			MT	Mathematics	12
			BE	Basic Engineering	20
PC	Programme Core	84	CE	Core Engineering	84
PE	Programme Elective	19	PE	Programme Elective	28
IE	Interdisciplinary Elective	9	IE		
OE	Open Elective	6	OE	Open Electives	6
PP	Professional Practice	12	PW	Project Work	12
	Total	190			190

Engineering Chemistry (Elective)

S. No	Course Code	Course Title	Category	L	T	P	C
1	ECY102	Chemical Aspects of Engineering Materials	FC(BS)	3	0	0	3
2	ECY104	Advanced Engineering Chemistry	FC(BS)	3	0	0	3
3	ECY106	Chemistry of Advanced Materials	FC(BS)	3	0	0	3

Engineering Mathematics-III (Elective)

S. No	Course Code	Course Title	Category	L	T	P	C
1	EMA201	Complex Variables and Transforms	FC(MT)	3	0	0	3
2	EMA203	Probability and Statistics	FC(MT)	3	0	0	3
3	EMA205	Linear Algebra	FC(MT)	3	0	0	3
4	EMA207	Complex Variables and Partial Differential Equations	FC(MT)	3	0	0	3

Engineering Mathematics-IV (Elective)

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	EMA202	Numerical Methods	FC(MT)	3	0	0	3	
2	EMA204	Probability Theory and Random Processes	FC(MT)	3	0	0	3	
3	EMA208	Discrete Mathematical Structures	FC(MT)	3	0	0	3	
4	EMA210	Fuzzy Set Theory, Fuzzy Logic and Applications	FC(MT)	3	0	0	3	

Engineering Physics (Elective)

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1	EPH102	Materials Science	FC(BS)	3	0	0	3	
2	EPH104	Solid State Physics	FC(BS)	3	0	0	3	
3	EPH106	Physics of Nanomaterials	FC(BS)	3	0	0	3	

Open Elective-I:

S. No	Course Code	Course Title	Category	L	T	P	Credits	Remarks
1.	EOE 202	German for Beginners	OE(OE)	3	0	0	3	
2.	EOE 204	Chinese for Beginners	OE(OE)	3	0	0	3	
3.	EOE 206	Introduction to Music	OE(OE)	3	0	0	3	
4.	EOE 208	Gandhian Philosphy	OE(OE)	3	0	0	3	
5.	EOE 210	Philosophical Foundations of Education	OE(OE)	3	0	0	3	
6.	EOE 212	Analytical Essay Writing	OE(OE)	3	0	0	3	
7.	EOE 214	Indian Economy	OE(OE)	3	0	0	3	
8.	EOE 216	Public Administration	OE(OE)	3	0	0	3	
9.	EOE 218	Environment and Ecology	OE(OE)	3	0	0	3	
10.	EOE 220	Indian History	OE(OE)	3	0	0	3	

Open Elective-II

S. No	Course Code	Course Title	Category	L	T	P	Cre-dits	Remarks
1.	EOE 301	Indian Constitution	OE(OE)	3	0	0	3	
2.	EOE 303	Japanese for Beginners	OE(OE)	3	0	0	3	
3.	EOE 305	French for Beginners	OE(OE)	3	0	0	3	
4.	EOE 307	Contemporary Relevance of Indian Epics	OE(OE)	3	0	0	3	
5.	EOE 309	Indian National Movement	OE(OE)	3	0	0	3	
6.	EOE 311	Science and Technology	OE(OE)	3	0	0	3	
7.	EOE 313	Professional Communication	OE(OE)	3	0	0	3	
8.	EOE 315	Ethics, Integrity and Attitude	OE(OE)	3	0	0	3	
9.	EOE317	Personality Development	OE(OE)	3	0	0	3	

Program Electives

Program Elective-I

S. No	Stream	Course Code	Course Title	Category	L	T	P	C
1	Structures	ECE342	Advanced reinforced Concrete structures	PE(PE)	3	0	0	3
2	Construction Management	ECE344	Construction Management	PE(PE)	3	0	0	3
3	Water Resources	ECE346	Hydraulics and Hydraulic Machinery	PE(PE)	3	0	0	3

Program Elective-II

S. No	Stream	Course Code	Course Title	Category	L	T	P	C
1	Structures	ECE348	Bridge Engineering	PE(PE)	3	0	0	3
2	Surveying	ECE350	Geographic Information Systems	PE(PE)	3	0	0	3
3	Water Resources	ECE352	Hydraulic Structures	PE(PE)	3	0	0	3

Program Elective-III

S. No	Stream	Course Code	Course Title	Category	L	T	P	C
1	Structures	ECE441	Advanced design of steel structures	PE(PE)	3	0	0	3
2	Construction Management	ECE443	Advanced Construction Techniques	PE(PE)	3	0	0	3
3	Water Resources	ECE445	Surface and Ground Water Modelling	PE(PE)	3	0	0	3

Program Elective-IV

S. No	Stream	Course Code	Course Title	Category	L	T	P	C
1	Geotechnical	ECE447	Advanced Foundation Engineering	PE(PE)	3	0	0	3
2	Transportation	ECE449	Transportation Infrastructure Engineering	PE(PE)	3	0	0	3
3	Environmental	ECE451	Sanitary Engineering	PE(PE)	3	0	0	3

Program Elective-V

S. No	Stream	Course Code	Course Title	Category	L	T	P	C
1	Geotechnical	ECE442	Soil Dynamics and Machine Foundation	PE(PE)	3	0	0	3
2	Transportation	ECE444	Traffic Engineering	PE(PE)	3	0	0	3
3	Environmental	ECE446	Air Pollution Control and Management	PE(PE)	3	0	0	3

Program Elective-VI

S. No	Stream	Course Code	Course Title	Category	L	T	P	C
1	Geotechnical	ECE448	Ground Improvement Techniques	PE(PE)	3	0	0	3
2	Transportation	ECE450	Intelligent Transportation Systems	PE(PE)	3	0	0	3
3	Environmental	ECE452	Advance Environmental Management	PE(PE)	3	0	0	3

Interdisciplinary Electives-I

S. No	Stream	Course Code	Course Title	Category	L	T	P	C	Remarks
1	Professional	EME403	Operations Research	IE(IE)	3	0	0	3	Offered by ME
2	Computer Oriented	ECS362	Operating Systems Concepts	IE(IE)	3	0	0	3	Offered by CSE
3		ECS364	Fundamentals of Data Structures	IE(IE)	3	0	0	3	
4		EIT362	Introduction to Programming with Java	IE(IE)	3	0	0	3	Offered by IT
5	Management	EHS302	Organizational Behaviour	IE(IE)	3	0	0	3	
6		EHS304	Business Ethics and Corporate Governance	IE(IE)	3	0	0	3	

Interdisciplinary Electives-II

S. No	Stream	Course Code	Course Title	Category	L	T	P	C	Remarks
1	Professional	EME481	Introduction to Thermo dynamics	IE(IE)	3	0	0	3	Offered by ME
2	Computer Oriented	ECS461	Introduction to Database Management System	IE(IE)	3	0	0	3	Offered by CSE
3		ECS464	Introduction to Web Technologies	IE(IE)	3	0	0	3	
4	Management	EHS401	Project Management	IE(IE)	3	0	0	3	
5		EHS403	Disaster Management	IE(IE)	3	0	0	3	
6		EHS405	Entrepreneurship Development	IE(IE)	3	0	0	3	

Interdisciplinary Electives-III

S. No	Stream	Course Code	Course Title	Category	L	T	P	C	Remarks
1	Professional	EME462	Project Planning and Management	IE(IE)	3	0	0	3	Offered by ME
2	Computer Oriented	EIT463	Management Information System and E-Commerce	IE(IE)	3	0	0	3	Offered by IT
3		ECS462	Fundamentals of Software Engineering	IE(IE)	3	0	0	3	Offered by CSE
4		ECS463	Introduction to Computer Networks	IE(IE)	3	0	0	3	
5	Management	EHS402	Operations and Supply Chain Management	IE(IE)	3	0	0	3	
6		EHS404	Total Quality Management	IE(IE)	3	0	0	3	

ECE102 : ENGINEERING MATERIALS

L	T	P	C
3	0	0	3

Module I **10 hours**

Bricks: Classification, characteristics of good bricks, ingredients of good brick earth, harmful substance in brick earth, manufacture of bricks, types (clay bricks, fly ash, cellular light weight concrete brick, aerated cement concrete brick or autoclave brick) and engineering properties, different forms of bricks, testing of bricks as per BIS, and defects of bricks

Lime: Impurities in limestone, classification, slaking and hydration, hardening, testing, storage, handling

Glass: Uses, types and properties, application and ingredients, market forms, glass claddings, aluminium composite panel cladding

Module II **08 hours**

Wood and Wood Products: Classification of timber, structure, characteristics of good timber, various types of defects in wood, seasoning of timber, decay of timber, preservation of timber testing of timber, veneers , plywood, fibre boards, particle boards, chip boards , black boards, button board and laminated boards, applications of wood and wood products**.**

Module III **08 hours**

Paints, Enamels and Varnishes: Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, painting: plastered surfaces, painting wood surfaces, painting metal surfaces, defects, effect of weather, enamels, distemper, water wash and colour wash, varnish, french polish, wax polish.

Miscellaneous materials: heat and sound insulating materials, geo-synthetics, aluminium, glass, plastic, admixtures: chemical (plasticiser and super plasticisers), minerals (fly ash, microsilica).

Module IV **10 hours**

Foundations: Function of foundations, essential requirement of good foundation; brick masonry: definitions, rules for bonding, type of bonds – stretcher bond, header bond, English bond, Flemish bond, comparison of English bond and Flemish bond (one and one and half brick thick wall)

Lintel: Necessity, materials: Wood, stone, brick, steel, R.C.C. and reinforced brick lintels.

Wall: Load bearing wall, partition wall, reinforced brick wall

Doors: Classification, teak wood panelled door, flush door, aluminium glazed doors, and steel door

Windows: Classification, teak wood glazed windows, aluminium glazed windows, steel windows

Formwork: materials (wooden, steel and aluminium).

Stairs: Technical terms, requirements of good stair, dimension of steps, classification, geometric design of a dog legged stair case, fixtures and fastening of doors and windows and utility fixtures.

Module V **06 hours**

Flooring: Components of a floor, selection of flooring materials, brick flooring, cement concrete flooring, mosaic, marble, terrazzo flooring, and tiled roofing

Plastering and Pointing: Plastering with cement mortar, defects in plastering, pointing, white washing, colour washing, distempering,

Roofs: Types, pitched roofs and their sketches, lean – to roof, king post – truss, queen post truss and simple steel truss, roof covering materials: AC sheets GI sheet

TextBook(s)

1. S.C. Rangwala, Engineering Materials, 41/e, Charotar Publishing House, 2014.
2. B.C. Punmia Building Construction 10/e, Laxmi Publication, 2012

Reference Books

1. P.C. Varghese, A Text Book Building Materials, 1/e, Prentice-Hall, Publication, 2005.
2. Mohan Rai and M.P. Jain Singh, Advances in Building Materials and Construction by – publication by CBRI,1985.
3. Sushil Kumar, Engineering Materials, Standard Publication and Distributors,1983.
4. Jha and Sinha, Building Construction and Foundation Engineering, 5/e,Khanna Publishers,.1986.

ECE121: CIVIL ENGINEERING WORKSHOP

L	T	P	C
0	0	3	2

1. Assemble a pipe line as per the piping layout using pipes and accessories
2. Exercise involving sanitary fittings such as water cloasets, wash basins etc
3. Assemble a brick wall as per the drawing and arranging bricks of Flemishbond (without using motar)
4. Assemble a brick wall as per the drawing and arranging bricks of English bond (without using motar)
5. Plotting a building by using chain and accessories
6. To plaster a given brick surface
7. Applying white wash and distemper colour washing of given area
8. To paint metal surface (old and new)
9. Laying of tiles for floors
10. Model making of different structures like building, bridges, different types of trusses etc
11. Exercise involving construction of a recharge pit
12. Market survey: For trade/commericial names, specifications, units of purchase and prevalent market rates for the following
    a. Various types of Stones(Blocks and slabs)
    b. Types of bricks, hollow blocks, etc
    c. Tiles- Flooring tiles and clay roofing etc
    d. Sanitary ware pipes, water closets etc
    e. Types of cements
    f. Marketable forms of various types timber available in market, Timber allied products such as plywood,hard board, block board, sunmicaand various preservatives of timber available in market
    g. Materials required for white washing colour wash
    h. Various types of distempers such as oil bound and water bound
    i. Sound insulating materials available in the local market
    j. Fire proofing material available in local market
    k. Various types of glass available in local market

ECE201 : MECHANICS OF SOLIDS

L	T	P	C
3	1	0	4

Module I **12 hours**

Stress: Introduction, normal stresses in axially loaded bars; allowable stress and factor of safety,

Strain: Introduction; normal strain; stress- strain relationships; Hooke's law, Poisson's ratio; thermal strain and deformation; deformation of axially loaded bars.

Generalized Hooke's law and pressure vessels:

Generalized Hooke's law for isotropic materials; relationship between modulus of elasticity and modulus of rigidity; dilatation and bulk modulus.

Module II **12 hours**

Shear Force and Bending Moment Diagrams:

Shear force diagram and bending moment diagram for simply supported beams; cantilever beams; over hanging beams, differential equations of equilibrium for a beam element.

Module III **12 hours**

Transformation of stresses in two dimensional problems; principal stresses in two –dimensional problems; mohr's circle for two dimensional problems; construction of mohr's circle for stress transformation.

Module IV **10 hours**

Bending stresses in beams: Introduction; basic assumptions; elastic flexure formula; application of flexure formula, combined direct and bending stresses, unsymmetrical bending.

Shear stresses in beams: Introduction; shear flow; shear stress formula for beams; Shear stress in beam flanges; shear centre**.**

Module V **10 hours**

Torsion: Introduction; application of the method of sections; torsion of circular elastic bars – basic assumptions, the torsion formula, design of circular bars in torsion for strength, angle of twist of circular bars.

Text Book(s)

1. R. Subramanian, Strength of Materials, 2/e, Oxford, 2010.
2. E.Popov, Engineering Mechanics of Solids, 2/e, Pearson, 2009.

References

1. S.S. Rattan, Strength of Materials, 2/e, Tata McGraw Hill Education, 2011.
2. Geriand Timoshenko, Mechanics of Materials, 4/e, CBS Publishers, 2006.
3. Stephen Timoshenko, Strength of Materials, 3/e, CBS Publisher, 2002.
4. R.K. Rajput, Strength of Materials, S.Chand Publications, 2007.

ECE202: SOIL MECHANICS

L	T	P	C
3	0	0	3

Module I **10hours**

Soil Properties: Origin and formation of soils; three phase representation of soil mass, physical properties of soil – void ratio, porosity, degree of saturation, water content, module weights, specific gravity – their functional relationships, relative density.

Consistency Limits: Determination and various indices – plasticity index, consistency index, liquidity index – uses and applications of consistency limits in soil engineering, activity ratio.

Classification: Mechanical analysis – sieve analysis, I,S and MIT grain size classification, Indian standard classification for fine grained and coarse grained soils for general engineering purposes.

Module II **8hours**

Soil Hydraulics: Types of soil water, Darcy's law and its limitations, determination of coefficient of permeability, laboratory methods-constant head and variable head permeameter tests, factors influencing coefficient of permeability, permeability of stratified soils, stress principle for saturated soils-total, neutral and effective stresses, no flow, downward flow and upward flow conditions, quick sand conditions, critical hydraulic gradient, piping failures in dams founded on permeable formations.

Module III **8hours**

Stress Distribution: Boussinesq's theory for the determination of vertical stresses due to point loads, assumptions and validity, extension to rectangular and circular loaded areas, 2 : 1 approximate method, Westergaard's theory, Newmark's influence chart - construction and use, contact pressure distribution beneath rigid footings, founded on cohesive and cohesion less soils.

Module IV **9hours**

Consolidation: Oedometer Tests, e-p and e-log p curves – compression index, coefficient of compressibility and coefficient of volume change, Terzaghi's assumptions for one dimensional consolidation, equation and application, coefficient of consolidation, degree of consolidation vs time, curve fitting methods, initial compression, primary compression and secondary compression, determination of pre-consolidation pressure by Casagrande's method, normally consolidated, over consolidated and under consolidated clayey deposits.

Compaction: Mechanism of compaction, factors affecting compaction, British standard, modified AASHO and IS compaction tests, effect of compaction on physical and engineering properties of soils, field compaction equipment and quality control, proctor's penetrometer.

Module V **10 hours**

Shear Strength of Soils: Stress at a point, Mohr circle of stress, Mohr - coulomb's failure theory, shear tests – direct shear box, unconfined compression, tri-axial compression, and field vane shear tests, shear parameters, types of shear tests in the laboratory based on drainage conditions, shear strength of sands, critical void ratio and dilatancy , shear strength of clays, total stress analysis and effective stress analysis, skempton's pore pressure coefficients.

Text Book(s)

1. B.C. Punmia, Soil Mechanics and Foundations, (SI Modules), 16/e Laxmi Publications, 2005.
2. Gopala Ranjan and A.S.R, Rao, Basic and Applied Soil Mechanics, 2/e, New Age International Publishers, 2000.

References

1. C. Venkataramaiah, Geotechnical Engineering, ,New Age International, 2006.
2. H. Iqbal Khan, Text Book of Geotechnical Engineering, Prentice Hall of India, 2005.
3. M. Braja Das, Principles of Geotechnical Engineering,Cengage Learning, 2013.
4. P. Donald, Coduto, Geotechnical Engineering, Prentice-Hall India, 2010.
5. Rodrigo Salgado, The Engineering of Foundations, McGraw Hill, 2006.

ECE203 : SURVEYING

L	T	P	C
3	0	0	3

Module I **9 hours**

Introduction, Chain and Compass Surveying: Surveying objectives, plane surveying principles and classification, linear measurements, instruments for surveying, preparation of map and plan, measurement of distance, chain surveying principles, offsets, chain surveying instruments, measurement of directions and angles, types of compass, meridians and bearings, local attraction, magnetic declination, traversing with a chain and compass, plotting of traverse, adjustment of closing error.

Module II **9 hours**

Plane table Surveying, Levelling and Contouring: Principle and instruments used in plane table surveying, working operations, methods of plane table surveying, instruments for leveling, principle and classification of leveling, bench marks, readings and booking of levels, height (level) computations, field work, longitudinal and cross-sectional levelling, plotting the profile, contours, characteristics of contours, contours of natural features, methods of contouring, interpolation, contour gradient, contour maps.

Module III **9 hours**

Theodolite Survey and Traversing, Tacheometric Surveying: Theodolite component parts, classification, theodolite observations, principle of theodolite survey and traversing, field work, traverse computations, practical problems, principle of tacheometry, methods of tacheometry, tacheometric tables, reduction diagram, tacheometry as applied to subtense measurement, field work for tacheometric surveying, errors.

Module IV **6 hours**

Curve Setting: Types of curves, elements of a curve, setting out a simple curve, setting out a compound curve, checks on field work, reverse curve, transition curves, super elevation, deflection angles, transition curves, characteristics of transition curves, types of vertical curves, setting out vertical curves, sight distance

Module V **9 hours**

Trigonometrical Surveying, Triangulation and Total Station: Base of the object accessible, base of an inclined object accessible, reduced level of the elevated points with inaccessible bases, instrument axes at different levels, principle of triangulation, purpose and classification of triangulation

surveys, layout of triangulation, field work, triangulation stations, triangulation computations, EDM instruments, total station, global positioning system

Text Book(s)

1. B.C. Punmia, A.K.Jain, Arun Jain, Surveying I and II, Laxmi Publications, 2005.
2. R. Subramanian, Surveying and Levellin, 2/e, Oxford University Press, 2014.
3. D.G Charles, R.W. Paul, Elementary Surveying, 14/e, Prentice Hall, 2014

References

1. S.K. Roy, Fundamentals of Surveying, Prentice Hall of India, 2011.
2. T.P. Kanetkar, (2012), Surveying and Levelling, Part I and II, New Central Book Agency,2012.

ECE204 : FLUID MECHANICS

L	T	P	C
3	1	0	4

Module I **8 hours**

Introduction: Units and dimensions of quantities, properties of fluids, newton's law of viscosity fluid pressure measurement – manometers.

Module II **10hours**

Fluid Statics: Forces on submerged plane surfaces, analysis of lock gates, buoyancy, kinematics, methods of describing fluid motion, types of flow, acceleration, continuity equation, rotation, vorticity, stream function, velocity potential function, flow net and applications.

Module III **8 hours**

Fluid Dynamics: Bernoulli's equation and its applications - venturimeter, pitot tube.

Dimensional Analysis: Rayleigh's method, Buckingham pi-theorem, dimensionless numbers, model laws and their applications.

Module IV **8 hours**

Pipe Flow: Losses, Darcy - Weisbach equation, HGL, TEL, pipes in series and parallel, syphon pipe, power transmission, water hammer,pipe network

Module V **8 hours**

Impact of Jets: Impulse - momentum equation, practical applications of momentum principle - pipe bend - impact of fluid jets on flat plate and curved vane (both stationary and moving).

Text Book(s)

1. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics and Hydraulic Machines, Standard Book House, 20/e, 2015.
2. A.K. Jain, Fluid Mechanics,12/e, khanna publishers 2014.

References

1. L. Victor, Streeter and E. Benjamin Wylie, Fluid Mechanics, 9/e, Tata McGraw Hill,2013
2. K.R. Arora, Fluid Mechanics, Hydraulics and Hydraulic Machines, 9/e, Standard Publishers, 2013.
3. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2011.
4. M. Franck White, Fluid Mechanics, Tata McGraw Hill, 2014.

ECE205 : ENGINEEREING GEOLOGY

L	T	P	C
3	0	0	3

Module I **8 hours**

Branches of geology, rock weathering process, soils soil profile, soil formation, Indian soil groups, soil erosion and conservation, landforms: produced by rivers, ground water - origin, distribution, aquifers, porosity and permeability and water bearing properties of rocks.

Module II **8 hours**

Minerals - physical properties: form, color, streak, lustre, cleavage, fracture, hardness and specific gravity, study of some important rock forming minerals - quartz, feldspars, pyroxenes, amphiboles, micas and clays, rocks - classification, texture, structure and mineralogical composition of some typical igneous, sedimentary and metamorphic rocks, granite, syenite, diorite, gabbro, dolerite, basalt, breccia, conglomerate, sandstone, shale, limestone, gneiss, khondalite, schist, slate, marble, quartzite, charnockite.

Module III **8 hours**

Stratigraphic time scale - major geological formations of India, Archeans, Cuddapahs, Vindhyans, Gandwanas and Deccan trap systems, elements of structural geology: strike and dip, clinometers/brinton compass, description and classification of folds, faults and joints.

Module IV **10 hours**

Remote sensing: introduction, electromagnetic spectrum, sensors and platforms, IRSsatellites– applications to civil engineering, geophysical investigations of civil engineering importance: introduction, electrical, resistivity and seismic refraction methods, natural hazards: origin, classification and mitigation of earthquakes and landslides.

Module V **10 hours**

Geological investigations for dams and reservoirs, geological investigations for tunnels, bridge sites and highways, geological investigations for coastal structures.

Text Book(s)

1. Parbin Singh, Textbook of Engineering and General Geology, SK Kateriaand Sons, 2010.
2. N. Chennakesavulu, Textbook of Engineering Geology,2/e, Trinity Press, 2013.

References

1. Subinoy Gangopadhyay – Engineering Geology, Oxford University Press, 2013.
2. P. K. Guha, Remote Sensing for the Beginner, East West press, 2003

ECE206 : STRUCTURAL ANALYSIS-I

L	T	P	C
3	0	0	3

Module I **9 hours**

Deflection of Statically Determinate Structures: (a) Beams using Macaulay's method, moment – area method, unit load method (b) Trusses (having 9 members or less) using unit load method.

Module II **9 hours**

Shear force and bending moment diagrams for a) Fixed beams subjected to UDL and point loads

b) Analysis of three span continuous beams using theorem of three moments and Slope deflection method.

Module III **9 hours**

Analysis of three span continuous beams using a) Moment distribution method b) Kani's method.

Module IV **8 hours**

Columns and Struts: Combined bending and direct stresses - kern of a section - Euler's theory –end conditions, Rankine - Gordon formula - eccentrically loaded columns - Secant formula.

Module V **7 hours**

Thin Cylinders and Thick Cylinders: Thin cylinders: stresses in thin cylinders, circumferential and longitudinal stress, change in dimensions and volume of thin cylinders due to internal pressure.

Thick cylinders: Lame's theory, stresses in thick cylinders, compound thick cylinders.

Text Book(s)

1. R. Subramanian ,Strength of Materials, 2/e, Oxford University Press, 2010.
2. T.S. Thandavamoorthy, Structural Analysis, 2/e, Oxford University press, 2011.

References

1. C.K. Wang, Statically Indeterminate Structures, Tata McGrawHill , 2010.
2. R.C. Hibbeler, Structural Analysis, 6/e, Pearson, 2011.

ECE207 : CONCRETE TECHNOLOGY

L	T	P	C
3	0	0	3

Module I **8 hours**

Cement: Historical note, chemical composition, hydration of cement, setting, structure of hydrated cement, different grades of cement, tests on properties of cement.

Module II **8 hours**

Properties of Aggregates: Classification of aggregates, tests on strength and other mechanical properties of aggregates, deleterious substances in aggregate, alkali-silica reaction, sieve analysis, grading requirement, practical grading.

Module III **8 hours**

Fresh Concrete: Process of manufacture of concrete, quality of mixing water, properties of fresh concrete, workability, factors affecting workability, measurement of workability, definitions of segregation, bleeding and honey combing.

Admixtures: Benefits of admixtures, types of admixtures, accelerating admixtures, retarding admixtures, water-reducing admixtures, super plasticizer, special admixtures.

Module IV **8 hours**

Strength of Concrete: Water/cement ratio, effect of age and specimen size on strength of concrete, relation between compressive and tensile strengths, bond between concrete and reinforcement.

Testing of Hardened Concrete: Compression, split tensile and flexure strength test, methods of non destructive test of concrete, rebound hammer test, ultrasonic pulse velocity test, importance of NDT, definitions of modulus of elasticity, creep, shrinkage and Poisson's ratio, introduction to durability of concrete.

Module V **10 hours**

Special Concrete: Concrete with different cementatious materials containing fly ash, GGBS, silica fume, high performance concrete, self-compacting concrete, light-weight concrete, ready mix concrete, fibre reinforced concrete and polymer concrete.

Selection of concrete mix proportions – IS method and ACI method.

Text Book(s)

1. P.K. Mehta and J.M. Paulo Monteiro, Concrete Microstructure Properties and Materials,4/e, McGraw-Hill Professional, 2013.
2. M.S. Shetty, Concrete Technology,7/e, S.Chand and Company Ltd, 2015.

References

1. A.M. Neville and J.J. Brooks, Concrete Technology,2/e,Prentice Hall, 2010.
2. A.R. Santhakumar, "Concrete Technology", Oxford University Press India, 2006.
3. M.L. Gambhir, Concrete Technology, 5/e, Tata McGraw-Hill Education, 2013.

ECE208: HIGHWAY ENGINEERING

L	T	P	C
3	0	0	3

Module I **7 hours**

Highway Development and History of Roads: History of development of roads, highway development in India, classification of roads, planning surveys, highway alignment, engineering surveys for highway alignment.

Module II **12 hours**

Highway Geometric Design: Highway cross-sectional elements, stopping sight distance, overtaking sight distance, intermediate sight distance, camber, super elevation, extra widening, setback distance at horizontal curves, design of horizontal curves, transition curves, vertical curves.

Module III **9 hours**

Pavement Design: design of pavements: design of flexible pavement by C B R method as per IRC 37-2001 and theory of empirical mechanistic method, stresses in rigid pavement by Westergaards and IRC methods, design of overlay by Benkelman beam method.

Module IV **7 hours**

Highway Materials, Construction and Maintenance: Highway materials: aggregate properties and tests: crushing, abrasion and impact test, bitumen properties and tests, - penetration, ductility, viscosity, binder content and softening point highway construction: earthen roads, WBM roads, bituminous roads and cement concrete roads, highway maintenance: failure of flexible and rigid pavements and their maintenance, highway drainage: surface and sub surface drainage system.

Module V **7hours**

Traffic Engineering: Traffic characteristics: road user characteristics and vehicle characteristics, traffic studies: traffic volume study, speed studies and origin and destination studies, traffic control devices: signs, signals and markings and traffic islands, intersection: introduction to un-channelized and channelized intersections and rotary intersections.

Text Book(s)

1. Khanna and Justo, Highway Engineering, 10/e, Nem Chand and Bros, 2014.
2. L.R. Kadiyali, N.B. Lal, Principles and Practice of Highway Engineering, 6/e, Khanna Publication, 2014.

References

1. W.R. McShane and R.P. Roess, Traffic Engineering, Prentice Hall India, 2010.
2. C. JotinKhisty and B. KentLal, Introduction to Highway Engineering,3/e, Prentice Hall India, 2002.

ECE221 : SURVEYING LABORATORY

L	T	P	C
0	0	3	2

1. Survey of an area by chain survey (closed traverse) and plotting
2. Compass traversing
3. Radiation method, intersection methods by plane table survey
4. Traversing by plane table survey
5. Fly leveling (differential leveling)
6. Longitudinal and cross sectioning
7. Grid contouring
8. Indirect contouring
9. Theodolite survey
10. Trigonometric leveling to determine heights/elevations
11. Tacheometry
12. Setting of curves
13. Demonstration of auto level and total station

ECE222 : FLUID MECHANICS LABORATORY

L	T	P	C
0	0	3	2

1. To determine the coefficient of discharge of venturimeter.
2. To determine the coefficient of discharge of orifice meter.
3. To determine the coefficient of discharge of mouthpiece using constant head Method.
4. To determine the coefficient of discharge of small orifice using falling head Method.
5. To determine the coefficient of discharge of V-notch.
6. To determine the friction factor using Darcy-Weisbach Equation.
7. To verify the Bernoulli's equation.
8. To study the hydraulic jump.
9. To find the coefficient of impact of a jet on a flat circular fixed vane.
10. To study the performance characteristics of Pelton wheel turbine.
11. To study the performance characteristics of the Francis Turbine.
12. To study the functionality of a centrifugal pump.

ECE223 : CONCRETE TECHNOLOGY AND NON DESTRUCTIVE TESTING LABORATORY

L	T	P	C
0	0	3	2

MATERIAL TESTS

1. Determination of fineness and consistency of cement.
2. Determination of setting time of cement
3. Determination of specific gravity of cement
4. Determination of compressive strength of cement.
5. Determination of fineness modulus of fine aggregate and coarse aggregate
6. Determination of specific gravity of fine aggregate and coarse aggregate.
7. Determination of workability of concrete by slump cone test.
8. Determination of workability of concrete by compaction factor apparatus.
9. Determination of workability of concrete by vee bee consistometer.
10. Determination of compressive strength of designed mix concrete by conducting compressive strength and asses it by rebound hammer test / UPV test.
11. Determination of split tensile strength of concrete.
12. Determination of modulus of rupture of plain concrete beam.

ECE224 : MECHANICS OF SOLIDS LABORATORY

L	T	P	C
0	0	3	2

1. Stress-strain characteristics of tension and compression members using UTM.
2. Determination of hardness of metals using Brinnel's and Rockwell's hardness test.
3. Impact test by using Izod's method and Charpy's method
4. Shear resistance using double shear test
5. Determination of Young's modulus by conducting load deflection test(using simply supported beam and cantilever beam)
6. Verification of Maxwell's reciprocal theorem (using simply supported beam and cantilever beam)
7. Modulus of rigidity by conducting compression test on springs.
8. Modulus of rigidity by conducting torsion test on rods.
9. Verification of force induced in the member of given truss of a applied load.
10. Determination of coefficient of friction between various materials on inclined plane
11. Compression strength of wood and brick.
12. Study of forces in coplanar force system.
13. Determination of constant strength of beam

ECE225 : ENGINEERING GEOLOGY LABORATORY

L	T	P	C
0	0	2	1

1. Study of physical properties of some important rock forming Silicate Minerals
2. Study of physical properties of some important rock forming non-Silicate Minerals
3. Study of megascopic properties of igneous rocks
4. Study of megascopic properties of sedimentary rocks
5. Study of megascopic properties of metamorphic rocks.
6. Description and engineering considerations of structural models – folds.
7. Description and engineering considerations of structural models –faults
8. Description and engineering considerations of structural models – joints.
9. Description and engineering considerations of tunnel models.
10. Analysis of Survey of India topo sheet.
11. Visual interpretation of remote sensing imageries.
12. Electrical resistivity survey and data interpretations

ECE226 : SOIL MECHANICS LABORATORY

L	T	P	C
0	0	3	2

1. Determination of specific gravity of soil grains by pycnometer and density bottle
2. Field identification and classification of soils.
2. Determination of grain size analysis by sieve analysis
3. Determination of Atterberg's limits (LL / PL /SL).
4. Determination of field density by core cutter method / sand replacement method.
5. Determination of permeability of soil.
6. Determination of optimum moisture content and max density by IS light compaction test.
7. Determination of relative density of soils.
8. Determination of shear strength by direct shear test.
9. Determination of shear strength by unconfined compression test for cohesive soils.
10. Determination of shear strength by triaxial compression test.
11. Determination of co-efficient of consolidation and compressibility of soils by consolidation test.
12. Determination of swell pressure of soil by swell pressure test.

ECE301 : STRUCTURAL ANALYSIS-II

L	T	P	C
3	0	0	3

Module I **8 hours**

Arches: Introduction to arches, analysis of three hinged and two hinged arches subjected to concentrated loads and uniformly distributed loads (rolling loads and influence lines not included), cables - tension forces in towers.

Module II **9 hours**

Analysis of statically indeterminate frames (single storey single bay portal frames only) using moment distribution method and Kani's method.

Module III **8 hours**

Moving Loads: Maximum bending moment at a section, under a wheel load and absolute maximum bending moment in the case of several wheel loads, influence lines for beams (statically determinate and indeterminate beams).

Module IV **9 hours**

Introduction to Matrix Methods: Analysis of two and three span continuous beams only by flexibility and stiffness matrix methods.

Module V **8 hours**

Plastic Analysis: Introduction, upper and lower bound theorems, shape factor, collapse loads for beams (simply supported, fixed and two span continuous beams).

Text Book(s)

1. G.S. Pandit, S.P. Gupta, R. Gupta, Theory of Structures-Vol I and II, 2/e, Tata McGraw-Hill,2003.
2. T.S. Thandavamurthy, Structural Analysis, 2/e, Oxford University Press, 2011.

References

1. Vazirani and Ratwani, Analysis of Structures, Vol-II, 16/e, Khanna Publishers, 2015.
2. J.S. Kinney, Indeterminate Structural Analysis, 1/e, Naroja Publishing, 1987.
3. C.K. Wang, Statically Indeterminate Structures, Tata McGraw Hill, 2010.
4. Weaver and Gere, Matrix Methods of Framed Structures,2/e, cbs publisher, 1990.

ECE302 : DESIGN OF STEEL STRUCTURES

L	T	P	C
3	1	0	4

Module I **8 hours**

General: Fundamental concepts of design of structures, different types of rolled steel sections available to be used in steel structures, stress strain relationship for steel.

Bolted Connections: Failure of a joint, strength and efficiency of a joint, lap joint, butt joint and eccentric connections.

Module II **8 hours**

Welded Connections: Types of welds, stresses in welds, design of welded joints subjected to axial load, eccentric welded connections.

Module III **8 hours**

Tension Members: Allowable stress in axial tension, net effective sectional area for angle and tee sections, design of tension members, lug angles.

Module IV **10 hours**

Compression Members: Effective length, radius of gyration and slenderness of compression members, allowable stresses in compression, design of axially loaded compression members, built up compression members (I section and two channels) laced and battened columns, eccentrically loaded columns, column splices.

Module V **8 hours**

Beams: Introduction, beam types, lateral stability of beams, factors affecting lateral stability, behavior of simple beams in bending, design strength of laterally unsupported beams, shear strength of steel beams, maximum deflection, web buckling, web crippling.

Text Book(s)

1. S.K. Duggal,Limit state of steel structures, 2/e, Tata McGraw Hill, 2014.
2. N. Subramanyam, Design of Steel Structures, 1/e, Oxford University Press, 2014.

References

1. V.L. Shah and Veena Gore, Limit State Design of steel structures IS:800-2007, Structures Publications, 2012.
2. M.L. Gambhir, Fundamentals of Structural Steel Design, McGraw Hill Education, 2013.
3. R. Narayanan, Teaching Resource on Structural Steel Design, INSDAG, Ministry of Steel Publications, 2002.
4. Ramachandra and V. Gehlot, Design of Steel Structures, Scientific Publishers, 2009

ECE303 : FOUNDATION ENGINEERING

L	T	P	C
3	0	0	3

Module I **8 hours**

Subsoil Exploration: Methods of subsoil exploration, direct, indirect methods, soundings by standard, dynamic cone and static cone penetration tests, types of boring, types of samples, criteria for undisturbed samples, transport and preservation of samples, bore-logs, planning of exploration programs, report writing.

Module II **9 hours**

Shallow Foundations: Safe bearing capacity and allowable bearing pressure, Terzaghi's bearing capacity equations its modifications for square, rectangular and circular foundation, types of bearing capacity failures : general, local and punching shear conditions, factors affecting bearing capacity of soil, allowable bearing pressure based on n-values, bearing capacity from plate load tests, factors effecting location of foundation and design considerations of shallow foundations, causes of settlement, computation of elastic or immediate settlement, allowable settlement.

Module III **8 hours**

Pile Foundations: Classification, load carrying capacity of single pile, dynamic formula, static formula, pile load, cyclic pile load tests, load capacity of pile groups, Feld's rule, average efficiency of pile groups, settlement of pile groups, negative skin friction on plies, under reamed pile foundations in expansive sub-soils.

Caissons: Introduction, various forces acting and types of caissons: box, open (well), pneumatic, different shapes and cross sections of well foundations, different components of well, grip length, problems in well sinking and remedial measures.

Module IV **9 hours**

Earth Pressure: Types of earth pressures, Rankine's active and passive earth pressures, smooth vertical wall with horizontal backfill, extension to Coloumb's wedge theory, Rebhann's graphical method for active earth pressure.

Bulkheads: Classification, introduction to ground improvement techniques.

Module V **9 hours**

Stability Analysis of Slopes: Introduction, types of slope failures, finite slopes, Swedish slip circle – $\phi = 0$ analysis, c-ϕ analysis, Fellinius method

of locating critical slip centre, friction circle methods of stability analysis, and Taylors stability number, introduction to Bishop's method of stability analysis, factors influencing slope stability.

Text Book(s)

1. Gopala Ranjan and A.S.R. Rao, Basic and Applied Soil Mechanics, New age Publishers, 2000.
2. C. Venkataramaiah, Geotechnical Engineering, New Age Publishers, 2006.

References

1. V.N.S. Murthy, Soil Mechanics, Foundation Engineering, UBS Publishers, 2011.
2. J.E. Bowles, Foundation Analysis and Design, McGraw Hill, Publishers, 2001.
3. M.D. Braja, Principles of Geotechnical Engineering, 7/e, Cengage Learning: 2013.
4. P.C. Donald, Geotechnical Engineering, Prentice-Hall India, 2010.
5. Rodrigo Salgado, The Engineering of Foundations, Mcgraw Hill, 2006.
6. Iqbal H, Khan, Text Book of Geotechnical Engineering, Prentice Hall of India, 2005.

ECE305: ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

Module I **8 hours**

Need for protected water supplies, objectives of water supply systems, physical, chemical and biological characteristics of water, water sampling, water analysis IS and WHO standards, water borne diseases, requirements of water supply, types of demand and their contribution, rate of consumption, forecasting the population, variation in demand pattern.

Module II **8 hours**

Sources of water, intake structure-river, canal, reservoir; conveyance of water; types of conduits, capacity and design, materials for pipes, hydraulic design of pipes, laying, testing, pipe appurtenances.

Module III **8 hours**

Treatment of water, objectives, various module operations involved in water treatment, working principles and design of plain sedimentation, sedimentation aided with coagulation, filtration, and disinfection

Module IV **10 hours**

Theory and working principles of iron and manganese removal, taste and odour control, de - fluoridation and water softening; recent advances; rural water supply.

Module V **8 hours**

Water distribution system, requirements, classification, layout of distribution system, analysis of pipe networks of distribution system, water supply installations in buildings, plumbing systems, appurtenances in distribution system, maintenance of water supply installations

Text Book(s)

1. K.N. Duggal, Elements of Public Health Engineering, S Chand, 1988
2. P.N. Modi, Water Supply Engineering - Environmental Engineering (Vol I), Standard Book House, 2006

Reference Books

1. S.K. Garg, Environmental Engineering Vol I: Water Supply Engineering, Khanna Publishers, 2004.
2. Gurucharan Singh Water Supply and Sanitary Engineering Vol, 1; Standard Publishers, Distributors, 2013.
3. J. Mark Hammer Water and Wastewater Technology ; John Wiley and Sons, 2013.
4. Manual on Water Supply and Treatment; CPH and EEO, Ministry of Urban Development; Govt, of India, New Delhi.

ECE306 : COMPUTATIONAL METHODS IN CIVIL ENGINEERING

L	T	P	C
3	0	0	3

Module I **8 hours**

Linear system of equations: Problems in structural analysis – slope deflection method, formulation of simultaneous equations, solution of simultaneous equations using Gauss elimination method, solution of simultaneous equations by using iterative method – Gauss Seidal iterative method (max 3 unknowns), developing computer programming for gauss-Seidal method, solution of problems using MATLAB.

Module II **10 hours**

Numerical Integration: Determination of areas and volumes, calculation of volume of earthwork using trapezoidal rule and Simpson's rule, measurement of discharge through rivers using Weddle's rule, development of computer programs for trapezoidal rule, Simpsons 1/3rd rule, Simpsons 3/8th rule, Boole's and Weddle's rules, development of computer programs for trapezoidal and Simpsons 1/3rd rule, solution of problems using MATLAB.

Module III **9 hours**

Interpolation: Forward differences, backward differences, central differences, interpolation using difference techniques, forecasting of traffic demand, forecasting of water demand for a city and other applications of civil engineering problems, solution of problems using computer programming and MATLAB.

Module IV **10 hours**

Data Analysis: Calculation of mean, variance, standard deviation, coefficient of variation of a sample, construction of histograms and determination of mean and standard deviation of cube strengths of concrete, determination of correlation coefficient of correlation such as cube strength vs cylinder strength of concrete and other civil engineering problems, solution of problems using MATLAB.

Module V **9 hours**

Finite Difference Method: Introduction, application of finite difference method in the determination of deflections of beams, indeterminate beams (propped cantilever beam) determination of

i) Deflections at the centre of simply beam subjected to UDL w per unit run over the entire span.

ii) Deflections at the centre of simply beam subjected to concentrated load at the mid span.
iii) Prop reaction and deflection at centre beam subjected to UDL over the entire span.
iv) Prop reaction and deflection at centre of beam subjected to concentrated load at the centre.

Text Book(s)

1. S.P. Venkateshan, Prasanna Swaminathan, Computational Methods in Engineering, 1/e, Academic Press - Published by Elsevier, ISBN 978-0-12-416702-5, 2014.
2. S.S. Sastry, Introducion to Numerical Methods,4/e, Printice Hall of India Private Limited, New Delhi, 2006.

References

1. S.C. Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists, 3/e, McGraw-Hill Companies Inc, 2011.
2. S. Chapra, and R, Canale, Numerical Methods for Engineers, 6/e, McGraw-Hill Higher Education, 2009.

ECE307 : DESIGN OF REINFORCED CONCRETE STRUCTURES

L	T	P	C
3	1	0	4

Module I **8 hours**

Loading standards as per IS 875, grades of steel and concrete, introduction to working stress, ultimate load and limit state methods.

Working stress method: Assumptions, flexure of RCC beams of rectangular section, under reinforced, balanced and over-reinforced sections, analysis and design of singly reinforced beams of rectangular sections using working stress method.

Module II **8 hours**

Limit State Method:RCC beams of rectangular sections under flexure, under reinforced, balanced and over-reinforced sections, analysis and design of singly and doubly reinforced beams of rectangular sections;, Design of T beams: effective flange width, analysis and design of T-beams.

Module III **9 hours**

Shear, Torsion and Bond: Limit state of collapse in shear, types of shear failures, truss analogy, shear, span/depth ratio, calculation of shear stress, types of shear reinforcement, design for shear in beams, analysis for torsional moment in a member, torsion shear stress in rectangular sections, reinforcement for torsion in RCC beams, concept of bond, development length, anchorage.

Module IV **8 hours**

Design of one-way and two-way slabs (using IS 456),method of analysis, classification of slabs, design of one way simply supported slab, behavior of two way slab, types of two way slabs, analysis of two way slabs, design of two way slabs with different edge conditions.

Module V **9 hours**

Columns: Short columns, minimum eccentricity, column under axial compression, analysis and design of short columns subjected to uniaxial moment, analysis and design of short columns subjected to bi-axial moments.

Footings: Design of isolated footings

Text Book(s)

1. Pillai and Menon, Reinforced Concrete Design, 3/e, Tata McGraw Hill, 2009.
2. N. Subramanian, Design of Reinforced Concrete Structures, Oxford University, 2014.

References

1. P.C. Varghese, Limit State Design of Reinforced Concrete, 2/e, Prentice Hall of India,2013.
2. A.K. Jain, Reinforced Concrete – Limit State Design, 7/e Standard book house, 2012.

ECE309 : WATER RESOURCES ENGINEERING

L	T	P	C
3	0	0	3

Module I **9 hours**

Surface Water Hydrology: Water resources in India, hydrologic cycle, precipitation, types of rainfall and its measurement, computation of mean depth of rainfall over an area, double mass curve; evaporation and evapo - transpiration, infiltration, infiltration indices W-index, ø - index, runoff, methods of determination of runoff, stream gauging.

Module II **9 hours**

Hydrograph Analysis: Storm hydrograph, unit hydrograph, applications of unit hydrograph, hydrograph of different durations, S-hydrograph, flood forecasting techniques.

Ground Water Hydrology: Types of aquifers, Darcy's law, well hydraulics, steady flow into wells in un-confined and confined aquifers, determination of hydraulic properties of aquifer, constant pumping test and recuperation test methods for determination of yield of an open well.

Module III **8 hours**

Reservoir Planning: Investigations for reservoir planning, selection of site for a reservoir, zones of storage in a reservoir, reservoir yield, mass curve and demand curve, determination of reservoir capacity, yield from a reservoir, operating schedules, guide curve for reservoir operation, reservoir sedimentation, control of reservoir sedimentation, useful life of a reservoir.

Module IV **8 hours**

Irrigation: Introduction of irrigation, types of irrigation systems, methods of irrigation, surface, sub-surface and sprinkler methods, drip irrigation, soil moisture constants, depth and frequency of irrigation, water requirements of crops, duty, delta, base period and their relationship, crop seasons, factors affecting duty, consumptive use of water, irrigation efficiencies, determination of canal capacities for cropping patterns.

Module V **8 hours**

Canal Systems: Classification of irrigation canals, canal alignment, regime silt theories, design of unlined canals, Kennedy's and Lacey's theories, tractive force method, design problems, cross section of a canal, balancing depth of canal.

Text Book(s)

1. P.N. Modi, Irrigation, Water Resources and Water Power Engg,, 9/e,Standard Book House,2014
2. B.C. Punmia and B.B. Lal Pande, Irrigation and Water Power Engg,16 e, Laxmi Publications, 2014.

References

1. S.K. Garg, Irrigation Engineering and Hydraulic Structures, Khanna Publishers, 2014.
2. P. Jayarami Reddy, A Textbook of Engineering Hydrology, 29/e, Laxmi Publications, 2014,
3. K. Subramanya, Engineering Hydrology, 4/e, Tata McGraw Hill Publishing, 2014.

ECE321 : ARCHITECTURAL PLANNING AND CAD

L	T	P	C
1	0	2	2

PLANNING ASPECTS & REGULATIONS

Classification of buildings - principles of planning - dimensions of buildings - building bye-laws for floor area ratio, open spaces - orientation of buildings - lighting and ventilation-space standards for residential, commercial &institutional categories. Planning and preparing sketches and working drawings of Residential buildings

Drafting of following Using CAD software

1. Drawing of conventional signs using CAD.
2. Foundation details of a building.
3. Drawing of English bond and Flemishbond brick masonry
4. Drawing of cross section of door.
5. Drawing of stair case.
6. Drawing of plan, section , elevation and site plan of residential buildings of a single room building.
7. Drawing of plan, section, elevation and site plan of residential buildings of a two bed roomed house.
8. Drawing of plan, section, elevation and site plan of residential buildings of a three bed roomed house.
9. Drawing of plan, section, elevation and site plan of residential buildings of duplex type house.
10. Preparation of plan, section, elevation and site plan of residential buildings given specifications.

Text Book(s)

1. R. Trimurty, Civil Engineering Drawing, Series 'B', Premier Publishing House, 2014.
2. N. Kumara Swamy, A. Kameswara Rao, 7/e, Building Planning and Drawing, 2013.

References

1. Bible, E. Finkelstein, AutoCAD 2012 and AutoCAD LT 2012, Wiley Publishing, 2012
2. M.G. Shah, C.M. Kale and S.Y. Patki, Building Drawing with an Integrated Approach to Build Environment, Tata McGraw- Hill Publication, 2002.
3. George Omura, Mastering AutoCAD 2013 and AutoCAD LT 2013, BPB Publishers, 2013.
4. B.P. Verma, Civil Engineering Drawing and House Planning, Khanna Publishers, 2014.
5. V.M. Marimuthu, R. Murugesan, S. Padmini, S. Pratheeba, Civil Engineering Drawing-I, Publishers, 2008.

ECE322 :COMPUTATIONAL MECHANICS LABORATORY IN CIVIL ENGINEERING

L	T	P	C
0	0	3	2

1. Formulate set of simultaneous equations and solutions for the analysis of continuous beam using MATLAB (Gauss elimination).
2. Developing a computer program for the analysis of continuous beam and solving the unknowns using Gauss-Seidal method (maximum 9 unknowns).
3. Determination of cross sectional area of a road using trapezoidal rule.
4. Determination of cross sectional area of a road using Simpsons rule.
5. Determination of flow through a canal using Weddle's rule.
6. Forecasting of traffic demand using MATLAB.
7. Forecasting of water requirement using MATLAB.
8. Determination of mean, standard deviation of a given sample of concrete strengths.
9. Developing correlation between cube strengths and cylinder strengths.
10. Determination of deflection at the centre of simply supported beam subjected to UDL w per unit run over the entire span and using finite difference method.
11. Determination of deflection at the centre of a propped cantilever beam subjected to concentrated load at the centre of span using finite difference method.
12. Construction of influence line diagram for Bendingg Moment in simply supported beam.

ECE323 : HIGHWAY ENGINEERING LABORATORY

L	T	P	C
0	0	3	2

1. Determination of specific gravity and water absorption of aggregates.
2. Gradation test on aggregates.
3. Shape test of aggregates.
4. Determination of impact and compressive strength value of aggregates.
5. Determination of abrasion value of aggregates.
6. Determination of penetration, viscosity and stripping value test on bitumen.
7. Determination of ductility test of bitumen.
8. Determination softening point , flash and fire point test of bitumen.
9. Determination of optimum binder content(Marshall mix design).
10. Traffic volume studies.
11. Spot speed studies.
12. Parking studies.

Note: All laboratory tests are as per IS, ASTM, AASHTO, TRL, IRC, BS procedures specifications and guidelines.

References

1. Khanna and Justo, Highway Material Testing, 4/e, Nem Chand, 1989.
2. W. R. Mc Shane, and R.P. Roess, Traffic Engineering, Prentice Hall, 2010.
3. L.J. Pignataro, Traffic Engineering Theory and Practice; Prentice Hall, 1973.

ECE325 : ENVIRONMENTAL ENGINEERING LABORATORY

L	T	P	C
0	0	3	2

1. Determination of pH; conductivity, turbidity of water.
2. Determination of acidity, alkalinity of water.
3. Determination of total hardness, calcium hardness of water.
4. Determination of available chlorine, residual chlorine of water.
5. Conducting jar test for determining optimum dosage of coagulant.
6. Determination of Coliform by MPN Method.
7. Determination of total solids, total dissolved solids and settleble solids.
8. Determination of phosphates, sulphates.
9. Determination of dissolved oxygen. (DO)
10. Determination of biochemical oxygen demand. (BOD)
11. Determination of chemical oxygen demand. (COD)
12. Determination of nitrates and florides.

References

1. Standard Methods for the Examination of Water and Wastewater, 21/e, Washington APHA 2012.
2. C.N. Sawyer, P.L. McCarty, and G.F. Perkin, 5/e, Chemistry for Environmental Engineering and Science, McGraw-Hill, 2002.
3. B. Kotaiah, and N. Kumara Swamy, 1/e, Environmental Engineering Laboratory Manual, Charotar Publishing, 2007.

ECE327 : SURVEY CAMP

L	T	P	C
0	0	0	1

Survey camp will be conducted for two weeks. Students are required to prepare the topographical map of the area by traditional method, students should also be exposed to modern survey equipment and practices, like Total station, Auto level, GPS etc.

ECE342 : ADVANCED REINFORCED CONCRETE STRUCTURES (Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Deflection of Reinforced Concrete Beams and Slabs: Introduction, short-term deflection of beams and slabs,deflection due to imposed loads, short-term deflection of beams due to applied loads, calculation of deflection by IS456, estimation of crack width in reinforced concrete members: introduction, factors affecting crack width in beams, calculation of crack width, simple empirical method, estimation of crack width in beams by IS 456,shrinkage and thermal cracking.

Module II **8 hours**

Retaining Walls: Types of retaining walls, forces on retaining walls, stability requirements, preliminary proportioning of cantilever/ counterfort retaining walls, design of cantilever and counterfort retaining walls.

Module III **8 hours**

Piles and Pile Caps: Design of bored cast-in-situ piles (bearing and friction types), under reamed piles, design of pile cap for three and four piles using bending method.

Module IV **8 hours**

Water Tanks (working stress method): Impermeability requirements, design of rectangular and circular water tanks resting on ground, underground.

Module V **9 hours**

Design of Flat Slabs: Direct design method- distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns-shear in flat slabs-check for one way shear-introduction to equivalent frame method, limitations of direct design method- distribution of moments in column strips and middle strip.

Text Book(s)

1. N. Subramanian, Design of Reinforced Concrete Structures, 1/e, Oxford University Press, 2013.
2. P.C. Varghese, Advanced Reinforced Concrete Design, Prentice Hall of India, 2009.

References

1. Pillai and Menon, Reinforced Concrete Design,2/e, Tata Mc,Graw Hill, 2009.
2. P.C.Verghese, Limit State Design of Reinforced Concrete, 2/e, Prentice hall India, 2008.
3. A.K.Jain, Reinforced Concrete Design (Limit state design), 6/e, Nem Chand and Bros, Roorkee, 2007.

ECE344 : CONSTRUCTION MANAGEMENT (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction to Construction Management: Origin of PERT and CPM, planning, scheduling and controlling, bar charts, milestone charts, weaknesses in bar charts, PERT and CPM networks and problems, comparison, event, activity, rules for drawing networks numbering the events (Fulkerson's law), dummy activities, work break-down structure.

Module II **8 hours**

CPM-PERT-Network Analysis: Time estimate-expected time, earliest allowable occurrence time, latest allowable occurrence time, slack and problems, problems on network analysis, project duration, probability of completion, start and finish time estimates, floats and problems, project scheduling, critical and sub-critical path.

Updating – Process of updating; when to update.

Module III **8 hours**

CPM Cost Model and Resources Allocations, Resource Scheduling: Cost analysis; direct and indirect costs, operation time, normal times and costs, problems on cost analysis, optimizing project cost, crash limit, free float limit, optimization resource smoothening, resource leveling.

Module IV **10 hours**

Management: Scope of construction management; significance of construction management, concept of scientific management; safety in construction, qualities of manager; the roles/functions performed by effective and competent managers, the manager: i) as a decision maker ii) as a motivator iii) as a communication-link iv) as a conflict resolver v)as a well – wisher of co-employees and the employer etc.

Module V **10 hours**

Organization – Types of organization; merits and demerits of different types of organization – authority –policy– labour problems; labour legislation in India; 'workmen's compensation act of 1923 and minimum wages act of 1948', and subsequent amendments.

Text Book(s)

1. B.C. Punmia, PERT and CPM, 4/e, Laxmi Publications, 2015.
2. NeerajJha Kumar, Construction Project Management, Pearson Publications,2011.

References

1. Guha and B Sen Gupta, Construction Management andPlanning, 1995.
2. A Shapero, Managing Professional People: Understanding Creative Performance, 1985
3. Groups-G Egan, Interpersonal living: A Skill/Contract Approach to Human Relations Training, 1976.
4. U.K.Shrivastava,Construction Planning and Management, Galgotia Publications, 2000.

ECE346 : HYDRAULICS AND HYDRAULIC MACHINERY (Elective)

L	T	P	C
3	0	0	3

Module I **10 hours**

Flow through open channels: Classification of free surface flows – pressure distribution in open channels - uniform flow, Chezy's and Manning's equations, most efficient channel sections for rectangular, trapezoidal cross sections.

Module II **8 hours**

Non-Uniform Flow in Open Channels: Specific energy, specific force - hydraulic jump – gradually varied flow in rectangular channels; GVF profiles.

Module III **8 hours**

Pumps: Centrifugal pumps – single and multistage pumps – working principles – priming – head, power and efficiency - characteristic curves and specific speed.

Module IV **8 hours**

Turbines: Classification of turbines – impulse turbines - reaction turbines – various components and their functions – draft tubes –unit quantities, specific speed and performance characteristics of turbines.

Module V **8 hours**

Working principles and functionality of vertical turbine pumps, submersible and jet pumps, hydraulic press, hydraulic accumulator, centrifugal compressors, wind turbines, lawn sprinkler.

Hydroelectric Power Plant: Components and functioning.

Text Book(s)

1. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics and Hydraulic Machines, Standard Book House, 2015.
2. A.K. Jain, Fluid Mechanics,12/e, Khanna Publishers, 2014.

References

1. S.Nagaratnam, Fluid Machines and Systems, Tata McGraw Hill, 1989.
2. K.R. Arora, Fluid Mechanics, Hydraulics and Hydraulic Machines, 9/e,Standard Publishers, 2013.
3. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2011.
4. M. Franck White, Fluid Mechanics, 7/e, Tata McGraw Hill, 2014
5. L.Victor, Streeter and E, Benjamin Wylie, Fluid Mechanics,9/e, Tata McGraw Hill, 2013
6. S.L.Dixon, Fluid Mechanics and Thermodynamics of Turbomachinery, Butterworth and Heinemann, 6/e,2012.

ECE348 : BRIDGE ENGINEERING (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction and investigation for bridges components of a bridge, classification, standard specifications, need for investigation, selection of bridge site, preliminary data to be collected, preliminary drawings, determination of design discharge, economical span, location of piers and abutments, vertical clearance above HFL, scour depth, choice of bridge type, importance of proper investigation.

Module II: **9 hours**

Design of Slab Bridge: General, suitability, design of one way slab bridges for IRC class AA wheeled vehicle and IRC tracked vehicle.

Module III: **9 hours**

Design of Tee-beam Bridge General, components of a T-beam bridge, number and spacing of main girders, cross beams, design of deck slab, cantilever portion, design of longitudinal girders, design of cross beams.

Module IV **8 hours**

Bearings: Bearings for bridges, importance of bearings, bearings for slab bridges, bearings for girder bridges, expansion bearings, fixed bearings, design of elastomeric pad bearing.

Sub Structure for Bridges: Pier and abutment caps, materials for piers and abutments, design of pier, design of abutment, backfill behind abutment, approach slab scour at abutments and piers, grip length.

Module V **8 hours**

Bridge Foundations: General, types of foundations shallow foundations, pile foundations, well foundations.

Text Book(s)

1. D. Johnson Victor, Essentials of Bridge Engineering, Oxford and IBH Publishing, 2007.
2. N. Krishnaraju, Design of Bridges,4/e, Oxford and IBH publications,2009.

References

1. S. Ponnuswamy , Bridge Engineering, Tata McGraw-Hill, 1997.
2. D.R. Phatak, Bridge Engineering, Satya Prakasnan, 2000.
3. E.C. Hambly, Bridge deck behavior, Chapman and Hall, London, 1991.
4. E.J. O'Brien and D.L. Keogh, Bridge Deck Analysis, E and FN. Spon, 2005.

ECE350 :GEOGRAPHIC INFORMATION SYSTEM
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Basic Concept of GIS Introduction, Information systems, spatial and non-spatial information, geographical concepts and terminology, advantages of GIS, basic components of GIS, commercially available GIS hardware and software, organisation of data in GIS.

Module II **8 hours**

GIS Data: Input data, field data, statistical data, maps, aerial photographs, satellite data, points, lines and areas features, vector and raster data, advantages and disadvantages, data entry through keyboard, digitizers and scanners, digital data, GIS data formats and standards.

Module III **9 hours**

Data Management: Data management, data base management system (DBMS), various data models, run length encoding, quad trees, data analysis, data layers, analysis of spatial and non-spatial data, data overlay and modelling, smart features of DBMS.

Module IV **8 hours**

Applications of GIS: Applications of GIS in map revision, landuse, agriculture, forestry, archaeology, municipal, geology, water resources, soil erosion, land suitability analysis, change detection.

Module V **8 hours**

Case Study: A case study in GIS implementation, the consultant, the client, the initial applications, types of GIS analysis used for case study.

Text Book(s)

1. J.B. Campbell, Introduction to Remote Sensing,5/e, Guilford Press, 2011
2. C.A. Legg, Remote Sensing and Geographic Information Systems, Ellis Horwood, 1992.
3. Basudeb Bhatta, Remote Sensing and GIS,2/e, Oxford Press, 2011.

References

1. P.A. Burrough, Principles of Geographic Information System for Land Resources Assessment, Monograph on Soil Resources Survey No, 12, Claredon, Press, Oxford, 1988.
2. E.T. Engaman, and R.J. Gurney, Remote Sensing in Hydrology, Chapman and Hall, London, 1991.

ECE352 : HYDRAULIC STRUCTURES (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction: Classification of dams, gravity dams: forces acting, elementary profile, determination of profile of a dam, safety criteria, stability analysis including earthquake effects.

Module II **8 hours**

Earth Dams: Types, causes of failure, seepage analysis for homogeneous dams, stability analysis by slip circle method, seepage control.

Module III **10 hours**

Design of Hydraulic Structures: Functions and components of a diversion head work, hydraulic structures on permeable foundations, theories of subsurface flow, Bligh's creep theory, khosla's method of independent variables.

Module IV **8 hours**

Water Conductor System of Hydropower Station: Components, design of intake structure, design of trash rack, types of surge tanks, canal structures: head regulator, cross regulator.

Module V **8 hours**

Spillways and Gates: Types of spillways, design of ogee spillway, design of stilling basins, flood routing through spillways **(puls method),** types of hydraulic gates, design of radial gate.

Text Book(s)

1. P.N. Modi, Irrigation Water Resources and Waterpower Engineering, 9/e, Standard Publishing Company,2014
2. K.R. Arora, Irrigation, Water Power and Water Resources Engineering,4/e, Standard Book Publishing, 2015.

References

1. R.S. Varshney, Hydro Power Structures (A Compendium Including Canal and Small Hydro Engineering), 5/e, Nem Chand and Bros, 2014.
2. P. Novak, A.I.B. Moffat, C. Nalluri and R. Narayan, Hydraulic Structures, 4/e, Taylor and Francis, 2006.
3. Central Board of Irrigation and Power, Manual on Barrages and Weirs on Permeable Foundation, Publication 179 (GP-179), Volumes I and II, 1985.
4. Ven Te Chow, R. Maidment and L.W. Mays, Applied Hydrology, 1/e,Tata Mcgraw Hill Publishing Co. Ltd., 2012.
5. P. Jayarami Reddy, Text Book of Hydrology, 3/e, Laxmi Publications, 2014.

ECE391 : SEMINAR

L	T	P	C
0	0	2	1

Student has to select a topic of his / her interest in consultation with the faculty incharge of seminar. He / She can collect information from the books, journals, internet and prepare a report. Prepare a powerpoint presentation on the topics and present before a committee to evaluate the seminar.

Seminar is separate for each student.

ECE401 : DESIGN PRACTICE

L	T	P	C
1	0	2	2

Note: Student should choose any two specializations for design practice

Geotechnical Engineering: Utilization of bottom ash as a backfill material for highway construction and analysis of fatigue and rutting strains using IIT PAVE and KENPAVE software. Stabilization of black cotton and laterite soils using lime and flyash for pavement construction. Determination of shear strength parameters using graphic user interface (MATLAB).Design of sand drains (in triangular and rectangular patterns), about prefabricated vertical drains installation and construction practice.computerisation of IS soil classification procedure using a computer. Language or in MATLAB, a decision support system development.

Structures: Design a multi storey building for a given plan, the submission is to comprise following components: a) A conceptual design report b) Containing design calculations for the selected scheme superstructure, c) Containing the drawings of the selected scheme superstructure, d) Actual BOQ for the given structure

Environmental: The student should submit a) Design of waste water treatment of specific industry mentioned above b) Various calculations involved in the design c) Submission of line schematic diagrams of the lay out using computer knowledge if any needed in the project.
Hydraulics: a) Pipe network application: EPANET b) Ground water modeling: MODFLOW.

Transportation: Complete design of traffic signal is based on the following parameters: a) Traffic volumes and directional flows b) Speed studies c) Lane geometry of the location d) Signal design, phase design, determination of amber time clearance time, determination of cycle length, apportioning of green time, pedestrian crossing requirements, and the performance evaluation of the above design.

ECE402 : PRESTRESSED CONCRETE

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction: Basic concepts of prestressing, need for high strength steel and concrete, advantages of prestressed concrete, materials for prestressed concrete, high strength concrete and high strength steel, prestressing systems (a) Fressinet system (b) Gifford Udall (c) Magnel Blatan system, tensioning devices, anchoring devices, (d) pre tensioning and post tensioning.

Module II **8 hours**

Prestressing losses, elastic shortening, loss due to shrinkage, loss due to creep, loss due to friction, loss due to curvature, IS code provisions.

Module III **10 hours**

Analysis of pre-stress members, assumptions, pressure, or thrust line concept of load balancing, cable profile, kern distance, stress in tendons as per IS 1343, cracking moment.

Module IV **10 hours**

Limit state design of flexural members, stress, IS code provisions, design of symmetrical beams, design of prestressed concrete poles, design for shear, IS code provisions.

Module V **10 hours**

Transfer of prestress (pretensioned members), transmission length, bond stress, transverse tensile stress, end zone reinforcement, flexural bond stress, I.S. code provisions, anchorage zone in post tensioned members, stress distribution in end block, Guyon's method of approach of analysis of end block (not more than 2 cables).

Text Book(s)

1. T.Y. Lin, and H. Ned, Burhns, Design of Prestressed Concrete Structures, 3/e, John Wiley and Sons, 2010.
2. N. Krishna Raju, Prestressed concrete, 4/e, Tata McGraw Hill, 2012.

References

1. P. Dayaratnam, Prestressed Concrete Structures, Oxford and IBH Publishing Company, 2014.
2. G.S. Pandit, Prestressed concrete, CBS Publishers, 2014.
3. H. Arthur, Nilson, Design of prestressed concrete, Wiley India Pvt.ltd, 2011.
4. J.R. Libby, Modern prestressed concrete,CBS Publishers, 2007.

ECE403 : COST ESTIMATION OF CIVIL STRUCTURES

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction: General items of work in building, standard modules principles of working out quantities for detailed and abstract estimates, approximate method of estimating, errors in estimation, types, related terms in estimate, contingencies, different types of approvals, rules. **Specification:** purpose and basic principle of general and detailed specification (writing the detailed specification for various constructions should be covered in term work).

Module II **8 hours**

Contracts: Definition, element of contract, offer acceptance and consideration, valid contract, types of contracts, conditions of contract, sub-contracts, joint ventures, muster roll form 21, piecework agreement form, work order.

Tender: Definition quotation, earnest money- security money, tender notice, tender form, bidding procedure, irregularities in bidding, award, arbitration- disputes settlement.

Module III **10 hours**

Detailed Estimate of Buildings: Different items of works in building, detailed measurement form, estimate of RCC building long walls short wall method and centre line method.

Module IV **8 hours**

Rate Analysis: Working out of data sheet for materials and various items of work in buildings, schedule of rates, and abstract estimate of buildings.

Module V **8 hours**

Roads: Estimation of earth work, different formulae for calculations, concrete roads, bituminous roads.

Bar bending: Introduction to bar bending schedule, beams.

Text Book(s)

1. B.N. Dutta, Estimating and Costing in Civil Engineering,UB Publishers, 2014.
2. M. Chakraborti, Estimation Costing Specifications and Valuation in Civil Engineering, ,2014.

References

1. Standard schedule of rates and standard data book by public works department.
2. G.S. Birdie, Textbook of Estimating and Costing in Civil Engineering, 2014.
3. IS 1200-1992 “Methods of Measurements of Building and Civil Engineering Works”.

ECE421 : COMPUTER APPLICATIONS IN CIVIL ENGINEERING LABORATORY

L	T	P	C
0	0	3	2

1. Introduction to STAAD Pro software and basic beam analysis.
2. Analysis of RC plain and three dimensional frames.
3. Analysis and design of structures subjected to wind and earthquake loads.
4. Analysis and design of steel truss.
5. Design of structural components slabs, footings, pile caps, retaining walls (using NISA civil software).
6. Land use, land cover, hydro morphology, network of roads using GIS software (ESRI or ILWIS).
7. DEM Generation using digital photogrametry software (using PHOTOMOD/ ERDAS Leica).
8. Pipe network application EPANE.
9. Project Management Application MS Projects/Primavera.

Note: Students should learn any three software packages,

ECE441 : ADVANCED DESIGN OF STEEL STRUCTURES (Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Plate Girders: Components of a plate girder, economical depth, design of flanges, design of cross section of plate girders, design of connection.

Module II **9 hours**

Plate Girders: Web stiffeners - design of vertical, horizontal and bearing stiffener, web splice.

Module III **7 hours**

Roof Trusses: Types of trusses, economical spacing of roof trusses, loads on roof trusses, estimation of wind load on roof trusses as per IS:875, design of members of roof truss and joints, design of purlins.

Module IV **7 hours**

Beam-Columns: Short beam column, stability consideration for long beam-columns, interaction formula, design approach to beam-columns. **Column Bases and Foundations**: Slab base, gusset base and grillage foundations for axially loaded columns.

Module V **10 hours**

Gantry Girder: Introduction - loading consideration and maximum load effect - selection of gantry girder – design of gantry girders for primary loads only.

Text Book(s)

1) S.K. Duggal, Limit State , Design of Steel Structures , Tata McGraw Hill, 2014.
2) N. Subramanyam, Design of Steel Structures, 1/e, Oxford University Press, 2008.

References

1) V.L. Shah and Veena Gore, Limit State Design of steel structures IS:800-2007, 3/e , Structures Publications,2012.
2) M.L. Gambhir, Fundamentals of Structural Steel Design, McGraw Hill Education , 2013.
3) R. Narayanan, Teaching Resource on Structural Steel Design, INSDAG, Ministry of Steel Publications, 2002.
4) Ramchandra and V. Gehlot, Design of steel structures, 4/e, Scientific Publishers, 2010.

ECE442 : SOIL DYNAMICS AND MACHINE FOUNDATIONS (Elective)

L	T	P	C
3	0	0	3

Module I **9hours**

Fundamentals of Vibration: Definitions, simple harmonic motion, response of SDOF systems Of Free And Forced Vibrations With And Without Viscous Damping, Frequency Dependent Excitation, Systems Under Transient Loads, Rayleigh's method of fundamental frequency, logarithmic decrement, determination of viscous damping, transmissibility, systems with two and multiple degrees of freedom, vibration measuring instruments.

Module II **8hours**

Wave Propagation and Dynamic Soil Properties: Propagation of seismic waves in soil deposits attenuation of stress waves, stress-strain behaviour of cyclically loaded soils, strength of cyclically loaded soils, dynamic soil properties, laboratory and field testing techniques, elastic constants of soils, correlations for shear modulus and damping ratio in sand, gravels, clays and lightly cemented sand, liquefaction of soils - an introduction and evaluation using simple methods.

Module III **8hours**

Vibration Analyses: Types, general requirements, permissible amplitude, allowable soil pressure, modes of vibration of a rigid foundation block, methods of analysis, lumped mass models, elastic half space method, elasto-dynamics, effect of footing shape on vibratory response, dynamic response of embedded block foundation, vibration isolation.

Module IV **9hours**

Design of Machine Foundations: Analysis and design of block foundations for reciprocating engines, dynamic analysis and design procedure for a hammer foundation, is code of practice design procedure for foundations of reciprocating and impact type machines, vibration isolation and absorption techniques.

Module V **9hours**

Machine Foundations on Piles: Introduction, analysis of piles under vertical vibrations, analysis of piles under translation and rocking, analysis of piles under torsion, design procedure for a pile supported machine foundation.

Text Book(s)

1. I. Chowdhary and S P Dasgupta, Dynamics of Structures and Foundation, 2009.
2. S.D. Arya, M. O'Neil, and G. Pincus, Design of Structures and Foundations for Vibrating Machines, Gulf Publishing, 1979.

References

1. F.E. Richart, J.R. Hall, and R.D. Woods, Vibrations of Soils and Foundations, Prentice Hall, 1970.
2. Swami Saran, Soil Dynamics and Machine Foundation, Galgotia, 2010.
3. B.M. Das, Principles of Soil Dynamics, 2/e, PWS KENT, 2010.
4. S. Prakash, and V.K. Puri, Foundation for Machines: Analysis and Design, John Wiley, 1998.
5. N.S.V. Kameswara Rao, Vibration Analysis and Foundation Dynamics, Wheeler, 1998.
6. S.L. Kramer, Geotechnical Earthquake Engineering, Prentice Hall, 1996.

ECE443 : ADVANCED CONSTRUCTION TECHNIQUES
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Sub Structure Construction: Box jacking: need – elements – concept – precautions – advantages, pipe jacking: technique – factors – applications – advantages, diaphragm walls methods – sheet piles – applications – advantages, piling techniques: classifications – factors, well and caisson: types – sinking method –precautions.

Module II **8 hours**

Large Span Structures Construction: Tunnelling - purpose – aspects – shafts – mucking – construction techniques –advantages – trenchless technology; Bow string bridges - systems arrangements – advantages; Suspension and cable stayed bridges - parallel –radial patterns – concept.

Module III **8 hours**

Formwork: Requirements of formwork, loads carried by formwork, types of formwork: timber, steel, modular shuttering, scaffolding.

ModuleIV **8 hours**

Tall Structures Construction: Concrete in tall buildings, types of concrete pumps, factors, blockage causes,clearing, safety, slip form techniques: vertical, chimney, horizontal, concrete paving methods, suspended form work: purpose, methods, advantages, erection techniques.

Module V **10 hours**

Repair and Strengthening Techniques: Mud jacking: techniques, behaviour of slab -advantages, micro piles: uses - stages – applications - benefits, shallow profile pipeline laying -procedure - specifications - sub aqueous pipe lines - laying methods, demolition and dismantling: principles - methods - modern demolition techniques.

Text Book(s)

1. S.K. Sankar, and S. Saraswati, Construction Technology, Oxford University Press.2008
2. P.S. Gahlot, and Sanjay Sharma, Building Repair and Maintenance Management, CBS Publications, 2006.

References

1. Roy Chudley, Roger Geeno, Advanced Construction Technology, 1/e, 2006
2. S. Ponnuswamy, Bridge Engineering, 1/e, Mc-Graw Hill, 2008.
3. Robertwade Brown, Practical Foundation Engineering Hand Book, Mcgraw Hill Publications, 2001.

ECE444 :TRAFFIC ENGINEERING (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Traffic Flow Description: Statistical distributions to explain traffic flow Poisson distribution, exponential distribution, Erlang distribution, composite distribution.

Module II **10 hours**

Delay Models: Intersection delays, pedestrian delays, gap acceptance concepts.

Module III **9 hours**

Queuing Models: Demand service characteristics, single channel queuing systems, M/M/1 and D/D/1 system analysis.

Module IV **8 hours**

Traffic Flow Analogies: Car following theory, fluid-flow analogy, shock wave theory.

Module V **7hours**

Simulation: Introduction to simulation modeling, analog and digital simulation, random number operation, random variants, arrival times, validation of models.

Text Book(s)

1. C.S. Papacostas, Fundamentals of Transportation Engineering, Prentice Hall, 1987.
2. F.L. Mannering and W.P. Kilareski, Principles of Highways Engineering and Traffic Analysis, 2008.

References

1. T.R.B. Special Report, 165, TRB - Traffic Flow Theory, Washington.
2. M. Wohl and B. V. Martin, Traffic System Analysis, 4/e,
3. McGrawHill, 1967.
4. A.D. May, Traffic Flow Fundamentals, Prentice Hall, 1990.

ECE445 : SURFACE AND GROUND WATER MODELLING (Elective)

L	T	P	C
3	0	0	3

Module I **10 hours**

Mathematical Modeling: Integration of basic processes of evaporation, snow-melt, runoff, soil water dynamics, and groundwater flow in mathematical models, application of rainfall-runoff models.

Module II **8 hours**

Methods of surface and sub-surface investigation- Ground water investigation – geophysical, resistivity, spontaneous, potential, radiation, temperature, caliper, fluid conductivity, fluid velocity, RS and GIS.

Module III **8 hours**

Hydrograph Analysis: Synthetic module hydrograph, transposing module hydrograph, basics of stochastic and deterministic models.

Routing: Reservoir routing, channel routing, Muskingum and Muskingum-Cunge methods of channel routing.

Module IV **8 hours**

Ground Water Contamination: Sources and causes of pollution, principles of contaminant transport in groundwater, Ghyben-Herzberg relation between fresh and saline waters, stochastic approach to ground water modeling.

Module V **8 hours**

Ground Water Modeling: Application of MODFLOW and GMS groundwater modeling packages, ground water modeling through porous media.

Ground Water Basin Management: Hydrologic equilibrium equation, ground water basin investigations, data collection and field work, dynamic equilibrium in natural aquifers, Management of aquifers.

Text Book(s)

1. D.K. Todd and L. F. Mays, Groundwater Hydrology, 3/e, John Wiley and Sons Inc.,2004.
2. C.W. Fetter, Applied Hydrogeology, 4/e, Pearson Education Limited, 2014.

Reference

1. L.W. Mays, D.R. Maidment and V.T. Chow, 2010, Applied Hydrology, 1/e, Tata Mcgraw Hill Publishing Co. Ltd., 2012.
2. H.M. Raghunath, Hydrology: Principles, Analysis, Design, 3/e, New Age International Publishers, 2014.
3. Jr. W. Viessman, and G. L. Lewis, Introduction to Hydrology, 5/e, Pearson Education Limited, 2014.
4. K. Subramanya, Engineering Hydrology, 4/e, Tata Mcgraw Hill Publishing Co. Ltd., 2014
5. K.R. Karanth, Hydrogeology, Tata McGraw Hill, 1989.

ECE446 : AIR POLLUTION CONTROL AND MANAGEMENT (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Sources: Sources and classification of air pollution, natural and manmade, primary and secondary pollutants and various classifications of air pollutant standards as per central pollution control board (CPCB).

Module II **8 hours**

Meteorology: Importance of meteorological parameters, stability conditions, types of inversions lapse rate, mixing depth, mixing height, method of measurement of meteorological parameters, plume behavior-effective stack height Gaussian plume models.

Module III **8 hours**

Air Pollution Mechanism: Effect of air pollution, specific air pollutant effects on human health, animals and plants, effect on various structures, automobile pollution, effect of automobile pollution and its control.

Module IV **8 hours**

Sampling Procedures: Particulate matter collection, respirable sampler for estimation of particulate matter, gaseous sampling collection, analysis procedures.

Module V **8 hours**

Management of Air Pollution Control: Objectives of using control equipment, settling chambers, cyclone separators, multi - clones, scrubbers, bag filters, dust suppression systems electrostatics precipitators.

Text Book(s)

1. M.N. Rao and H.V.N. Rao, Air Pollution, Tata McGraw, 1989.
2. C.S. Rao, Environmental Pollution Control, 2/e, Wiley Eastern, 2006.

References

1. A.C. Stern, Air Pollution, Vol, I-Viii, Academic Press, 1984..
2. K.V.G.S. Murali Krishna Air Pollution and control, Kakinada, 1995

ECE447 : ADVANCED FOUNDATION ENGINEERING
(Elective)

L	T	P	C
3	0	0	3

Module I **9hours**

IS code provision in respect of subsoil exploration for dams, canals, tunnels, off shower structure, air ports bridges, IRC, provisions for exploration in respect of roads, case studies of foundation failures.

Module II **9 hours**

Design of shallow foundations subjected to inclined loads, design of raft foundation on different types of soil, design of combined and isolated footing based on field test including calculation of settlement, introduction to software available for geotechnical design.

Module III **9 hours**

Design of pile based on cyclic load test, study of provision made in different IS codes related to deep foundation, various types of pile, design of racer piles and piles subjected to lateral load, testing and design of piles subjected to tensile loads.

Module IV **8 hours**

Design of under reamed pile foundation subjected to tensile loads, design of sand drains and stone columns.

Module V **8 hours**

Study of various provisions made as per IRC and as per IS in respect of design of well foundation, case studies of failure of well foundation, design and enabling structures like cofferdam, sheet piles, cellular cofferdam, rock fill cofferdam.

Text Book(s)

1. J.E. Bowles, Foundations Analysis and Design, 7/e, McGraw-Hill, 2001.
2. R.K. Shenbage, Design Aids in Soil Mechanics and Foundation Engineering, Tata McGraw Hill.
3. P. K. Nainan, Design of Foundation Systems, Narosa Publication House.
4. M.J. Tamlinson, Foundation Design and Construction, ELBS Publication, 2001.
5. G.A. Leonards, Foundation Engineering, Tata McGraw Hill, 1962.

References

IS Codes (Relevant/Prescribed IS Codes).
IS: 1892-1979, Code of Practice for Subsurface Investigation for Foundation.
IS: 2131-1981 (Reaffirmed 1997), Method for Standard penetration Test for Soils.
IS: 6403-1981, Code of Practice for Determination of B.C. of Shallow Foundation.
IS: 8009 (Part-1) 1976, Code of Practice for Calculation of settlements of foundations.
IS: 1904-1986, Code of Practice for Design and Construction of Foundations in Soils, general Requirements.
IS: 2911-1979, Code of Practice for Design and Construction of Pile Foundation.

Handbooks

1. H.Y. Fang, Foundation Engineering Handbook, Chapman and Hall, 1991.
2. W.C. Teng, Foundation Design, Prentice Hall International, 1962.

ECE448 : GROUND IMPROVEMENT TECHNIQUES
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Introduction: Role of ground improvement in foundation engineering, methods of ground improvement, geotechnical problems in alluvial, laterite and black cotton soils, selection of suitable ground improvement techniques based on soil condition.

Module II **9 hours**

Drainage and Dewatering: Drainage techniques, well points, vaccum and electro osmotic methods, seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

Module III **9 hours**

Insitu Treatment of Cohesionless and Cohesive Soils: Insitu densification of cohesionless and consolidation of cohesive soils, dynamic compaction and consolidation, vibrofloation, sand pile compaction, preloading with sand drains and fabric drains, stone columns, lime piles, installation techniques only - relative merits of various methods and their limitations.

Module IV **8 hours**

Earth Reinforcement: Concept of reinforcement, types of reinforcement material, applications of reinforced earth, use of geotextiles for filtration, drainage and separation in road and other works.

Module V **8hours**

Grout Techniques: Types of grouts, grouting equipment and machinery, injection methods, grout monitoring, stabilisation with cement, lime and chemicals, stabilisation of expansive soils.

Text Book(s)

1. R.M. Koerner, Construction and Geotechnical Methods in Foundation Engineering, Tata McGraw Hill, 1994.
2. R.P. Purushothama, Ground Improvement Techniques, Tata McGraw Hill,1995.

References

1. M.P. Moseley, Ground Improvement Block, IE Academic and Professional, Chapman and Hall, 1993.
2. J.E.P. Jones, Earth Reinforcement and Soil Structure, Butterworths, 1995.
3. R.M. Koerner, Design with Geosynthetic, 3/e Prentice Hall, 2002.
4. R.A. Jewell, "Soil Reinforcement with Geotextiles", CIRIA special publication,1996.
5. B.M. Das, Principles of Foundation Engineering, Thomson Books / Cole, 2003.

ECE449 : TRANSPORTATION INFRASTRUCTURE ENGINEERING (Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Railways - Introduction and Planning: Development of railways in India, components of a permanent way and its functions, rails, sleepers, ballast, formation, rail fittings and fastenings, comparison of roadways and railways, engineering surveys for track alignment and GIS, GPS and RS applications, track alignment considerations, track construction and track maintenance, track drainage, introduction to modern developments in railways.

Module II **10 hours**

Railways – Geometric Design, Points and Crossings, Signaling and Interlocking: Gradient and grade compensation on curves, speed on curves, super elevation and negative super elevation, widening of gauge on curves, types of stations and station yards, station equipment's, types of points switch and crossings, design calculation of turnout, various types of track junctions, signaling and interlocking, different types of signals, their working and location, control systems of signals, track circuiting.

Module III **9 hours**

Airport Engineering: Layout and Design: Introduction, classification of airports, factors influencing site selection, components of airport landing areas, terminal area and terminal buildings, cross sectional components of runway and taxiway, components, drainage, airport zoning, clear zone, approach zone, buffer zone, turning zone, clearance over highways and railways.

Module IV **7 hours**

Airport Planning and Air Traffic Control: Hangers and helipads, turning radius, taxiway as per Indian standards, wind rose diagram, runway orientation, landing aids, air traffic control, airfield marking and lighting-sign, aircraft parking system, flight planning and operations, design standards, planning and design of airport as per Indian condition.

Module V **7 hours**

Harbours Docks and Management: Dock, different types, functional design and various types and their usage, navigational aids, necessity and type of signals and different types of dredges and their applications, classification and requirements of harbours, classification and construction,

wharves, piers and bulkheads, dolphins, fender and other mooring devices, typical layout of existing harbours.

Text Book(s)

1. N.J. Ashford, S.A. Mumayiz, and P.H. Wright, Airport Engineering: Planning, Design and Development of 21stCentury Airports, 4/e, John Wiley and Sons,2011.
2. C. SaxenaSubhash, and Satyapal Arora, A course in Railway Engineering, 7/e, Dhanpat Rai and sons, Delhi, 2009.

References

1. M.M. Agarwal, Indian Railway Track, 5/e, Prabha and Co, 2007.
2. K.F. Anita, "Railway Track", New Book Company, 2000.
3. S.B. Young, and A.T. Wells, Airport Planning and Management, 6/e, McGraw-Hill,2011.

ECE450 : INTELLIGENT TRANSPORTATION SYSTEMS
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

System architecture, standards, database, tracking database, commercial vehicle operations, intelligent vehicle initiative, metropolitan ITS, rural ITS, ITS for rail network.

Module II **8 hours**

ITS travel management, autonomous route guidance system, infrastructure based systems, telecommunications, vehicle, road side communication, vehicle positioning system, electronic toll collection, electronic car parking.

Module III **10 hours**

ITS designs, modeling and simulation techniques, peer–to–peer program, ITS for road network, system design, mobile navigation assistant, traffic information centre, public safety program.

Module IV **7 hours**

Automated Highway System: Evolution of AHS and current vehicle trends, vehicles in platoons, aerodynamic benefits, integration of automated highway systems, system configurations, step by step to an automated highway system.

Module V **9hours**

Spacing and capacity for different AHS concepts, communication technologies for AHS, the effects of AHS on the environment, regional mobility impacts assessment of highway automation.

Text Book(s)

1. Kan Paul Chen, John Miles, Recommendations for World Road Association (PIARC) ITS Hand Book, 2000.
2. R. Roger, Stough, Intelligent Transport Systems – Cases and Policies, Edward Elgar, 2001.

References

1. Joseph Sussman, Introduction to Transportation Systems, Illustrated Edition, Artech House, 2000.
2. Kan Chen, John Miles, ITS Handbook 2000: Recommendations from the World Road Association (PIARC), Artech House, 1999.

ECE451 : SANITARY ENGINEERING (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction to Sanitary Engineering: Sanitation, conservancy and water carriage system, sewerage systems, relative merits.

Sanitary Sewage and Storm Sewage: Quantity of sanitary sewage, factors affecting sanitary sewage, determination of quantity of sanitary sewage, factors affecting storm water sewage, determination of quantity of storm water sewage, sewers, sewer appurtenances, sewage pumping, types of sewers, design of sewers, construction; testing, sewer appurtenances man holes, drop man holes, lamp holes, flushing tanks, grease and oil traps, inverted siphons, street inlets, catch basins, storm water regulators, sewage pumping, types of pumps.

Module II **10 hours**

Quality and Characteristics of Sewage: Characteristics of sewage, decomposition of sewage, BOD, COD, physical and chemical analysis of sewage.

Natural Methods of Wastewater Disposal: Introduction, disposal by dilution, types of receiving waters for dilution, self-purification of natural streams, oxygen sag curves, dilution into sea, disposal by land treatment, comparison of disposal methods, sewage sickness; reuse of treated sewage.

Module III **10 hours**

Primary Treatment of Sewage: Screens, grit chamber, grease traps, skimming tanks, sedimentation tanks.

Secondary Treatment Of Sewage: Trickling filters and ASP trickling filters, operational problems and remedies, activated sludge process vs. trickling filter process, methods of aeration, diffused air system, mechanical aeration, combined system, sludge bulking, sludge volume index.

Module IV **7 hours**

Miscellaneous Methods: Septic tank, septic tank effluent disposal, imhoff tank introduction, oxidation ditch, stabilization pond (oxidation pond), aerobic lagoons, anaerobic lagoons, facultative ponds, Rotating Biological Contractor. (RBC)

Module V **7 hours**

Sludge Treatment and Disposal: Anaerobic sludge digestion process, factors effecting sludge digestion, sludge digestion tanks, high rate

digestion, sludge thickening, sludge conditioning, methods of dewatering the sludge, methods of sludge disposal.

Sanitary Installations: Sanitary fittings, plumbing systems, single stack system, one pipe and two pipe systems, design of building drainage, maintenance of sanitary installations.

Text Book(s)

1. S.K. Garg, Environmental Engineering vol-II Sewage Disposal and Air Pollution Engineering, Khanna Publishers, 2008.
2. K.N. Duggal, Elements of Public Health Engineering,4/e, S Chand, 1988.

References

1. S.C. Rangwala, Water Supply and Sanitary Engineering,1/e,Charotar, 2005.
2. S.R. Kshirasagar, Sewage and Sewage Treatment, 3/e,Roorkee Publishing House, 1968.
3. Met Calf and Eddy, Wastewater Engineering Treatment, Disposal and Reuse, Tata McGraw Hill, 2010.
4. M.J. Hammer, Water and Wastewater Technology, 2/e,John Wiley and Sons, 1996.

ECE452 : ADVANCE ENVIRONMENTAL MANAGEMENT (Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Introduction: Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics-methods of sampling and characterization, segregation of solid wastes – public health and economic aspects of open storage – source reduction of waste – objectives of waste processing, elements of solid waste management – municipal and bio medical solid waste rules – public role in solid waste management.

Module II **8 hours**

Resource recovery from solid waste composting and biomethanation; materials- soil pollution: sources, types of soil pollution, effects of fertilizers, pesticides and radioactive material on soils, land disposal of solid waste; sanitary landfills – site selection; landfill liners – management of leachate and landfill gas- landfill bioreactor– dumpsite rehabilitation.

Module III **8 hours**

Hazardous Waste Management: Sources and types of hazardous waste-characteristics of hazardous wastes; collection-handling-processing techniques-disposal methods; hospital waste management - processing techniques - disposal.

Module IV **10 hours**

Conceptual Facts of EIA: Introduction, definition and scope of EIA, objectives in EIA, basic EIA principles, classification of EIA, strategic EIA (SEIA), regional EIA, sectoral EIA, project level EIA and life cycle assessment, project cycle.

Baseline Data Acquisition: Environmental inventory, data products and sources: thematic data, topographical data, collateral data and field data, environmental baseline monitoring (EBM), preliminary study to determine impact significance.

Module V **8 hours**

Prediction of Impacts (Air and Water): Air and water environment, sources and basic information on water and air conceptual approach for addressing air and water environment impacts, assessment of impacts air, water, noise, soil, biological and scio-economic impacts, assessment of impact significance.

Text Book(s)

1. G. Tchobanoglous, H. Theisen and S.A. Vigil 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw-Hill, 1993.
2. P.A. Vesilind, W.A. Worrel and D.R. Reinhart, Solid Waste Engineering, 1/e, Thomson Brooks/Cole, 2002.

References

1. M. Anjireddy, Textbook of Environmental Science and Technology, BS Publications, 2010.
2. Y. Anjaneyulu, Environmental Impact Assessment, B.S. Publications, 2003.
3. P.A. Erickson, Environmental Impact Assessment Principles and applications,2000.
4. Technological guidance manuals of EIA, MoEF.
5. L.W. Canter, Environmental Impact Assessment, 2/e, McGraw-Hill, 1997.

ECE491 :MINI PROJECT

L	T	P	C
0	0	3	2

Mini project is a short project intended to train students to identify a problem of practical significance related to various specializations of civil engineering.

Study of literature related to any of the problem and works for a solution and submits a report.

Mini project can be individual or maximum of 4 persons.

ECE492 : COMPREHENSIVE VIVA

L	T	P	C
0	0	0	2

Comprehensive viva is intended to train students to face interviews. Students are expected to prepare fundamentals in all core subjects of their branch for taking comprehensive viva.

ECE493 : SUMMER INTERNSHIP

L	T	P	C
0	0	0	2

Summer internship is planned to expose students to industrial practices. Studens have to correlate the theory in classroom to the procedures adopted in industry. Students have to maintain a diary on the work carried out in industry and submit a detailed report of her / his experience at the industry.

ECE494 : PROJECT WORK

L	T	P	C
0	0	0	8

A graduate is expected to contribute to the industry in various specializations of civil engineering as soon as joining in the industry. Hence it is essential to have training in any one of the specialized areas by taking up a project work. The project work can be an extension of mini project or can be an independent.

ECS362: OPERATING SYSTEM CONCEPTS (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction: Introduction to operating systems, what operating systems do, user view, system view, defining operating systems, computer system architecture-single processor systems, multiprocessor systems, clustered systems.

Module II **10 hours**

Process Management: Process concept, the process, process state, process control block, process scheduling, scheduling queues, schedulers, context switch**. CPU Scheduling:** Basic concepts CPU I/O burst cycle, CPU scheduler, preemptive scheduling, scheduling criteria, scheduling algorithms, first come first serve scheduling, shortest job first scheduling, priority scheduling, round robin scheduling.

Module III **8 hours**

Process Synchronization: Critical section problem, synchronization hardware, semaphores, classic problems of synchronization, the bounded buffer problem, the readers writers problem, the dining philosophers problem, monitors.

Module IV **8 hours**

Deadlock: System model, deadlock characterization necessary conditions, resource-allocation graph, methods for handling deadlocks, deadlock prevention, avoidance, detection, recovery from deadlock.

Module V **10 hours**

Memory Management: Swapping, contiguous memory allocation, segmentation, paging. **Virtual memory:** Demand paging, page-replacement FIFO page replacement, optimal page replacement, LRU page replacement, allocation of frames, thrashing.

Text Book(s)

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Operating System Concepts, 9/e, John Wiley, 2015.

References

1. Naresh Chauhan, Principles of Operating Systems, Oxford Higher Education, 2010.
2. Andrew S Tanenbaum, Modern Operating Systems, 2/e, Pearson/PHI, 2008.
3. William Stallings, Operating Systems – Internal and Design Principles, 5/e, Pearson Education, 2007.
4. Deitel and Deitel, Operating Systems, 3/e, Pearson Education, 2004.

ECS364: FUNDAMENTALS OF DATA STRUCTURES
(Elective)

L	T	P	C
3	0	0	3

Module I **10 hours**

Data Representation: Introduction, array based representation and operations, indirect addressing and operations, linked representation, comparisons. **Searching**: Linear search, binary search. **Arrays**: Arrays, matrices, sparse matrices.

Module II **8 hours**

Linked Lists: Creation of single linked list, double linked list, circular linked list, and operations on it.

Module III **8 hours**

Stacks: Definitions, operations and applications, array and linked representation of stacks. **Queues:** Definitions and operations, array and linked representation of queues.

Module IV **8 hours**

Graphs: Introduction, representation of graphs, graph traversals, spanning trees. **Introduction to Sorting:** Insertion sort, selection sort, bubble sort, quick sort.

Module V **8 hours**

Trees: Definitions and properties, representation of binary trees, operations, binary tree traversals, binary search tree, heap sort.

Text Book(s)

1. Reema Thareja, Data Structures using C, 2/e, Oxford University Press, 2011.

References

1. Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, Fundamentals of Data Structures in C, 2/e, Universities Press, 2008.
2. Seymour Lipschutz, Data Structures with C, Tata McGraw Hill, 2011.

ECS461: INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction to DBMS: Overview, file system vs. DBMS, advantages of DBMS, storage data, queries, transaction management, DBMS Structure.

Module II **10 hours**

Entity Relationship Model: E-R model entities, attributes and entity sets, relationship and relationship sets, features of E-R model, conceptual database design with E-R model.

Module III **8 hours**

Relational Model: Integrity constraints over relations and enforcement, querying relational data, logical database design, views, destroying/altering tables and views, relational algebra and calculus**.** Relational algebra and calculus.

Module IV **8 hours**

Structure Query Language: Basic SQL, query, union, interest, except, nested queries, aggregated operation, null values, embedded SQL, cursors, ODBC and JDBC, triggers and active database.

Module V **8 hours**

Transaction Management, Concurrency Control and Crash Recovery: Transaction concept, transactions and schedules, concurrent execution of transactions, lock based concurrency control, crash recovery.

Text Book(s)

1. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, McGraw-Hill, 2003.
2. H.F.Korth and A.Silberschatz, Data System Concepts, McGraw-Hill, 2011.

References

1. Ramez Elmasri and S.B.Navathe, Fundamentals of Database System, Benjamin Cummings, 1989.

ECS462: FUNDAMENTALS OF SOFTWARE ENGINEERING (Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Introduction, programs vs. software products, why study software engineering?, emergence of software engineering, notable changes in software development practices, classical waterfall model, iterative waterfall model, prototyping model, evolutionary model, spiral model.

Module II **8 hours**

Requirements analysis and specification, requirements gathering and analysis, software requirements specification, formal system development techniques and software design, what is good software design?, cohesion and coupling, software design approaches.

Module III **9 hours**

Function-oriented software design, overview of software analysis / software design methodology, structure analysis, dataflow diagrams (DFDs), structure design, detailed design, design review, user interface design, characteristics of a good user interface, basic concepts.

Module IV **9 hours**

Coding and testing, coding, code review, testing, testing in the large vs testing in the small, unit testing, block box testing, white-box testing debugging, program analysis tools, some general issues of testing.

Module V **7 hours**

Software project management, responsibilities of a software project manager, project planning, metrics for project size estimation, scheduling, organization and team structures, staffing.

Text Book(s)

1. Rajib Mall, Fundamentals of Software Engineering, 2/e, PHI Eastern Economy Edition, 2005.

References

1. Ian Sommerville, Software Engineering, 7/e, Pearson Education, 2004.
2. Pankaj Jalote, Software Engineering, A Precise Approach, Wiley India, 2010.
3. Waman S Jawadekar, Software Engineering: A Primer, Tata McGraw-Hill, 2008.

ECS463: INTRODUCTION TO COMPUTER NETWORKS
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Introduction: Uses of the computer networks, reference models. Medium Access Control: channel allocation problems, multiple access protocols: CSMA, collision free protocols.

Module II **9 hours**

Ethernet: Ethernet physical layer, ethernet mac sub layer protocol, ethernet performance, switched ethernet, fast ethernet, gigabit ethernet, repeaters, hubs, bridges, switches, routers and gateways.

Module III **9 hours**

Network Layer: Network layer design issues, routing algorithms: Optimality principle, shortest path, distance vector routing, congestion control algorithms, traffic shaping.

Module IV **9 hours**

Transport Layer: The transport service: **s**ervices provided to the upper layers, transport service primitives, the internet transport Protocols: UDP, TCP, the TCP segment header.

Module V **7 hours**

Application Layer: The domain name system, world wide web.

Text Book(s)

1. Andrew S. Tanenbaum and David J Wetherall, Computer Networks, 5/e, Pearson Education, 2011.

References

1. Behrouz A Forouzan and Firouz Mosharraf, Computer Networks: A Top-Down Approach,Tata McGraw Hill Education, 2011.
2. S.Keshav, An Engineering Approach to Computer Networks, 2/e, Pearson Education, 1997.
3. Larry L Peterson and Bruce S Davie, Computer Networks: A Systems Approach, 4/e, Elsevier Publication, 2011.

ECS464: INTRODUCTION TO WEB TECHNOLOGIES (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction to HTML Version5 and Cascading Style Sheets (CSS) Version3: Basic syntax, elements, attributes and tags, paragraph, heading, forms, frames, levels of style sheets, style specification formats, selector forms, span and div tags.

Module II **8 hours**

Introduction to Java Script and Document Object Model (DOM): Variables, literals, operator and control structures, arrays, functions, the window object, the location object, the history object and event handlers.

Module III **8 hours**

Introduction to XML: Syntax of XML, document structure, document type definition, namespaces, XML schemas, document object model.

Module IV **8 hours**

Introduction to Servlets and Tomcat Web Server: Lifecycle of a servelet, the servlet API, the javax.servelet package, tomcat server and testing tomcat, structure of web application, deploying web application.

Module V **8 hours**

Introduction to JSP: JSP and servlet, the anatomy of a JSP page, JSP syntax, comments, expressions, scriptlets, scope of objects and synchronization.

Text Book(s)

1. Uttam K.Roy, Web Technologies, 2/e, Oxford Higher Education Publication, 2010.

References

1. Dietel and Nieto, Internet and World Wide Web – How to Program, Pearson Education, Asia, 2009.
2. Chris Bates, Web Programming Building Internet Applications, 3/e, Wiley India, 2009.

ECY101: ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

Module I **9 hours**

Water Technology: Introduction and properties of water, hardness of water, temporary and permanent, units, treatment methods, municipal water treatment, sedimentation, coagulation, filtration and sterilization. Desalination of brackish water, reverse osmosis (RO) and electrodialysis, industrial water treatment, lime-soda ash method, chemical reactions and problems, zeolite and ion-exchange processes.

Module II **9 hours**

Energy Sources and Applications: Conventional Energy Sources: Electrode potential, determination of single electrode potential. Reference electrodes: Hydrogen and calomel electrodes, electrochemical series and its applications. Primary cell: dry or leclanche cell. Secondary cell: lead acid storage cell, nickel-cadmium cell, lithium-ion batteries (Lithium-MnO2). Fuel cell: hydrogen-oxygen fuel cell, methyl alcohol-oxygen fuel cell and propane-oxygen fuel cell. **Non-Conventional energy sources:** solar energy, wind energy, photovoltaic cell and applications.

Module III **9 hours**

Corrosion Engineering: Definition, theory of corrosion: dry corrosion and electro chemical corrosion. Factors affecting corrosion: nature of the metal and nature of the environment. **Corrosion Controlling Methods:** Metallic coatings: anodic coatings, cathodic coatings, galvanizing and tinning. Organic coatings: paints and varnishes (constituents and their functions).

Module IV **8 hours**

Surface Chemistry: Colloids: types of colloids, preparation of colloidal solutions, micelles, coagulation of sols. Origin of charge on colloids, stability of colloids, applications of colloids. **Adsorption: c**lassification, adsorption of gases on solids, adsorption from solutions. Langmuir's theory and Freundlich's theory of adsorption, applications of adsorption.

Module V **8 hours**

Engineering Materials: Refractories: classification, properties of a good refractory. Preparation and properties of silica, magnesite and silicon carbide refractories. Clay-bond, silica nitride bond and self-bond in silicon carbide. **Ceramics:** Structural clay products, examples. White wares and chemical stone wares. **Adhesives:** Introduction and classification of adhesives. Adhesive action, development of adhesive strength.

Text Book(s)

1. P.C. Jain and M. Jain, Engineering Chemistry, 16/e, Dhanpat Rai Publishing Company, 2013.
2. O.V. Roussak and H.D. Gesser, Applied Chemistry - A Textbook for Engineers and Technologists, 2/e, Springer, 2013.

References

1. Sashi Chawla, A Text book of Engineering Chemistry, 3/e, Dhanpat Rai Publishing Company, 2013.
2. B.S. Murty, P. Shankar, B. Raj, B.B. Rath and J. Murday, Textbook of Nanoscience and Nanotechnology, Universities Press, 2013.
3. S.S. Dara, S.S. Umare, A Textbook of Engineering Chemistry, 12/e, S. Chand and Company, 2014.
4. V. Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2013.

ECY102: CHEMICAL ASPECTS OF ENGINEERING MATERIALS (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Analytical Instrumental Techniques: Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle and applications of pH metry, potentiometry, conductometry and UV-spectroscopy.

Module II **9 hours**

Semiconductors, Solar cells and Storage Devices: Semiconductors: definition, types of semiconductors: stoichiometric, non-stoichiometric, controlled valence semiconductors, doping and applications. **Solar cells:** Introduction, harnessing solar energy, solar water heaters. **Storage devices:** Materials used and working of compact disc and flash (pen) drive.

Module III **9 hours**

Chemistry of Nanomaterials: Introduction to nanomaterial: nanoparticles, nanocluster, carbon nanotube (CNT) and nanowires. Chemical synthesis of nanomaterials: sol-gel method, reverse micellar method, electrolytic method. **Characterization:** Principle and applications of X-ray diffraction (XRD), scanning electron microscope (SEM) and transmission electron microscope (TEM).

Module IV **8 hours**

Solid State Chemistry: Introduction, classification and properties of solids. Crystallographic systems, types of lattices, Brag's equation, Born-Haber cycle and cohesive energy. Ionic and liquid crystals - properties and applications.

Module V **9 hours**

Polymer Chemistry: Types of polymerization, mechanism of addition polymerization, moulding constituents, differences between thermoplastic and thermo setting resins. Preparation and properties of polyethylene, polyvinylchloride, polystyrene, polyamides (nylon-6,6), polycarbonates and bakelite. engineering applications of plastics. Preparation and properties of inorganic polymers: polysiloxanes and polyphosphazenes.

Text Book(s)

1. P.C. Jain and M. Jain, Engineering Chemistry, 16/e, Dhanpat Rai Publishing Company, 2013.

2. B.K. Sharma, Engineering Chemistry, 6/e, Krishna Prakashan Media, 2011.

References

1. Sashi Chawla, A Textbook of Engineering Chemistry, 3/e, Dhanpat Rai Publishing Company, 2013.
2. B.S. Murty, P. Shankar, B. Raj, B.B. Rath and J. Murday, Textbook of Nanoscience and Nanotechnology, Universities Press, 2013.
3. S.S. Dara and S.S. Umare, A Textbook of Engineering Chemistry, 12/e, S. Chand and Company, 2014.
4. V. Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2013.

ECY104: ADVANCED ENGINEERING CHEMISTRY
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Pollution and Its Control: Introduction to natural and manmade pollutants, particulate and gaseous pollutants. Earth radiation balance, sewage and its treatment. Radioactive pollution, lapse rate and inversion temperature. Hazardous wastes and treatment technologies (biological, physical and thermal).

Module II **9 hours**

Control of Specific Gaseous Pollutants: Introduction of gas pollutants, control of sulphur dioxide, sulfur reduction during combustion, desulphurization of flue gases. Lime water scrubbing, magnesium oxide scrubbing. Control of oxides of nitrogen. Modification of operating conditions, low air and excess air combustion, two-stage combustion. Flue gas, recirculation, control of carbon monoxide, proper designing.

Module III **8 hours**

Polymer Chemistry: Types of polymerization, mechanism of addition polymerization, moulding constituents, differences between thermoplastic and thermo setting resins. Preparation and properties of polyethylene, polyvinylchloride, polystyrene, polyamides (nylon-6,6), polycarbonates and bakelite. engineering applications of plastics. preparation and properties of inorganic polymers: Polysiloxanes and polyphosphazenes.

Module IV **9 hours**

Concrete Chemistry: Constituent materials and their properties, grades of concrete, decay of concrete, hardening of concrete. Hydration reactions in concrete, hydration of calcium silicate minerals, hydration of calcium aluminate minerals. Reaction with additional sulphate ions. Durability of concrete (expansion of concrete to sulfate attack, expansion due to alkali aggregation). Curing of concrete: Hydration mechanism by Vander Waal's theory.

Module V **9 hours**

Chemistry of Nanomaterials: Introduction to nanomaterials, nanoparticles, nano cluster, carbon nanotube (CNT) and nanowires. Chemical synthesis of nanomaterials: sol-gel method, reverse micellar method, electrolytic method. **Characterization:** Principle and applications of X-ray diffraction (XRD), scanning electron microscope (SEM) and transmission electron microscope (TEM).

Text Book(s)

1. P.C. Jain and M. Jain, Engineering Chemistry, 16/e, Dhanpat Rai Publishing Company, 2013.
2. O.V. Roussak and H.D. Gesser, Applied Chemistry - A Textbook for Engineers and Technologists, 2/e, Springer, 2013.

References

1. C.S. Rao, Environmental Pollution Control Engineering, 2/e, New Age International, 2013.
2. P. Kumar Mehta and Paulo J. M. Monteiro, Concrete: Microstructure, Properties, and Materials, 3/e, Tata McGraw Hill Education, 2006.
3. B.S. Murty, P. Shankar, B. Raj, B.B. Rath and J. Murday, Textbook of Nanoscience and Nanotechnology, Universities Press, 2013.
4. V. Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2013.
5. Ozin G.A., Arsenault A.C, and Cademartiri L., Nanochemistry: A Chemical Approach to Nanomaterials, 2/e, Royal Society of Chemistry, 2009.

ECY106: CHEMISTRY OF ADVANCED MATERIALS
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Semiconductors, Solar cells and Storage Devices: Semiconductors: Definition, types of semiconductors: stoichiometric, non-stoichiometric, controlled valence semiconductors, doping and applications. **Solar cells:** Introduction, harnessing solar energy, solar water heaters. **Storage devices:** Materials used and working of compact disc and flash (pen) drive.

Module II **9 hours**

Chemistry of Nanomaterials: Introduction to nanomaterials, nanoparticles, nano cluster, carbon nanotube (CNT) and nanowires. Chemical synthesis of nanomaterials: sol-gel method, reverse micellar method, electrolytic method. **Characterization:** Principle and applications of X-ray diffraction (XRD), scanning electron microscope (SEM) and transmission electron microscope (TEM).

Module III **9 hours**

Fuel Technology: Introduction and classifications of fuels, characteristics of a good fuel, calorific value and units. Determination of calorific value by Bomb calorimeter and Dulong's formula. **Solid Fuels:** Coal, classification of coal by rank. Analysis of coal: Proximate and ultimate analysis. **Liquid Fuels:** Refining of petroleum, petroleum products used as fuels, knocking (detonation), octane number of gasoline. Synthetic petrol: Bergius and Fischer tropsch's methods. Diesel: High speed and low speed diesel, cetane number.

Module IV **8 hours**

Analytical Instrumental Techniques: Electromagnetic spectrum, absorption of radiation: Beer-Lambert's law. Principle and applications of pH metry, potentiometry, conductometry and UV-spectroscopy.

Module V **9 hours**

Lubricants: Introduction and classification of lubricants. Principles and mechanism of lubrication: Hydrodynamic, boundary and extreme pressure lubrications. Properties of lubricants: Viscosity, oiliness, flash and fire points, cloud and pour points, aniline point, saponification number, carbon residue, emulsification number, volatility, precipitation number, specific gravity and neutralization number.

Text Book(s)

1. P.C. Jain and M. Jain, Engineering Chemistry, 16/e, Dhanpat Rai Publishing Company, 2013.
2. B.K. Sharma, Engineering Chemistry, 6/e, Krishna Prakashan Media, 2011.

References

1. Sashi Chawla, A Textbook of Engineering Chemistry, 3/e, Dhanpat Rai Publishing Company, 2013.
2. B.S. Murty, P. Shankar, B. Raj, B.B. Rath and J. Murday, Textbook of Nanoscience and Nanotechnology, Universities Press, 2013.
3. S.S. Dara, S.S. Umare, A Textbook of Engineering Chemistry, 12/e, S. Chand and Company, 2014.
4. V. Raghavan, Material Science and Engineering, 5/e, Prentice Hall of India, 2013.

ECY121: ENGINEERING CHEMISTRY LABORATORY

L	T	P	C
0	0	3	2

List of Experiments

1. Calibration of volumetric apparatus.
2. Determination of sulphuric acid in lead-acid storage cell.
3. Determination of hardness of a ground water sample.
4. Estimation of active chlorine content in bleaching powder.
5. Estimation of iron as ferrous iron in an ore sample.
6. Estimation of calcium in portland cement.
7. Determination of chromium (VI) in potassium dichromate.
8. Determination of copper in a copper ore.
9. Determination of viscosity of a liquid.
10. Determination of surface tension of a liquid.
11. Determination of Mohr's salt by potentiometric method.
12. Determination of strength of an acid by pH metric method.

EEE103 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P	C
3	0	0	3

Module I **8 hours**

Ohms law, Kirchoff's Laws, series and parallel circuits, source transformations, delta–wye conversion, linearity and superposition theorem with simple examples, Thevenin's and Norton's theorem with simple examples, maximum power transfer theorem with simple examples. Mesh analysis, nodal analysis, super node.

Module II **9hours**

DC Machines: Constructional features, function of commutator, induced EMF and torque expressions, relationship between terminal voltage and induced EMF for generator and motoring action, different types of excitation and performance characteristics of different types of dc machines, starting and speed control of dc motors, losses and efficiency, efficiency by direct loading, Swinburne's test, application of dc machines.

Module III **8 hours**

Transformers: Constructional details, EMF equation, equivalent circuit, voltage regulation, losses and efficiency, auto-transformer, open/short-circuit tests and determination of efficiency and regulation.

Module IV **8 hours**

Three Phase Induction Motors: Construction, rotating magnetic field and three phase induction motor, power flow diagram, torque and torque slip characteristics, condition for maximum torque and its value, starting and speed control, losses and efficiency.

Module V **9hours**

Semiconductor Diodes: Basic operating principle, current-voltage characteristics, rectifier circuits (half-wave, full-wave, rectifier with filter capacitor), Zener diode, clipper and clamper, LED. Bipolar junction transistor (BJT): Modes of Operation: NPN and PNP transistors in active mode, BJT as an amplifier and switch. Metal oxide semiconductor field effect transistor (MOSFET): Operation of N-type and P-type MOSFET, MOSFET as an amplifier and switch.

Text Book(s)

1. Vincent Del Toro,Basic Electrical Engineering, PHI.
2. V.K.Mehta,Basic Electrical and Electronics Engineering, PHI.

References

1. Kothari, Basic Electrical and Electronics Engineering, 1/e, McGraw-Hill.
2. Chakrabarthy, Electrical Machines,1/e, McGraw-Hill.

EHS101: COMMUNICATIVE ENGLISH - I

L	T	P	C
3	0	2	4

Module I **9 hours**

Introduction: Brief orientation, an integrated approach to LSRW skills, self-assessment of skills at the entry level. **Grammar:** Tenses; Articles, subject-verb agreement. **Writing:** Constructing complete and meaningful sentences.

Module II **8 hours**

Choices and Implications: Reading: Researching texts for essays, skimming and scanning, identifying the sequence of ideas, understanding implicit meanings, inferring the meaning of words, understanding how essay types are organized. **Writing:** Drafting the introduction to an essay, summarizing. **Grammar and Vocabulary (Contextual):** Word families, linking words, verb-noun collocations.

Module III **8 hours**

Risks and Hazards: Reading: Selecting and prioritizing what you read; inferring the meaning of words; Making notes. **Writing:** Using claims to plan essays; supporting claims with evidence, drafting the body of an essay using the given notes. **Grammar and Vocabulary (Contextual):** Countable and uncountable nouns, word families: adjectives meaning large and important, adjective + noun combinations, prefixes.

Module IV **8 hours**

Language and Communication: Reading: Predicting the content of a text, reading for detail, scanning for information, understanding implicit meanings, making notes. **Writing:** Reporting what is read, writing a paragraph or two using the given notes. **Grammar and Vocabulary (Contextual):** Word families: nouns with related adjectives ending -ic and -ical; Reporting verbs.

Module V **9 hours**

Difference and Diversity: Reading: Reading in detail; collecting information for writing tasks. **Writing:** Reporting what is read; writing a paragraph or two using the given notes (compare and contrast). **Grammar and Vocabulary (Contextual):** Linking parts of a text: conjunctions and sentence connectors, single-word verbs and multi-word verbs, word families: nouns with related adjectives.

Laboratory **26 hours**

Listening: Listening for information; Identifying key terms, understanding outlines, identifying main and secondary points; understanding short presentations and following the logical flow of thought, taking notes; understanding short discussions, making predictions while listening to short talks, identifying topic change, following an argument, making predictions during lectures, matching phrases to functions such as introducing a topic, sub-topic, clarification/explanation.

Speaking: Discuss and decide, key terms, main and secondary points (pair work); making suggestions in group work; making mini oral presentations using appropriate discourse markers, discussing preparation strategies before a lecture starts, working in small groups, generating ideas and reporting (based on listening materials); making oral presentations based on prompts given.

Text Book(s)

1. Hewings, Martin, Cambridge Academic English B2 Student's Book, Cambridge University Press, India, 2014.

Teacher Resource Material

1. Hewings, Martin. Cambridge Academic English B2 Teacher's Book. Cambridge University Press, India, 2014.
2. Class Audio CD, DVD, Audio and DVD Pack.
3. Supplementary material chosen will be from public domain/free resources for classroom use. Sources will be cited wherever available/applicable.

EHS102: COMMUNICATIVE ENGLISH - II

L	T	P	C
3	0	2	4

Module I **9 hours**

The World We Live In: Reading: recognizing plagiarism, identifying the main ideas in a text, summarizing what is read. **Writing:** Using paraphrases, including quotations in writing.

Grammar and Vocabulary (Contextual): Articles: zero article and complex prepositions. vocabulary: single-word verbs and multi-word verbs, hedging adverbs.

Module II **9 hours**

Behaving the Way We Do: Reading: Organizing information for an essay; Skimming and scanning texts; Taking notes and explaining what is read. **Writing:** writing conclusions in essays, giving references, language for writing: hedging. **Grammar and Vocabulary (Contextual):** Avoiding repetition, expressions with Wh- noun clauses, vocabulary: collocations-verb/ adjective + preposition combinations.

Module III **9 hours**

Bringing about Change: Reading: Reading critically; Finding information and taking notes; Retelling what is read. **Writing:** Using an academic style. **Grammar and Vocabulary (Contextual):** Relative clauses, it clauses: expressing personal opinions impersonally; abstract nouns+of +-ing/to-infinitive, inferring the meaning of words.

Module IV **8 hours**

Work and Equality: Reading: Understanding figures and tables, scanning for information; Understanding the significance of references. **Writing:** Structure and content of reports, describing events in a time sequence, cause and effect. **Grammar and Vocabulary (Contextual):** Passive voice, past perfect, -ing nouns.

Module V **7 hours**

Writing Formal Letters: Letters of enquiry, seeking permission, complaint and adjustment, job application (cover letter).

Laboratory: **26 hours**

Listening: Listening for gist and detail, identifying contrasts while listening to lectures/ presentations (pitch, emphasis), understanding the organization of a talk, understanding the relationship between parts of a lecture, listening for a lecture summary, understanding descriptions of processes.

Speaking: Reaching a consensus in group work, referring forward and backward in presentations, concluding a presentation, taking part in discussions, group discussions, making presentations using PowerPoint slides.

Text Book(s)

1. Hewings, Martin, Cambridge Academic English B2 Student's Book, Cambridge University Press, India, 2014.

Teacher Resource Material

1. Hewings, Martin, Cambridge Academic English B2 Teacher's Book, Cambridge University Press, India, 2014.
2. Class Audio CD, DVD, Audio and DVD Pack.
3. Supplementary material chosen will be from public domain/ free resources for classroom use. Sources will be cited wherever available/applicable.

EHS201: ENVIRONMENTAL STUDIES

L	T	P	C
3	0	0	3

Module I **12 hours**

Introduction to Environment and Natural Resources: Introduction to environment: definition, scope and importance, multidisciplinary nature of environment, need for public awareness. Natural Resources: Renewable and non-renewable resources, natural resources and associated problems. Forest resources: Uses, reasons for over-exploitation, deforestation effects, timber extraction, case studies. Water resources: use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Uses, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, Impacts of overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, use of renewable and non renewable energy sources, case studies. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

Module II **9 hours**

Ecosystems and Biodiversity: Structural components of ecosystem: Biotic and Abiotic components. Functional components of an ecosystem: Food chains, food webs, ecological pyramids, energy flow in the ecosystem (10% law), ecological succession. Biogeochemical cycle: (Nitrogen, carbon, phosphorus cycle). Introduction, types, structure and function of the following ecosystem: Forest ecosystem, grassland ecosystem, desert ecosystem. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity: definition, levels of biodiversity: genetic, species and ecosystem diversity. Bio-geographical classification of India, values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega-diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In situ and Ex situ conservation of biodiversity.

Module III **8 hours**

Environmental Pollution and Control: Environmental Pollution: Definition, causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, thermal pollution, nuclear hazards, solid waste management, e-waste, hazardous waste management. Role of an individual

in prevention of pollution. Pollution case studies. Disaster Management: floods, earthquake, cyclone and landslides.

Module IV **7 hours**

Social Issues and Global Environment Problems and Efforts: Unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management, remote sensing and GIS methods, resettlement and rehabilitation of people: its problems and concerns. Case studies, environmental ethics: Issues and possible solutions. Green building concept, environmental impact assessment (Checklists, matrix methods), environmental management plan, climate change: global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Module V **6 hours**

Human Population and Environment Legislation: Population growth, variation among nations, family welfare programme. Environment and human health. HIV/AIDS, human rights, value education, women and child welfare. Role of information technology in environment and human health. Environment legislation. Air (prevention and control of pollution) act, water (prevention and control of pollution) act, wildlife protection act, forest conservation act, environmental protection act. Issues involved in enforcement of environmental legislation, public awareness, project work.

Text Book(s)

1. Kaushik, C.P. Kaushik, A Text book of Environmental Studies, 4/e, New Age International, 2014.
2. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, 2/e, University Grants Commission, Universities Press, 2013.

References

1. Benny Joseph, Textbook of Environmental Studies for Undergraduate Courses, 2/e, Tata McGraw Hill Publishing Company, 2008.
2. K.C. Agarwal, Environmental Biology, Nidi Publishing, Bikaner, 2001.
3. Calvin Brunner, Hazardous Waste Incineration, McGraw Hill Education, 1993.

EHS301: ENGINEERING ECONOMICS AND MANAGEMENT

L	T	P	C
3	0	0	3

Module I **8 hours**

Economics: Utility, value, wealth, consumption, wants, necessaries, comforts and luxuries. **Demand:** law of demand, elasticity of demand, price elasticity of demand, factors affecting elasticity of demand.

Module II **8 hours**

Costing: Cost concepts, elements of cost. Methods of distribution of overhead costs, unit costing, job costing and process costing; Simple problems. **Accounts:** Preparation of profit and loss account and balance sheet.

Module III **6 hours**

Break-Even Analysis: Assumptions, break-even charts, simple problems. Depreciation: Depreciation methods.

Module IV **10 hours**

Forms of Business Organization: Single trader, partnership and public limited company. **Principles of Organization:** Types of organization, span of management, authority, delegation and decentralization, source of formal authority, difference between authority and power, line and staff authority, case studies.

Module V **10 hours**

Principles of Management: Importance of management, definition of management, management process, roles of a manager, management, a science or art - management, a profession, functions of management, leadership: difference between a leader and a manager, characteristics of leadership, functions of a leader, case studies.

Text Book(s)

1. Tara Chand, Engineering Economics, Vol-1, 13/e, Nem Chand and Brothers, 2012.
2. O.P Khanna, Industrial Engineering and Management, 14/e, Dhanpat Rai Publications, 2011.

References

1. Maheswari, Engineering and Managerial Economics, 19/e, Sultan Chand and Company, 2009.
2. Shukla, Grewal, Cost Accounting, 12/e, S. Chand and Company, 2007.
3. L.M. Prasad, Principles and Practice of Management, 8/e, Sultan Chand and Sons, 2012.

EHS302: ORGANIZATIONAL BEHAVIOUR
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction: Organizational behavior, nature, management functions, management roles, management skills, systematic study, foundations of individual behavior, attitudes, types of attitudes.

Module II **8 hours**

Perception and Motivation: Perception, factors, motivation, nature; Theories of motivation, hierarchy needs theory, two - factor theory, expectancy theory, applications of motivation.

Module III **8 hours**

Foundations of Group Behavior: Groups, nature, classification; stages of group development, group structure, group decision, making, groups and teams; leadership, nature, theories, trait theories, behavioural theories, contingency theories.

Module IV **8 hours**

Organizational Structure: Nature, work specialization, departmentalization, chain of command, span of control, centralization and decentralization, organizational designs, the simple structure, the bureaucracy, the matrix structure, the team structure, the virtual organization, the boundary less organization.

Module V **8 hours**

Organizational Culture and Change Management: Organizational culture, nature, cultures functions, approaches to managing organizational change, Lewin's model, Kotter's plan for implementing change, organizational development techniques.

Text Book(s)

1. Robbins, Stephen, S. Sanghi, Organizational Behavior, Pearson Education. 2010.

References

1. Mullins, J. Laurie, Management and Organizational Behavior, Oxford Publishers, 2007.

EHS304: BUSINESS ETHICS AND CORPORATE GOVERNANCE (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction: Corporation, definition and characteristics, history of corporate form and models, corporate objectives, corporations and government, governance, corporate governance, definition, perspectives.

Module II **8 hours**

Theoretical Foundations of Corporate Governance: Notion of conflict of interest, property rights theory, nexus of contracts, agency theory, Berle and Means' theory, concept of separation of ownership and control, shareholder, stakeholder debate.

Module III **8 hours**

Pillars of Governance in Organizations: Owners, ownership structure, types of owners, ownership vs. control, board of directors, types of directors, board roles and board attributes, board committees, executive management, role of CEO, succession planning, managerial myopia, institutional investors, types, categories, features and role.

Module IV **8 hours**

Work Ethos: Values and ethics, model of management in the Indian socio, political environment, need for values in global change, Indian perspective, values for managers, holistic approach for managers in decision making.

Module V **8 hours**

Business Ethics and CSR: Corporation as a social institution, accountability and sustainability, relevance of triple bottom line reporting to CSR, codes of conduct, applications of ethical theories to decision making, ethical issues related to employment, healthcare and advertisement.

Text Book(s)

1. Praveen B. Malla, Corporate Governance: Concept, Evolution and India Story, Routledge, 2010.
2. Sadri, Business Ethics: Concepts and Cases, Tata McGraw Hill, 1998.

References

1. Robert Monks, Nell Minow, Corporate Governance, Wiley Publications, 2009.

EHS401: PROJECT MANAGEMENT
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Concept of Project: Basic concepts, classification, characteristics of project, project life cycle, project management, tools and techniques of project management, project organization.

Module II **8 hours**

Project Identification: Identification, generation of ideas, SWOT analysis, preliminary screening, project rating index. Market and demand analysis, collection of data, market survey, market planning, market environment, project risk analysis, demand forecasting techniques.

Module III **8 hours**

Technical Analysis: Selection of technology, material input and utilities, plant capacity, location and site, machinery and equipment, structures and civil work, environmental aspects, project charts and layouts, PERT, CPM.

Module IV **8 hours**

Financial Estimation: Project cost, source of finance, cost of production, financial analysis: characteristics of financial statement, working capital, project income statement, projected profitability, investment evaluation, investment decision rule, techniques of evaluation, payback period, accounting rate of return, internal rate of return, discounted payback period.

Module V **8 hours**

Social Cost Benefit Analysis: Concept of social cost benefit, significance of SCBA, approach to SCBA, Project implementation, schedule of project implementation, project planning, project control, human aspects of project management, team building, and high performance team.

Text Book(s)

1. Prasanna Chandra, Projects: Planning, Analysis, Implementation and Review, Tata McGraw Hill, 2009.

References

1. Marwah, Project Management, Wiley Dreamtech, 2011.

EHS402: OPERATIONS AND SUPPLY CHAIN MANAGEMENT (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction to Operations Management: History of operations management, types of manufacturing systems, role and responsibilities of operations manager, services operations.

Module II **8 hours**

Understanding the Logistics and Supply Chain: Introduction to supply chain, supply chain links, role of logistics in supply chain, drivers and metrics in supply chain, designing the supply chain network, online sales and distribution network, factors influencing the network design.

Module III **8 hours**

Impact of Uncertainty in Network: Globalization and supply chain, risk management in global supply chain, demand forecasting in supply chain role of information technology in forecasting.

Module IV **8 hours**

Coordination in Supply Chain: Collaborative planning and replenishment strategies, CPFR, managing uncertainties in inventory.

Module V **8 hours**

Impact of Replenishment Policies in Safety Inventory: Role of information technology in inventory management, transportation in supply chain.

Text Book(s)

1. Sunil Chopra, Supply Chain Management, Pearson Education, 2012.

References

1. Sridhara Bhatt, Logistics and Supply Chain Management, Himalaya Publishers, 2011.
2. D. K. Agarwal, Logistics and Supply Chain Management, Macmillan Publishers, 2013.

EHS403: DISASTER MANAGEMENT
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction to Disasters: Concepts and definitions (disaster, hazard, vulnerability, resilience, risks). **Disasters:** Classification causes, impacts (including social, economic, political, environmental, health, psychosocial etc.). Differential impacts in terms of caste, class, gender, age, location, disability. Global trends in disasters, urban disasters, pandemics, complex emergencies, climate change.

Module II **8 hours**

Approaches to Disaster Risk Reduction: Disaster cycle its analysis, phases, culture of safety, prevention, mitigation and preparedness community based DRR, structural- nonstructural measures, roles and responsibilities of community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, centre and other stake-holders.

Module III **8 hours**

Inter-Relationship Between Disasters and Development: Factors affecting vulnerabilities, differential impacts, impact of development projects such as dams, embankments, changes in land-use etc. Climate change adaptation, relevance of indigenous knowledge, appropriate technology and local resources.

Module IV **8 hours**

Hazard and Vulnerability Profile of India Components of Disaster Relief: Water, food, sanitation, shelter, health, waste management institutional arrangements (mitigation, response and preparedness, DM Act and Policy, other related policies, plans, programmes and legislation).

Module V **8 hours**

Project Work: (Field Work, Case Studies): The project/fieldwork is meant for students to understand vulnerabilities and to work on reducing disaster risks and to build a culture of safety. Projects must be conceived creatively based on the geographic location and hazard profile of the region where the college is located. A few ideas or suggestions to be discussed.

Text Book(s)

1. G.K. Ghosh, Disaster Management, A.P.H. Publishing Corporation, 2011.
2. Mukesh Kapoor, Disaster Management, Dhanpat Rai, 2012.

References

1. Parag Diwan, A Manual on Disaster Management, 2007.
2. A. K. Jain, A Practical Guide to Disaster Management, 2013.
3. Nikuj Kumar, Disaster Management, Alfa Publications, 2012.

EHS404: TOTAL QUALITY MANAGEMENT
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Quality, Strategic Planning and Competitive Advantage: Brief history, definitions of quality, quality in manufacturing and service systems, quality and price, quality and market share, quality and cost, quality and competitive advantages. ISO 9000, 14000.

Module II **8 hours**

Managing and Organization for Quality: Quality policy, quality objectives, leadership for quality, quality and organization culture, cross-functional teams, supplier/customers partnerships.

Module III **8 hours**

Quality Control and Improvement Tools : Cheek sheet, histogram, pareto chart, cause and effect diagram, scatter diagram, control chart, graph, affinity diagram, tree diagram, matrix diagram, process decision program chart, arrow diagram, acceptance sampling, process capability studies, zero defect program (POKA-YOKE).

Module IV **8 hours**

Quality Circles: Concept and total quality through bench marking, Japanese 5-S, quality management systems QS 9000, ISO 14000. Statistical process control: Control chart - X-R, P, np and C Charts, benefits of control charts and applications (10 %).

Module V **8 hours**

Customer Focus: The customer-driven quality cycle, quality function deployment, customer satisfaction measurement techniques, customer relationship management techniques.

Text Book(s)

1. J.M. Juran, F.M. Gryna, Quality Planning and Analysis, McGraw-Hill, 1993.

References

1. J. Bank, Essences of Total Quality Management, Prentice Hall, 2007.
2. Joel E. Ross, Text and Cases, Total Quality Management, St. Lucie Press, 1995.
3. D.L. Goetsch, S. Davis, Introduction to Total Quality, Prentice Hall, 2002.

EHS405: ENTREPRENEURSHIP DEVELOPMENT
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction: Evolution of entrepreneurship, characteristics of entrepreneur, entrepreneurial mindset, theories of entrepreneurship, motivation for entrepreneurship, role of entrepreneurship in economic development, entrepreneurship development programmes, corporate entrepreneurship, meaning and benefits of corporate entrepreneurship.

Module II **8 hours**

Sources Of Innovative Ideas: Methods of generating ideas, opportunity identification, setting-up new ventures, acquiring existing business, franchising, business model, components of business model, types of business model.

Module III **8 hours**

Business Plan: Contents of business plan, the marketing plan, the organisational plan, the financial plan, sources of finance, institutional support to entrepreneurs, management of business, financial management, human resource management, marketing management, production and operation management.

Module IV **8 hours**

Family Businesses: Importance, types and responsibilities, challenges and issues in family business, succession planning and grooming the successor, best practices in family business, live examples of family businesses.

Module V **8 hours**

Social Entrepreneurship: Introduction, definition, importance, characteristics of social enterprise, funding of social enterprise, significance of social entrepreneurs, measures of success in a social enterprise, live examples of social entrepreneurs.

Text Book(s)

1. Rodert D. Hisrich, M.J. Manimala, M.P. Peters, D.A. Shepherd, Entrepreneurship, McGraw Hill, 2014.
2. Rajeev Roy, Entrepreneurship, 3/e, Oxford University Press, 2012.

References

1. Donald F. Kuratko, Entrepreneurship: Theory, Process, Practice, 9/e, Cengage Learning, 2012.
2. Poornima M. Charantimath, Entrepreneurship Development - Small Business Enterprises, Pearson Education, 2012.
3. Arya Kumar, Entrepreneurship: Creating and Leading an Entrepreneurial Organization, Pearson Education, 2012.

EHS407: PROFESSIONAL ETHICS AND HUMAN VALUES

L	T	P	C
1	0	0	1

Module I **3 hours**

Introduction: Morals, values and ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully, caring, sharing, honesty.

Module II **3 hours**

Engineering Ethics: Senses of Engineering Ethics, variety of moral issues, types of inquiry, moral dilemmas, moral autonomy.

Module III **3 hours**

Engineering as Social Experimentation: Decomposing the system, overview of system design, system design concepts, system design activities, addressing design goals, managing system design.

Module IV **3 hours**

Safety, Responsibilities and Rights: Safety and risk, assessment of safety and risk, risk benefit analysis and reducing risk, the Three Mile Island and Chernobyl case studies. Collegiality and loyalty, respect for authority, conflicts of interest, occupational crime, professional rights.

Module V **3 hours**

Global Issues: Multinational corporations, environmental ethics, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership.

Text Book(s)

1. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw-Hill, 1996.
2. M. Govindarajan, S. Natarajan, V.S. Senthil Kumar, Engineering Ethics, Prentice Hall of India, 2004.

References

1. Charles D. Fleddermann, Engineering Ethics, Prentice Hall, 2004.
2. Charles E Harris, Michael S. Protchard, Michael J Rabins, Engineering Ethics: Concepts and Cases, Wadsworth Thompson Learning, 2000.
3. John R. Boatright, Ethics and the Conduct of Business, Pearson Education, 2003.
4. Edmund G Seebauer, Robert L Barry, Fundamentals of Ethics for Scientists and Engineers, Oxford University Press, 2001.

EID101: PROGRAMMING WITH C

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction to Programming, Algorithms and Flowcharts: Programs and programming, programming languages, compiler, interpreter, loader and linker, classification of programming languages, structured programming concept, algorithms and flowcharts. **Basics of C:** Developing programs in C, a simple C program, structure of a C program, concept of variable, data types in C, program statement, declaration.

Module II **10 hours**

Tokens: All tokens, operators and expressions, type conversions in C. **Input and Output:** Introduction, non-formatted input and output, formatted input and output. **Control Statements:** Introduction, conditional execution (if, if-else, nested if), selection (switch), unconditional types (break, continue, goto).

Module III **8 hours**

Loops: Iteration and repetitive execution (for, while, do-while), nested loops. Arrays and Strings: Introduction, one dimensional array, one dimensional character arrays (strings), two dimensional arrays and character arrays (array of strings).

Module IV **10 hours**

Functions: Concept of function, using functions, call by value and call by references mechanism, working with functions, example programs, passing arrays to functions, scope and extent, storage classes, recursion. Pointers: Understanding memory addresses, pointer operators (& and *), pointers declaration, initialization, void pointer, null pointer, use of pointers, 1-D arrays and pointers, pointers and strings.

Module V **10 hours**

Structures: Declaring structures and structure variables, accessing members of a structure, arrays of structures, arrays within a structure. **Union:** Declaring union and its members, accessing and initializing members of a union, structure versus union. **Files:** Using files in C: declaration of file pointers, opening a file, closing a file, working with text files: reading from and writing into text files.

Text Book(s)

1. Pradip Dey, Manas Ghosh, Programming in C, 2/e, Oxford Higher Education, 2013.

References

1. K. R. Venugopal, S. R. Prasad, Mastering C, McGraw Hill, 2009.
2. B. A. Forouzan, R. F. Gilberg, Computer Science: A Structured Programming Approach using C, 3/e, Thomson, 2004.
3. E. Balagurusamy, Programming in ANSI C, 6/e, McGraw Hill, 2004.
4. Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education, 2006.

EID121: PROGRAMMING WITH C LABORATORY

L	T	P	C
0	0	3	2

List of Experiments

Develop the C Programs for the following problems

1. Conversion of an upper-case character to a lower-case character.
2. Finding the sizes and ranges of different types. (Hint: use sizeof() and limits.h)
3. Roots of a quadratic equation using 'if'.
4. Print whether the given number is perfect (for a perfect number, the sum of divisors-except the number itself-will be equal to that number; Exs: 6,28,496 etc.).
5. First n terms of Fibonacci sequence using (i) any loop and (ii) if statement (use 'switch' to decide the choice).
6. Print twin primes up to a specified limit. (Exs: 3-5, 5-7, 11-13, 17-19, etc.).
7. Generate one hundred random integers in the range of 1 to 100, store them in an array and print the average (using any loop structure).
8. Print the average of the given numbers and also the numbers greater than the average.
9. Converting a decimal value to binary.
10. Program that uses a function to perform multiplication of two matrices.
11. Program that uses a function to perform transpose of a given matrix.
12. Determine if the given string is a palindrome or not (use a function).
13. Sort the given array of strings in dictionary order (use a function).
14. Recursive and nonrecursive functions for Towers of Hanoi.
15. Program that performs all the five arithmetic operations using pointers.
16. Print the details of students of a class (the details may be: Roll Number, Name, department, class, address, marks in five subjects and average of marks) using nested structures (calculate average).
17. Program that demonstrates the memory allocation done by a structure and a union (declare structure and union in the same program).
18. Program to demonstrate member access in a union (declare three different types of variables in union, assign values and print them).
19. Program that illustrates the function fprintf() to write into a text file.
20. Program that illustrates the function fscanf() to read from a text file.
21. Program that accepts the names of two files and copies the first file into the second line by line using fgets() and fputs() functions.

EIT362: INTRODUCTION TO PROGRAMMING WITH JAVA (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Java Evolution and Environment: Java history, features of java, how java differ from C and C++, Java and World Wide Web, web browser. Java environment: java development kit (JDK), application programming interface (API). Java programming structure, java tokens, constants, variables, expressions, decision making statements and looping, java statements, Java Virtual Machine (JVM), command line arguments.

Module II **10 hours**

Arrays and Strings: Arrays: One-Dimensional arrays, creating an array, declaration of arrays, initialization of arrays, two dimensional arrays, string arrays, string methods, string buffer class, basic I/O streams: scanner, buffered reader. **Classes, Objects and Methods** Introduction, defining a class, creating objects, accessing class members, constructors, methods overloading, static members.

Module III **9 hours**

Inheritance: Defining a sub class, sub class constructor, multilevel variables, final classes, and finalize methods, abstract methods and classes. **Managing Errors and Exceptions:** Introduction, types of errors: Compile time and run time errors, exceptions- types of exceptions, syntax of exception handling code, multiple catch statements, using finally statement, throwing our own exceptions.

Module IV **8 hours**

Interfaces: Introduction, defining interfaces, extending interfaces, implementing interfaces. **Applet Programming:** Introduction, how applet differ from applications, building applet code, applet life cycle, about HTML, designing a web page, passing parameters to applets, getting input from the user.

Module V **8 hours**

Introduction to Swings: Introduction to swings, overview of swing components, Jbutton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList.

Text Book(s)

1. Herbert Schildt, The Java Complete Reference, 9/e, McGraw Hill, 2014.
2. Sachin Malhotra, Saurabh Choudhary, Programming in Java, 2/e, Oxford University Press, 2013.

References

1. Y. Daniel Liang, An Introduction to JAVA Programming, 9/e, McGraw Hill, 2008.
2. Kathy Sierra, Head First Java, 2/e, Shroff Publishers, 2005.
3. E. Balagurusamy, Programming with JAVA, 2/e, McGraw Hill, 2014.

EIT463: MANAGEMENT INFORMATION SYSTEM AND E-COMMERCE (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Information Systems (IS) in Business: Introduction, the real world of information systems, networks, the fundamental role of is in business, trends in is, managerial challenges of IT, system concepts: Foundation, components of an information system, information system resources, information system activities, recognizing information systems.

Module II **9 hours**

Fundamentals of Strategic Advantages: Strategic IT, competitive strategy concepts, the competitive advantage of IT, strategic uses of IT, building a customer focused business, the value chain and strategic IS, re-engineering, business processes, becoming an agile company, creating a virtual company, building a knowledge-creating company.

Module III **9 hours**

Enterprise Business Systems: Introduction, cross-functional enterprise applications, enterprise application integration, transaction processing systems, enterprise collaboration systems. Functional business systems: introduction, marketing systems, manufacturing systems, human resource systems, accounting systems, financial management systems, overview of ERP and E-Commerce.

Module IV **8 hours**

Decision Support in Business: Introduction, decision support trends, decision support systems (DSS), management information systems, online analytical processing, using DSS, executive information systems, enterprise portals and decision support, knowledge management systems, business and Artificial Intelligence (AI), an overview of AI, expert systems.

Module V **9 hours**

Security, Ethical and Societal Challenges of IT: Introduction, ethical responsibility of business professionals, cyber crime, privacy issues, other challenges, health issues, societal solutions. **Managing Global IT:** The international dimension, global IT management, cultural, political and geo-economic challenges, global business/IT strategies, global business/IT applications, global IT platforms, global data access issues, global systems development.

Text Book(s)

1. James A. O'Brien, George M. Marakas, Management Information Systems, McGraw Hill, 2010.

References

1. Kenneth C. Laudon, Jane P. Laudon, Management Information System: Managing the Digital Firm, Pearson Education, 2011.
2. Steven Alter, Information Systems: The Foundation of E-Business, Pearson Education, 2011.
3. W.S. Jawadekar, Management Information Systems, McGraw Hill, 2009.

EMA101: ENGINEERING MATHEMATICS-I
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Linear Differential Equations of Higher Order: Definition, complete solution, rules for finding complimentary function, rules for finding particular integral, method of variation of parameters, method of undetermined coefficients.

Module II **8 hours**

Equations Reducible to Linear Differential Equations and Applications: Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, applications of linear differential equations like mass-spring systems and LCR - circuits.

Module III **8 hours**

Partial Differentiation I: Euler's theorem, total derivative, differentiation of implicit functions, change of variables, Jacobians, tangent plane and normal to a surface.

Module IV **8 hours**

Partial Differentiation II: Taylor's theorem for functions of two variables, maxima and minima of functions of two variables, Lagrange's method of multipliers, differentiation under integral sign, Leibnitz rule.

Module V **10 hours**

Laplace Transforms: Transforms of elementary functions, properties of Laplace transforms, existence conditions, inverse transforms, transforms of derivatives, transforms of integrals, multiplication by tn, division by t, convolution theorem, applications to ordinary differential equations, periodic functions, unit step function, unit impulse function.

Text Book(s)

1. B.S. Grewal, Higher Engineering Mathematics, 42/e, Khanna Publishers, 2012.

References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, Wiley Eastern, 2013.
2. N.P. Bali, Manish Goyal, Textbook of Engineering Mathematics, 8/e, Laxmi Publications, 2011.

EMA102: ENGINEERING MATHEMATICS-II
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Matrices: Solution to system of linear simultaneous equations, Gauss elimination method, eigenvalues and eigenvectors of a matrix, Cayley-Hamilton theorem, reduction to diagonal form, quadratic forms and canonical forms.

Module II **8 hours**

Multiple Integrals I: Double integrals, change of order of integration, double integrals in polar coordinates, area enclosed by plane curves.

Module III **10 hours**

Multiple Integrals II: Triple integrals, volume of solids, change of variables, beta and gamma functions, relation between beta and gamma function.

Module IV **6 hours**

Vector Differentiation: Scalar and vector fields, gradient, divergence, curl, directional derivative, vector identities, irrotational and solenoidal fields.

Module V **10 hours**

Vector Integration: Line integral, surface integral, Green's theorem in plane, Stoke's theorem and Gauss divergence theorem.

Text Book(s)

1. B.S. Grewal, Higher Engineering Mathematics, 42/e, Khanna Publishers, 2012.

References

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, Wiley, 2013.
2. N. P. Bali, Manish Goyal, A Text Book of Engineering Mathematics, 8/e, Laxmi Publications, 2011.
3. T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham, M.V.S.S.N.Prasad, Engineering Mathematics, Volume I, Volume II, S. Chand Publishers, 2013.

EMA201: COMPLEX VARIABLES AND TRANSFORMS
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Calculus of Complex Functions: Analytic functions, Cauchy-Riemann equations, harmonic functions, applications to flow problems, some standard transformations, bilinear transformation, conformal mappings, special conformal transformations (w = z2 , w= z+1/z, w = ez, w= coshz).

Module II **8 hours**

Complex Integration: Cauchy's theorem, Cauchy's integral formula, series of complex functions, Taylor's series, Laurent's series, Cauchy residue theorem, calculation of residues.

Module III **8 hours**

Fourier Series: Periodic functions, Fourier series, conditions for a Fourier expansion, functions of any period, even and odd functions, half range expansions.

Module IV **6 hours**

Fourier Transforms: Fourier integrals, Fourier cosine and sine integrals, Fourier transforms.

Module V **10 hours**

Z-Transforms and Difference Equations: Definition of Z transform, linearity property, damping rule, Shifting un to the right and left, multiplication by n, initial value theorem, final value theorem, inverse Z transforms, convolution theorem, evaluation of inverse Z transforms, formation of difference equations, solving difference equations using Z transforms.

Text Book(s)

1. B. S. Grewal, Higher Engineering Mathematics, 42/e, Khanna Publishers, 2012.

References

1. R. K. Jain, S. R. K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House, 2014.
2. N. P. Bali, Manish Goyal, A Text Book of Engineering Mathematics, 8/e, Lakshmi Publications, 2012.

EMA202: NUMERICAL METHODS
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Solution of Algebraic and Transcendental Equations: Bisection method, secant method, false position method, Newton Raphson method.

Module II **10 hours**

Interpolation: Difference operators and relations, difference tables, Newton's forward and backward interpolation formulae, divided difference formula, Lagrange's interpolation formula.

Module III **6 hours**

Linear System of Algebraic Equations: Iteration method, Jacobi method, Gauss-Seidal method, power method.

Module IV **10 hours**

Numerical Differentiation: Derivatives using forward, backward and central difference formulae. Numerical Integration: Newton-cotes quadrature formula, trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule.

Module V **8 hours**

Numerical Solutions of Ordinary Differential Equations: Introduction-Picard's method, Taylor's series method, Euler's method, modified Euler's method, Runge-Kutta method, predictor-corrector method.

Text Book(s)

1. M.K. Jain, S.R.K. Iyengar, R.K. Jain, Numerical Methods for Scientific and Engineering Computation, 5/e, New Age International, 2007.

References

1. S.S. Sastry, Introductory Methods of Numerical Analysis, 4/e, Prentice Hall of India, 2009.

EMA203: PROBABILITY AND STATISTICS
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Probability: Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density laws, properties, mathematical expectation.

Module II **8 hours**

Probability Distributions: Probability Distribution-Binomial - Poisson approximation to the binomial distribution and normal distribution-their properties.

Module III **10 hours**

Correlation - Regression Sampling Distribution and Estimation: Correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, working procedure, regression lines, curvilinear regression, fitting of other curves, **Estimation:** Types of sampling, sample, populations, statistic, parameter, sampling distribution and standard error.

Module IV **8 hours**

Testing of Hypothesis: Formulation of null hypothesis, critical regions, level of significance and power of the test. **Large Sample Tests:** Test for single proportion, difference of proportions, test for single mean and difference of means.

Module V **8 hours**

Small Sample Tests: Student t-distribution (single mean, two means and paired t-test), testing of equality of variances (F-test), $\div 2$ - test for goodness of fit, $\div 2$ - test for independence of attributes.

Text Book(s)

1. Miller, Freunds, Probability and Statistics for Engineers,7/e, Pearson Education, 2008.
2. S.C. Gupta, V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand and Sons, 2012.

References

1. Sheldon P. Gordon, Florence S. Gordon, Contemporary Statistics: A Computer Approach, 2/e, McGraw Hill, 1994.
2. T. Veerarajan, Probability Statistics and Random Processes, 3/e, Tata McGraw Hill, 2008.
3. Kishor S. Trivedi, Probability Statistics with Reliability, Queuing and Computer Science Applications, 2/e, Prentice Hall of India, 2005.
4. M. R. Spiegel, J. Schiller, R. Alu Srinivasan, Probability and Statistics, Schaum Series, 2010.

EMA204: PROBABILITY THEORY AND RANDOM PROCESSES (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Probability: Probability introduced through sets and relative frequency, joint and conditional probability, independent events, combined experiments, Bernoulli trials.

Module II **10 hours**

The Random Variable: Introduction, random variable concept, distribution function, density function, the Gaussian random variable, other distribution and density examples, conditional distribution and density functions. **Operation on One Random Variable:** Introduction, expectation, moments, functions that give moments, transformations of a random variable.

Module III **10 hours**

Multiple Random Variables: Vector random variables, joint distribution and density functions, properties, conditional distribution and density, statistical independence, distribution and density of a sum of random variables, central limit theorem. **Expected Value of a Function of Random Variables:** Joint moments about the origin, joint central moments, jointly Gaussian random variables - two random variables case, N random variable case.

Module IV **8 hours**

Random Processes: Temporal characteristics - the random process concept, stationarity and statistical independence, correlation functions, Gaussian random processes, Poisson random process.

Module V **10 hours**

Random Processes: Spectral characteristics, the power spectrum: Properties, relationship between power spectrum and autocorrelation function, the cross-power density spectrum: Properties, relationship between cross-power spectrum and cross-correlation function.

Text Book(s)

1. Peyton Z. Peebles, Probability, Random Variables and Random Signal Principles, 4/e, Tata McGraw Hill, 2002.
2. Athanasios Papoulis, S. Unnikrishna Pillai, Probability, Random Variables and Stochastic Processes, 4/e, Tata McGraw Hill, 2002.

References

1. Simon Haykin, Communication Systems, 4/e, Wiley Student Edition, 2006.
2. Henry Stark, John W. Woods, Probability and Random Processes with Application to Signal Processing, 3/e, Pearson Education, 2002.

EMA205: LINEAR ALGEBRA
(Elective)

L	T	P	C
3	0	0	3

Module I **10 hours**

Vector Spaces: Vector space definition, general properties of vector spaces, vector subspaces, algebra of subspaces, linear combination of vectors, linear span, linear sum of two subspaces, linear independence and linear dependence of vectors, basis of a vector space, finite dimensional vector spaces, dimension of a vector space, dimension of a sub space.

Module II **8 hours**

Homomorphism of Vector Spaces: Homomorphism of vector spaces or linear transformations, isomorphism, quotient spaces, direct sum of spaces.

Module III **10 hours**

Linear Transformations: Linear transformations, linear operator, range and null space of linear transformation, rank and nullity of a linear transformation, linear transformations as vectors, product of linear transformations, algebra or linear algebra, invertible linear transformation, singular and non singular transformations.

Module IV **8 hours**

Inner Product Spaces: Inner product spaces, definition, euclidean and unitary spaces, norm or length of a vector, Schwartz's inequality, orthogonality, orthonormal set, complete orthonormal set, Gram - Schmidt orthogonalization process.

Module V **8 hours**

Bilinear Forms: Bilinear forms, definition, bilinear forms as vectors, matrix of bilinear form, symmetric bilinear forms, skew-symmetric bilinear forms.

Text Book(s)

1. A.R. Vasishtha, J.N. Sharma, Linear Algebra, 42/e, Krishna Prakashan, 2010.

References

1. S. Arumugam, Modern Algebra, Scitech Publications, 2004.
2. J.B. Fraleigh, A First Course in Algebra, 3/e, Addison Wesley, 1986.
3. S. Lipschutz, Beginning Linear Algebra, Tata McGraw Hill, 2005.
4. M.L. Santiago, Modern Algebra, Tata McGraw Hill, 2002.
5. Surjeet Singh, Qazi Zameeruddin, Modern Algebra, Vikas Publishing House, 1982.

EMA207: COMPLEX VARIABLES AND PARTIAL DIFFERENTIAL EQUATIONS

L	T	P	C
3	0	0	3

Module I **8 hours**

Calculus of Complex Functions: Analytic functions, Cauchy-Riemann equations, Harmonic functions, applications to flow problems, some standard transformations, bilinear transformation, conformal mappings, special conformal transformations ($w = z^2$, $w= z+1/z$, $w = e^z$, $w= \cosh z$).

Module II **8 hours**

Complex Integration: Cauchy's theorem, Cauchy's integral formula, series of complex functions, Taylor's series, Laurent's series, Cauchy Residue theorem, calculation of residues.

Module III **8 hours**

Partial Differential Equations: Formation of partial differential equations, solutions of partial differential equations, Lagrange's, Charpit's methods, homogeneous linear equations with constant coefficients, rules for finding the complementary function, rules for finding the particular integral.

ModuleIV **10 hours**

Applications ofPartial Differential Equations: Classification of second order PDE, conversion to normal form, one dimensional wave equation, one dimensional heat flow, two dimensional heat flow, method of separation of variables.

Module V **8 hours**

Difference Equations: Definition, formation of difference equations, linear difference equations, rules for finding the complementary function, rules for finding the particular integral.

Text Book(s)

B. S. Grewal, Higher Engineering Mathematics, 42/e, Khanna Publishers, 2012.

References

1. Erwin Kreyszig, Advanced Engineering Mathematics,9/e, Wiley, 2013.
2. N.P. Bali and Manish Goyal, A Text Book of Engineering Mathematics, 8/e, Lakshmi Publications, 2012.

EMA208: DISCRETE MATHEMATICAL STRUCTURES

L	T	P	C
3	0	0	3

Module I **8 hours**

Mathematical Logic: Connectives, negation, conjunction, disjunction, conditional and bi-conditional, well formed formulae, tautologies, equivalence of formulae, duality, tautological implications, functionally complete set of connectives, principal disjunctive and conjunctive normal forms, inference calculus, rules of inference, indirect method of proof, conditional proof, automatic theorem proving.

Module II **10 hours**

Recurrence Relations: Recurrence relations, solving linear recurrence relations by characteristic roots method, system of recurrence relations, non - linear recurrence relations.

Module III **8 hours**

Groups: Groups, subgroups, Lagrange's theorem on finite groups, normal subgroups, group codes.

Module IV **8 hours**

Graph Theory: Definitions, finite and infinite graphs, incidence and degree, isolated pendant vertices, isomorphism, sub graphs, walk, path and circuit, connected and disconnected graphs, components, Euler graphs, Euler graph theorem, operations on graphs, decomposition of Euler graphs into circuits, arbitrarily traceable Euler graphs, Hamiltonian paths and circuits, number of edge disjoint Hamiltonian circuits in complete graph with odd number of vertices, travelling salesman problem.

Module 5 **8 hours**

Trees: Some properties of trees, pendant vertices, distance and centers, rooted and binary trees, spanning trees, fundamental circuit, shortest spanning trees, Kruskal's algorithm.

Text Book(s)

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1997. (Modules 1 and 3)
2. JoeL. Mott, Abraham Kandel and T. P. Baker, Discrete Mathematics for computer scientists & Mathematicians, 2/e, Prentice Hall of India Ltd, 2012. (Module 2)
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2006. (Modules 4 and 5).

References

1. Keneth.H.Rosen, DiscreteMathematicsanditsApplications, 6/e, TataMcGraw-Hill, 2009.
2. RichardJohnsonbaug, Discretemathematics, 7/e, Pearson Education, 2008.

EMA210: FUZZY SET THEORY, FUZZY LOGIC AND APPLICATIONS (Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Fuzzy Sets: Introduction, t-norms, t-co norms, algebra of fuzzy sets, mixed fuzzy logic, alpha cuts, distance between fuzzy sets, fuzzy numbers, introduction, fuzzy numbers, fuzzy arithmetic, fuzzy max. and min., defuzzification.

Module II **9 hours**

Fuzzy Equations: Linear equations, classical solution, extension principal solution, alpha cut and interval, arithmetic solution, fuzzy inequalities, introduction, solving $\overline{A}.\overline{X} + \overline{B} \leq \overline{C}.$

Module III **8 hours**

Fuzzy Relations: Introduction, definitions, transitive, closure, fuzzy equivalence relation, fuzzy relation equations, fuzzy functions, introduction, extension, principle, alpha cut, interval, arithmetic, types of fuzzy functions, inverse functions, derivatives.

Module IV **8 hours**

Approximate Reasoning: Introduction, approximate reasoning, multiple rules, discrete case.

Module V **8 hours**

Fuzzy Optimization: Introduction, maximum/minimum of fuzzy functions, fuzzy problems.

Text Book(s)

1. James J. Buckley and Esfandiar Eslami, Advances in Soft Computing: An Introduction to Fuzzy Logic and Fuzzy Sets, 1/e, Springer International Edition, 2007.

References

1. George J. Klir, Bo Yuan, Fuzzy Sets, Fuzzy Logic and Fuzzy Systems, 5/e, Prentice Hall, 2007.
2. Lotfy A. Zadeh, Advances in Fuzzy Systems-Applications and Theory, 6/e, World Scientific, 1996.

EME102 : ENGINEERING MECHANICS

L	T	P	C
3	1	0	4

Module I **8 hours**

Introduction to Engineering Mechanics: Composition and Resolution of forces, parallelogram law, principle of transmissibility, types of force systems – concurrent and concurrent coplanar forces, resultant of coplanar force systems, couple, moment of a force – Varignon's theorem, concept of free body diagrams, concept of equilibrium of coplanar force systems.
Friction: Laws of friction, types of friction, equilibrium of force systems involving frictional forces, wedge friction.

Module II **9 hours**

Analysis of Structures: Introduction to plane trusses, analysis of plane trusses by method of joints and method of sections.
Virtual Work: Equilibrium of ideal systems, work done by a force, work done by a couple, principle of virtual work.

Module III **9 hours**

Properties of Surfaces and Volumes: Centroid and center of gravity, derivation of centroids from first moment of area, centroids of composite sections, center of gravity of common volumes – cylinder, cone, sphere, theorem of Pappus.
Moment of Inertia: Area moment of inertia of plane and composite shapes, parallel axis theorem, perpendicular axis theorem, polar moment of inertia, mass moment of inertia of common volumes – thin plates, thin rod, cylinder, cone, sphere, rectangular prism, radius of gyration.

Module IV **8 hours**

Kinematics: Equations of motion for rigid bodies, constant and variable acceleration, rectilinear and curvilinear motion, motion under gravity - projectile motion, use of rectangular coordinates, tangential and normal coordinates, radius of curvature, rotation of a rigid body about a fixed axis, introduction to plane motion.

Module V **8 hours**

Kinetics: Principles of dynamics – Newton's Laws of motion, D'Alembert's principle in rectilinear translation, principle of work and energy.
Ideal Systems: Principle of conservation of energy, concept of power, conservation of linear and angular momentum, principle of momentum and impulse, impact – types of impact.

Text book(s)

1. N H Dubey, Engineering Mechanics: Statics and Dynamics, McGraw Hill, 2014.
2. S Timoshenko, DH Young, JV Rao, Sukumar Pati, Engineering Mechanics (in SI units), 5/e, McGraw Hill, 2013.

References

1. Basudeb Bhattacharya., Engineering Mechanics, 2/e, Oxford University Press (India), 2015.
2. Irving Shames, G K M Rao, Engineering Mechanics: Statics and Dynamics, 4/e, Pearson, 2009.
3. S S Bhavikatti, Engineering Mechanics, 4/e, New Age International, 2008.
4. K L Kumar, Veenu Kumar, Engineering Mechanics, 4/e, Tata McGraw Hill, 2010.

EME121 : WORKSHOP

L	T	P	C
0	0	3	2

Wood Working: **3 Classes**

Familiarity with different types of woods used and tools used in wood working and make following joints

a) Half – Lap joint b) Mortise and Tenon joint c)Corner Dovetail joint or Bridle joint.

Sheet Metal Working: **3 Classes**

Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal jobs from GI sheets

a) Tapered tray b) Conical funnel c) Elbow pipe.

Fitting: **3 Classes**

Familiarity with different types of tools used in fitting and following fitting exercises

a) V – fit b) Dovetail fit c) Semi-circular fit

Electrical Wiring: **3 Classes**

Familiarity with different types of basic electrical circuit connections and make the following connections

a) Parallel and series b) Two way switch c) Godown lighting
d) Tube light e) Three phase motor

EME123 : ENGINEERING GRAPHICS

L	T	P	C
1	0	3	3

Manual Drawing

Module I **2L+6P**

Lettering, line types, dimensioning and scales.General construction method for polygons.Construction of pentagon and hexagon by special methods.
Conic Sections: Ellipse, parabola, hyperbola with eccentricity method, tangent and normal to these curves.
Cycloidal curves: Cycloid, epicycloid, hypocycloid, inferior and superior trochoid. Involute of a circle.

Module II **3L+9P**

Projections of Points: Projections of points in different quadrants.
Projections of Straight lines: Line parallel to one or both the planes, line contained by one or both the planes, line perpendicular to one of the planes, line inclined to one plane and parallel to the other, line inclined to both the planes, inclinations, true length of the line and its traces.
Projections of Planes: Types of planes, plane perpendicular to one plane and parallel to other plane, perpendicular to one plane and inclined to other plane.

Module III **2L+6P**

Projections of Solids: Types of solids, projection of prism, pyramid, cylinder and cone in simple positions, and axis inclined to one plane and parallel to other, axis inclined to both the planes.

Computer Based Drawing:

Module IV **5L+15P**

Introduction to CAD package software commands.
Free Hand Sketching: Free hand sketches of 2D.
Computer Aided Sketching: Creation of 2D sketches by CAD package.
Orthographic Projections: Principle of projection, orthographic projection, planes of projection, first angle and third angle projection. Orthographic views of geometric shapes.

Module V **2L+6P**

Free Hand Sketching: Free hand sketches 3D of simple solids.
Isometric Views: Pictorial drawing, isometric views of plane figures and simple solids represented by multi-view drawings.

Text book(s)

1. M.B Shah and B.C Rana, Engineering Drawing, 2/e, Pearson Education, 2009.

References

1. N.D. Bhatt and V. M, Panchal,Engineering Drawing, 49/e, Charotar Publishing House, 2008.
2. K.L. Narayana and P. Kanniah, A text book on Engineering Drawing, SciTech publications, 2014.

EME403 :OPERATIONS RESEARCH (Elective)

L	T	P	C
3	0	0	3

Module I **10 hours**

Basics of Operations Research: History, definition, O.R. models, phases of implementing O.R. in practice

Linear Programming: Introduction, formulation, graphical solution, simplex method, artificial variable techniques - big m and two phase methods, duality principle, dual simplex method.

Module II **8 hours**

Transportation Model: Formulation, initial feasible solution, optimal solution - MODI method, unbalanced transportation problems, degeneracy in transportation problems.

Assignment Model: Formulation, optimal solution- Hungarian method, travelling salesman problem.

Module III **8 hours**

Queuing Models: Introduction, Kendall notation, classification of queuing models, single server and multi server models, Poisson arrival, exponential Service, infinite population.

Sequencing Models: Introduction, assumptions, processing n-jobs through two machines, n-jobs through three machines, N-jobs through M-machines and graphic solution for processing 2 jobs through n machines with different order of sequence.

Module IV **8 hours**

Replacement Models: Introduction, replacement of items that deteriorate with time - value of money unchanging and changing, simple probabilistic model for replacement of items that fail completely.

Game Theory: Introduction, game with pure strategies, game with mixed strategies, dominance property, graphical method for 2xn and mx2 games, linear programming approach for game theory.

Module V **8 hours**

Inventory Models: Introduction, inventory costs, economic order quantity (E.O.Q.) and economic batch quantity (E.B.Q.) models with and without shortages, inventory models with quantity discounts.

Project Management: Introduction, phases of project management, network construction, Fulkerson's rule, critical path method (C.P.M.), project evaluation and review technique (P.E.R.T)

Text Book(s)

1. P.K. Gupta,&D.S. Hira, Operation Research, 6/e, S ChandPublishers, 2006.
2. R. Paneerselvam, Operations Research, 2/e, Prentice Hall, 2010.

References

1. H.A. Taha, Operations Research, 9/e, Prentice Hall,2010.
2. M.W. Harvey,Principles of Operations Research: With Applications to Managerial Decisions, Prentice Hall, 2/e, 1975.
3. Kanti Swarup, Man Mohan., and P.K. Gupta, Introduction to Operations Research, 7/e, Sultan Chand & Sons, 2005.
4. F.S. Hillier, and G.J. Lieberman, Introduction to Operations Research, 7/e, TMH, 2009.

EME462 :PROJECT PLANNING AND MANAGEMENT
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Project Planning: Analysis and appraisal generation of project ideas, scouting for project ideas, preliminary screening, project rating index, cost of project.

Investment Appraisal: Social cost benefit analysis, UNIDO approach, net benefit in terms of economic prices, measurement of impact on distribution, savings impact and its value, income distribution impact, adjustment for merit and demerit, goods little Mirrless approach, shadow prices.

Module II **10 hours**

Project Implementation: Development of project network, dummy activities, activity on node networks, cyclic network, forward pass and backward pass computations, algorithm for critical path, total slacks, free slacks and their interpretations.

Time-Cost Trade off Procedure: Schedule related project costs, time cost trade off, lowest cost schedule.

PERT Network: Three time estimates for activities, estimation of mean and variance of activity times, event oriented algorithm for critical path, probability of meeting a schedule date.

Module III **8 hours**

Network Analysis: Algorithms for shortest route problems-Dijkstra's, Flyod's, and Pollack's, algorithms, algorithms for minimal spanning tree-Kruskal's algorithm and Prim's algorithm, algorithms for maximal flow problems-Ford and Fulkerson's algorithm

Module IV **8 hours**

Linear Programming Formulation of Network Problems: A flow network interpretation for determination of critical paths, time cost trade off and maximal flow, chance constrained linear programming for probabilistic durations of activities in PERT network.

Module V **8 hours**

Project Scheduling with Limited Resources: Complexity of project scheduling with limited resources, levelling the demands on key resources, a simple heuristic program for resource allocation.

Text Book(s)

1. P.I. Parameshwar, Engineering Project Management with Case Studies, vikas Publishing, 2005.
2. Prasanna Chandra, Projects Planning, Implementation and Control, Tata McGraw Hill, 1995.

References

1. Project Management Institute (PMI). A Guide to the Project Management of Knowledge (Newton Square, PA. 1996)
2. J.R. Meredith, and S.J. Mantel, Project Management: A Managerial Approach. John Wiley, 1995.
3. L.S.Srinath, PERT & CPM Principles & Applications, East – West Press, 1971.

EME481 : INTRODUCTION TO THERMODYNAMICS
(Elective)

L	T	P	C
3	0	0	3

Module I **10 hours**

Thermodynamic systems, micro & macro systems, homogeneous and heterogeneous systems, thermodynamic equilibrium, definition of work, heat, Joule's Experiments- first law of thermodynamics, first law applied to steady flow processes. Kelvin plank statement and Clausius statement, heat engine and heat pump, concept of entropy.

ModuleII **8 hours**

Steam: Properties of pure substance, T-S and H-S diagrams, basic Rankine cycle.

Steam turbines: Classification of steam turbines- components of steam turbine, construction and working of simple impulse turbine and reaction turbine, governing and compounding of steam turbines.

ModuleIII **8 hours**

IC Engines: Classification, comparison of two stroke and four stroke engines, comparison of SI and CI Engines.

Gas turbines: Construction of simple gas turbine power plant- component of gas turbine power plant.

Module IV **8 hours**

Principles of Psychrometry and Air Conditioning: Psychrometric terms, Psychrometric process, cooling load calculations of air conditioning systems.

Module V **12 hours**

Heat Transfer:Introduction: basic modes of heat transfer, governing laws of modes of heat transfer- combined mode of heat transfer. steady state heat conduction in plain and composite slabs- classification of fins and their uses - heat transfer analysis applied to buildings, furnaces and electronic systems with simple examples.

Text Book(s)

1. P. K. Nag, Engineering Thermodynamics, Tata McGraw-Hill, 2013.
2. A. Yunus, Cengel, M.A. Boles, Thermodynamics, Tata McGraw-Hill, 2001.

References

1. J.B.Jones and G.A.Hawkins, Introduction to thermodynamics, John wiley&sons, 1986
2. C.P.Arora,Refrigeration and Air – conditioning, Tata McGraw hill, 2008.
3. J.P.Holman,Heat Transfer, Int.Student edition, McGraw Hill Book Company,10/e, 2009.
4. V.Ganesan, Internal Combustion Engines,Tata McGraw hill, 4/e, 2012.

EOE202: GERMAN FOR BEGINNERS
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Introduction to the German language, grammar and pronunciation. Language: Greetings; Introducing oneself, asking the way, giving directions. Grammar: The nouns, gender distinctions, cases, definite and indefinite articles. Pronunciation: Vowels.

Module II **8 hours**

Language: Asking for and giving information; Discussing home and the household. Grammar: Conjugation of verbs, verbs with separable and inseparable prefixes, modal verbs. Pronunciation: Vowels.

Module III **8 hours**

Language: Describing people and their qualities, describing shape, size and colour of objects. Grammar: Personal pronouns, possessive pronouns, reflexive pronouns. Pronunciation: Consonants.

Module IV **8 hours**

Language: The Working World: Returning faulty goods to a shop, asking someone to repeat something; Refusing or declining politely. Grammar: Cases: nominative, accusative, dative. Pronunciation: Diphthongs.

Module V **9 hours**

Language: Making Comments and Suggestions: Asking for and giving opinions. Grammar: Structure of sentence and categories of sentences; subordinate clause - causative and conditional sentences. Pronunciation: Umlaut.

References

1. Deutsch als Fremdsprache IA Grundkurs
2. Ultimate German Beginner - Intermediate (Coursebook), Living Language, 2004.

EOE204: CHINESE FOR BEGINNERS
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Introduction to the Chinese language and pronunciation system; Tones; Chinese numbers; Language: Saying hello, greetings. Pronunciation: Initials: b p m n l h; Finals: a o e I u ü / ao en ie in ing uo; First tone.

Module II **8 hours**

Language: Asking what someone wants; Identifying people; Asking someone's name and nationality Grammar: Word order in Chinese sentence. Pronunciation: Initials: d t g k f; Finals: ei ou an ang eng iao iou(iu); Second tone.

Module III **8 hours**

Language: Introducing oneself; Asking for permission. Grammar: Sentence with an adjectival predicate; "Yes-no" question. Pronunciation: Initials: zh ch sh r; Finals : -I / ai uai ong; Third tone.

Module IV **8 hours**

Language: Introducing oneself; Asking for permission. Grammar: Questions with an interrogative pronoun. Pronunciation: Initials: j q x; Finals: ia ian iang / uei(-ui) uen(-un) üe üan; Fourth tone.

Module V **9 hours**

Language: Making comments and suggestions; Asking someone to repeat something; Refusing or declining politely. Grammar: Sentences with a verbal predicate. Pronunciation: Initials: z c s; Finals:-i er iong ua uan uang ün; Neutral tone; Retroflex ending.

*The course will focus on the pronunciation system, the introduction of common Chinese expressions and every-day phrases in the context of communicative activities.

References

1. Liu, Yuehua, Integrated Chinese: Simplified Characters Textbook, Level 1, Part 1. Cheng and Tsui Company, Inc. Boston, 2008.

EOE206: INTRODUCTION TO MUSIC
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction to Indian Classical Music: Heritage-Contribution of various races and tribes to the evolution of music in India, technical aspects of Indian classical music, influences Persian music especially on hindustani music, significance of music in bringing about social change.

Module II **9 hours**

History of Indian Music: Origin-Vedas, scriptures and bharata's natyasastra, traditions- hindustani and carnatic, basic elements, shruthi, swara, raaga and taala, similarities and variations in hindustani, carnatic and western classical music, octave, semitones, introduction to shruthi, swara, raaga and taala, fundamental ragas, importance of taala in indian music, introduction to pallavi, anupallavi and charana.

Module III **8 hours**

Hindustani Music: Brief history of hindustani music, concepts of raaga and taala, introduction to various gharanas, classification of music (folk, semi-classical, bhajans, light), appreciation of music.

Module IV **8 hours**

Carnatic Music: History of carnatic music, traditions, the musical trinity, Syama Sastri, Thyagaraja, Muthuswami Dikshitar, introduction to technical terms in carnatic music, compositional forms/strategies.

Module V **9 hours**

Connections-Music, Art and Culture: Musical oral tradition as a transmitter of culture, music as an expression of societal change, music as a means of communication across cultures.

References

1. Rangaramanuja Iyengar R., History of South Indian Carnatic Music: From Vedic Times To The Present, Wilco Publishing House, 1972.
2. Beni Madhab Barua, Swami Prajnanananda, The Historical Development of Indian Music: A Critical Study, Buddh Gaya, India, 1973.
3. G.H. Ranade, Hindustani Music, Popular Prakashan, 1971.

EOE208: GANDHIAN PHILOSOPHY
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Gandhi -The Man and His Times: Early life and education, lessons learnt from his wife, in South Africa, influence of Thoreau, Tolstoy and other thinkers, return to India, Sabarmati ashram, role in the Indian national movement, his impact during his life time.

Module II **8 hours**

Interpretation and Pursuit of Truth: Learning through trial and error; power of introspection, truth in thought, speech and action, pursuit of truth as true devotion to god, truth leads to courage and victory.

Module III **8 hours**

Peace and Conflict Resolution: Ahimsa as practical idealism - the means to the goal of truth, non-violent civil resistance, living faith in the power of nonviolence, prerequisites for practice, faith, courage and humility, prevention of structural violence, two pronged approach - conflict resolution and establishing peace, examples of methods and practices.

Module IV **8 hours**

Transformation of the Individual: Liberating the mind from dogmatism, control of the senses, thoughts and actions, respect for all faiths and universalism, a few strategies- Anasakta Karma, non-discrimination, simple living and self-sufficiency.

Module V **10 hours**

Contemporary Relevance: Gandhi's social, political and economic thought, sarva dharma sambhava - tolerance, respect towards all religions, educational reform - basic education and adult education, social equality-sarvodaya, removal of untouchability, communal unity, women empowerment, prohibition, service of backward classes, village sanitation, political solutions-swaraj, decentralization of power, democracy of enlightened majority, economic solutions-swadeshi, trusteeship, khadi and village industries, decentralization of wealth, sustainable development and equal opportunity, youth as agents of change.

References

1. Gandhi M.K., Mahadev H. Desai, Gandhi An Autobiography: The Story of My Experiments With Truth, Beacon Press, 1993.
2. Fischer, Louis, The Essential Gandhi: An Anthology of His Writings on His Life, Work, and Ideas. Vintage Books, 1983.
3. http://www.mkgandhi.org/main.htm
   Comprehensive Website by Gandhian Institutions - Bombay Sarvodaya Mandal and Gandhi Research Foundation

EOE210: PHILOSOPHICAL FOUNDATIONS OF EDUCATION (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Introduction: Philosophy's relevance to education; Philosophical roots of education, education as transmission of knowledge, education as the fostering of inquiry or reasoning skills, education as an agent of social change or personal liberation, liberal education and vocational education.

Module II **9 hours**

Philosophical Concepts Related to Education: Indian: from the vedic to the modern - an overview; Western: an overview - metaphysics - naturalism or supernaturalism; Epistemology - reason or faith; Human nature - dualism, reductive materialism or integrationism; Ethics - egoism, predation or altruism; Idealism, Realism, Pragmatism, Behaviorism, Existentialism.

Module III **9 hours**

Knowledge and Wisdom: Interrelation between education, science, technology, society and environment, Galileo to today-an overview.

Module IV **8 hours**

Purposes of Education: Personal growth or self-improvement, intellectual purposes, political purposes, economic purposes such as job preparation, social purposes such as the development of social and moral responsibility.

Module V **8 hours**

A Few Thinkers on Education and their Impact on Education: Eastern and western-Confucius, Socrates, Plato, Aristotle, Michel Foucault, Bertrand Russel, Rabindranath Tagore, Sri Aurobindo, Swami Vivekananda, J. Krishnamurti, S. Radhakrishnan, M.K. Gandhi.

References

1. Sharma, A.P., Indian and Western Educational Philosophy, Pustak Mahal, 2010.
2. Ozmon, Howard, Philosophical Foundations of Education, Prentice-Hall, 2011.
3. Palmer Joy, Bresler Liora, Cooper David, Fifty Major Thinkers on Education: From Confucius to Dewey, Routledge, 2001.
4. Noddings N., Philosophy of Education, Boulder, CO, Westview Press, 1995.
5. Gailbraith D., Analyzing Issues: Science, Technology and Society, Trifolium Books. Inc., Toronto, 1997.

EOE212: ANALYTICAL ESSAY WRITING
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Mechanics of Essay Writing: Framework of an essay, introduction, hypothesis/statement of claim, body-claims and counter claims, refuting or disproving the opposing position with reasons and examples, providing evidence and examples that prove or support one's claim, conclusion-restatement of the claim and summary of the main ideas, paragraphing, discourse markers.

Module II **9 hours**

Analyzing an Argument: Terms and definitions, statement, argument, claim, truth value, premise, identifying premises and claims/conclusions, strengths and weaknesses of an argument, discussion on the validity of a claim, scope for counter-argument if any, critiquing an argument.

Module III **8 hours**

Analyzing an Issue: An issue statement or statements followed by specific task instructions, discussing the extent to which one agrees or disagrees with the statement, rationale for the position one takes, developing and supporting one's position, discussion on the validity of the given statement/ claim, addressing the different views that are presented, remaining unbiased in assessing a claim, taking a stand and justifying it, writing a response.

Module IV **9 hours**

Writing an Argumentative Essay on a Topic of Contemporary Interest: Planning, writing and revising, clear, concise and defined thesis statement that occurs in the introduction, clear and logical transitions. **Body Paragraphs that include Evidential Support** (factual, logical, statistical or anecdotal), conclusion that does not simply restate the thesis, but re-addresses it in light of the evidence provided.

Module V **7 hours**

Peer Review: Preparing a template for peer review that is derived from the response rubric given to the student and assessment rubric used for evaluation, formulating and communicating constructive feedback on a peer's work, responding to feedback on one's work, checklist for peer review-lead strategy use in the introduction, thesis statement, supporting details given in the body, the writer's acknowledgement of a counterargument and his/her response to it, closing strategy used in the conclusion.

References

1. Bailey S., Academic Writing: A Handbook for International Students, Routledge, London and NewYork, 2001.
2. Jordan R.R., Academic Writing Course, Nelson/Longman, London, 1999.
3. Hamp-Lyons L., Heasley B., Study Writing, Cambridge University Press, 2006.

EOE214: INDIAN ECONOMY
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Structure of Indian Economy: Meaning of economic growth and development, features of Indian economy, changing structure of Indian economy, trends in national income, sources of growth, agriculture, industry and service sectors.

Module II **8 hours**

Demography, Poverty and Unemployment in India: Demography: Population size and growth rates, age and gender distribution, trends of urbanization, occupational distribution of labour force. Poverty: Nature of poverty causes for poverty, measures to eradicate poverty. Unemployment: Nature and types of unemployment, causes for unemployment, remedial measures of unemployment.

Module III **8 hours**

Public Finance: Sources of government revenue, Indian tax structure, direct and indirect taxes, composition of the government expenditure, role of monetary and fiscal policies, federal finance in India, 14th finance commission.

Module IV **8 hours**

Foreign Trade: Importance, composition and direction of foreign trade, foreign direct investment, BoPs equilibrium, Foreign Exchange Management Act (FEMA).

Module V **8 hours**

Economic Reforms in India: Industrial policy 1991, economic reforms, liberalization, privatization, and globalization.

Text Book(s)

1. V. K. Puri, S.K. Misra, Indian Economy, 31/e, Himalaya Publishing House, 2014.

References

1. R.C. Dutt, K.P.M. Sundaram, Indian Economy, S. Chand and Company, 2010.
2. A. N. Agarwal, Indian Economy, New Age International Limited, 2012.
3. I.C Dhingra, Indian Economy, Sultan Chand and Company, 2007.

EOE216: PUBLIC ADMINISTRATION
(Elective)

L	T	P	C
3	0	0	3

Module I **10 Hours**

Introduction: Meaning, scope and significance of public administration, evolution of the discipline and its present status, challenges of liberalisation, privatization and globalization, good governance, electronic governance-concepts and applications, New Public Management (NPM).

Module II **8 Hours**

Administrative Thought: Scientific management theory, classical theory, bureaucratic theory, human relations theory, system theory.

Module III **8 Hours**

Accountability and Control: Legislative, executive and judicial control over administration, role of media, interest groups, NGOs, civil society, Right to Information Act (RTI), social audit, citizen chapters.

Module IV **8 Hours**

Union and State Governments Administration: President, prime minister, council of ministers, cabinet, central and state secretariats, boards and commissions, governor, chief minister and council of ministers, central- state relations, finance commission, Neeti ayog.

Module V **8 Hours**

Civil Services: Recruitment, training and other condition of services, district administration, role of collector, local self governing institutes-73rd and 74th constitutional amendments act.

Text Book(s)

1. Avasti, Maheswari, Public Administration, 31/e, Lakshmi Narain Agarwal Books, India, 2014.
2. B. L. Fadia, Kuldeep Fadia, Indian Administration, 8/e, Sahitya Bhawan, India, 2014.

References

1. Nicholas Henry, Public Administration and Public Affairs, 21/e, Prentice Hall of India, 2012.
2. D. Ravindra Prasad, V. Sivalinga Prasad, P. Satyanarayana, Administrative Thinkers, 2/e, Sterling Publishers, 1991.
3. D. D. Basu, Introduction to the Indian Constitution, 21/e, Lexis Nexis Butterworths, Wadhwa Nagpur, 2013.
4. Ramesh K. Arora, Rajni Goyal, Indian Public Administration, 3/e, New Age International Publishers, India, 1995.

EOE218: ENVIRONMENT AND ECOLOGY
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Basic Concepts: Environment types, features of environment, structure of atmosphere, earth's four spheres, ecology, ecological principles, photosynthesis, components of ecosystem, carbon and oxygen cycles, nitrogen, hydrological, sedimentary, phosphorous and energy cycles.

Module II **8 hours**

Biomes: Terrestrial biomes, Aphine Tundra biomes, extinction of species. Bio-diversity: Biodiversity in American contents, Europe, central Asia and Africa. Categorization of species, biogeographic zones of India, biodiversity conservation, strategies, biodiversity conservation in India.

Module III **8 hours**

Environmental Degradation and Management: Greenhouse effect and global warming, acidification, world distribution of acid rain, impact of acid of precipitation, ozone depletion, Antarctic ozone hole, some basic facts about ozone depletion, salinisation, desertification or desertisation, soil erosion, types of soil erosion, soil conservation, deforestation, waste disposal, sustainable development.

Module IV **8 hours**

Natural Hazards and Disaster Management: Disaster, natural hazards, earthquakes in India, seismic zones of India, earthquake prediction, tsunami, landslides, types of landslides, avalanches, cyclones, thunderstorms, tornadoes, surge, sea-surge or storm surge. Floods: floods in India, flood disaster management. Drought hazards: causes of droughts, consequences of droughts, biological hazards and disasters, famines, wildfire (forest fire), forest fires in India.

Module V **8 hours**

Climate Change: Evidence of global warming, consequences of climatic change, consequences of climate change in India. Biodiversity and Legislation: Earth summit, the five earth summit agreements, the Montréal protocol, Kyoto protocol on climatic change.

Text Book(s)

1. Majid Husain, Environment and Ecology, 2/e, Access Publishing, New Delhi, 2014.

References

1. S. V. S. Rana, Essentials of Ecology and Environmental Science, Prentice Hall India, New Delhi, 2011.

EOE220: INDIAN HISTORY
(Elective)

L	T	P	C
3	0	0	3

Module I **10 Hours**

Ancient Indian History and Culture (Earliest Times to 700 AD): Indus valley civilisation, origin, significance. art and architecture, aryans and vedic period, expansions of Aryans in India, significance of the vedic age, evolution of monarchy and varna system, political conditions and administration under Mauryas, Guptas, social and economic conditions in ancient India, philosophy and religions in ancient India.

Module II **8 Hours**

Medieval Indian History and Culture: Delhi sultanate, great mughals, bahumanis, rise of south supremacy and conflicts, Pallava, Chalukya, Chola and Rasthrakutas.

Module III **8 Hours**

Modern Indian History and Culture: European penetration into India, the Portuguese and the Dutch, the English and the French east India companies, their struggle for supremacy, the battle of Plassey and its significance, consolidation of British rule in India.

Module IV **8 Hours**

Impact of British Colonial Rule: Economic: Commercialization of agriculture, dislocation of traditional trade and commerce, de-industrialisation, decline of traditional crafts, drain of wealth, famine and poverty in the rural interior. **Social and Cultural Developments:** The state of indigenous education and its dislocation, orientalist, anglicist controversy, introduction of western education in India, the rise of print media, literature and public opinion, the rise of modern vernacular literature, progress of science, rail and road connectivity.

Module V **8 Hours**

The Rise of Indian National Movement: Indian response to British rule, the great revolt of 1857, the peasant movements of the 1920s and 1930s, the foundation of the Indian national congress, the moderates and extremists, the partition of Bengal (1905), the swadeshi movement in Bengal, the economic and political aspects of swadeshi movement. Gandhian nationalism: Gandhi's popular appeal, Rowlett Act, satyagraha, the Khilafat movement, the non-cooperation movement, civil disobedience movement, Simon commission, the peasant and working class movements, Cripps mission, the quit India movement, declaration of independence.

Text Book(s)

1. Romila Thapar, A History of India, Vol. I, Penguin Books, 2013.
2. R.C. Majumdar, The History and Culture of the Indian People: Volume 1, The Vedic Age, Bharatiya Vidya Bhavan, 2010.
3. B. L. Grover, Modern Indian History: From 1707 to the Modern Times, S. Chand, 1998.
4. R.C. Majumdar, History of the Freedom Movement in India, South Asia Books, 1988.

References

1. D. N. Jha, Ancient India in Historical Outline, Manohar Publishers and Distributors, 2001.
2. G. S. Chabra, Advanced Study in the History of Modern India, Lotus Press, 2007.
3. M.K. Gandhi, Hind Swaraj: Indian Home Rule, Sarva Seva Sangh Prakashan, Varanasi, 2014.
4. W. W. Hunter, History of British India, Read Books Design, India, 2010.
5. A. R. Desai, Social Background of Indian Nationalism, 6/e, Popular Prakashan, 2005.

EOE301: INDIAN CONSTITUTION
(Elective)

L	T	P	C
3	0	0	3

Module I **10 Hours**

Introduction to Indian Constitution: Constitutional history, constituent assembly, salient features of the constitution, significance of preamble, amending process of the constitution.

Module II **8 Hours**

Rights and Duties: Citizenship, fundamental rights and directive principles, fundamental duties.

Module III **8 Hours**

Union Government: President and vice president, election, removal and powers, prime minister and council of ministers, parliament, supreme court, union, state relations, emergency provisions.

Module IV **8 Hours**

State and Local Governments: Governor, state legislature, assembly and council, chief minister and council of ministers, high court, rural and urban local governments with special reference to 73rd and 74th constitutional amendment acts.

Module V **8 Hours**

Other Constitutional and Statutory Bodies: Comptroller and auditor general, election commission, finance commission, attorney general and advocate general, union public service commission (UPSC), state public service commissions (SPSCs), tribunals, national human rights commission (NHRC).

Text Book(s)

1. J. C. Johari, Indian Government and Politics, Vishal Publications, Delhi, 2009.
2. M. V. Pylee, Introduction to the Constitution of India, 5/e, Vikas Publishing House, Mumbai, 2007.

References

1. D.D. Basu, Introduction to the Indian Constitution, 21/e, Lexis Nexis, Gurgaon, India, 2011.
2. Subhas C. Kashyap, Our Constitution, 2/e, National Book Trust India, New Delhi, 2013.

EOE303: JAPANESE FOR BEGINNERS
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Introduction to Japanese language, simple explanation of writing and pronunciation systems, characteristics of Japanese, grammar, meeting people, introductions, exchanging business cards, identifying people and things, useful daily expressions.

Module II **8 hours**

Asking about business hours, shopping, time and numbers, large numbers, counters. Grammar: Pronouns and noun modifiers. Useful daily expressions.

Module III **8 hours**

Getting around, confirming schedules (including going/coming), visiting another company (including month/week/day). Grammar: Motion verbs. Useful daily expressions.

Module IV **8 hours**

Existence of people and things, asking/telling location, dining out, making plans for a weekend.
Grammar: State of being/existence, basic verbs. Useful daily expressions.

Module V **9 hours**

Giving and receiving, expressing gratitude, talking about plans (usage of Te-Form), Grammar: Adjectives, present form of i-adjective, present form of na-adjective, past forms of i-adjective and na-adjective, the Te-Form. Useful daily expressions.

References

1. Ajalt, Japanese for Busy People: Romanized Version Volume 1, 2006.

*Study through Romanized Textbook - No reading/writing in Japanese letters

EOE305: FRENCH FOR BEGINNERS
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Asking for and giving personal information, asking for and giving directions, gender and number. Grammar: Verbs "avoir" and "etre", present tense, questions, vocabulary: countries and nationalities, professions, family, food

Module II **8 hours**

Asking and giving the time, asking when something is open or someone is available, asking for prices and describing what one wants. Grammar: Alphabet and numbers, possessive adjectives, negative sentences. Vocabulary: Days of the week, months, money.

Module III **8 hours**

Asking for information related to travel and accommodation, expressing one's wants/needs.

Grammar: Present tense for verbs in -er, -ir and -re, present tense of irregular verbs. Verbs: to be able to, to want, to know. Vocabulary: Food, shops, packaging and measures.

Module IV **8 hours**

Talking about daily routine and the working day, describing things, expressing oneself when buying things. Grammar: Possessive pronouns, reflexive verbs. Vocabulary: Clothes, colours and shapes, weather.

Module V **9 hours**

Describing places; visiting the doctor, reading short advertisements, describing places, feelings and symptoms. Grammar: Using avoir aller, etre faire, vouloir pouvoir. Vocabulary: Parts of the body, rooms and features of interior spaces.

References

1. LE NOUVEAU SANS FRONTIÈRES - Textbook
2. LE NOUVEAU SANS FRONTIÈRES - Workbook
   CD and selected passages/ exercises

EOE307: CONTEMPORARY RELEVANCE OF INDIAN EPICS (Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Reading the Texts: Reading for gist, chapter summaries, plot, pair work and discussions in small groups.

Module II **8 hours**

Understanding the Texts: Basic themes, characterization-major characters, watching short videos followed by discussion, analysis and writing short reviews.

Module III **8 hours**

Story Retelling and Responsive Writing: Narrating short episodes, enacting select scenes, role play, writing short paragraphs and short essays based on basic themes, plot and major characters.

Module IV **9 hours**

Exploring the Texts from Socio-cultural and Political Perspectives: Identifying examples of mutual co-existence, duties and responsibilities of individuals in the context of family and society, righteous action, conflict between good and evil, possibilities of redefining cultural and political systems, identifying spaces for reconciliation in conflict situations.

Module V **9 hours**

Contemporary Relevance of the Epics: Human relations, team play, leadership lessons, resource management, core competencies and competitiveness.

References

1. C. Rajagopalachari, Ramayana, 44/e, Bharatiya Vidya Bhavan, Mumbai, India, 1951.
2. C. Rajagopalachari, Mahabharata, 57/e, Bharatiya Vidya Bhavan, Mumbai, India, 2012.
3. R. K. Narayan, The Mahabharata: A Shortened Modern Prose Version of the Indian Epic, Penguin Group, 2009.
4. R. K. Narayan, The Ramayana: A Shortened Modern Prose Version of the Indian Epic, Penguin Classic, 2006.

EOE309: INDIAN NATIONAL MOVEMENT
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Background: Early British colonialism in India, early rebellions-Pazhassi Raja (the cotiote war - Kerala, 18th century), Veerapandiyan Kattabomman (Tamilnadu/Madras Presidency - 18th century), Paik rebellion (Kalinga/ Odisha, early 19th century), Vellore mutiny (early 19th century); The Sepoy Mutiny of 1857 and its consequences.

Module II **8 hours**

Contributory Factors: Socio-political consciousness, growth of Western education and its impact on socio-religious movement, British economic policies and their impact.

Module III **8 hours**

Rise of Organized Movements: Emergence of Indian national congress, its policies and programmes, partition of Bengal, rise of radical nationalists, Bal-Lal-Pal, formation of the Muslim league; Minto-Morley reforms, the national movement during the first world war.

Module IV **9 hours**

Gathering Momentum: Non-cooperation and civil disobedience, emergence of Gandhi, some prominent revolutionaries - Khudiram Bose, Prafulla Chaki, Bhupendra Nath Dutt, V.D. Savarkar, Sardar Ajit Singh, Lala Hardayal, Sardar Bhagat Singh, Raj Guru, Sukh Deo, Chandra Shekhar Azad, development of socialist ideas, communal divide.

Module V **8 hours**

Towards Independence: Constitutional developments, provincial elections, quit India movement and after, participation of women, national movement during the second world war, Indian national army, naval mutiny of 1946, freedom and partition, impact on the world.

References

1. K. Majumdar, Advent of Independence, Bhartiya Vidya Bhavan, Mumbai, 1969.
2. R. Desai, Social Background of Indian Nationalism, 5/e, Popular Prakashan, Mumbai, 1976.
3. Bandyopadhyay, Sekhar, Nationalist Movement in India: A Reader, Oxford University Press, 2008.
4. Chandra, Bipin, Nationalism and Colonialism in Modern India, Orient Longman Limited, New Delhi, 1979.

EOE311: SCIENCE AND TECHNOLOGY
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Planet Earth: Introduction, the crust in motion, earth quakes, mineral future, promise of oceans, changing climate, green house effect, global environmental issues, meteorological science, preserving mother earth.

Module II **8 hours**

Living State: Introduction, molecular genetics, cell biology, immunology, neuro sciences, biology and agriculture, storage of food grains, agriculture products and their preservation, biotechnology in food processing.

Module III **8 hour**

Energy: Introduction, some important time perspectives, mid-term energy options, mid-term supply strategies, hydro, wind, thermal, solar and nuclear energies, environmental and health effects in harvesting energy, long term energy options, some research needs.

Module IV **8 hours**

Computer and Communications: Introduction, development of communication system, telegram, telephone, wireless communication, current technology and systems, theoretical computer science and contribution from mathematics, computer and communications, artificial intelligence, television and entertainment.

Module V **8 hours**

Materials and Processing: Materials in ancient India, development in materials, materials processing and manufacturing: recent concepts in materials, polymer materials, composites, nano sciences and nano technologies, super conductivity, laser and photonics.

Text Book(s)

1. Ashok Singh, Science and Technology, 2/e, Access Publishing, 2014.
2. WH Freeman and Company, National Academy of Sciences, Washington D.C., 1979.

References

1. K D Sharma, M. A. Qureshi, Science, Technology and Development, Sterlings Publishers Pvt. Ltd., New Delhi, 1978.
2. B. R. Nanda (Editor), Science and Technology in India, Vikas Publishing House Pvt Ltd, 1977.

EOE313: PROFESSIONAL COMMUNICATION
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Internal Communication: Memo-structure, layout and style, e-mail-structure, style, content and etiquette, notice-structure, content and layout, conducting a meeting, purpose and preparation, drafting agenda and minutes, conducting effective meetings, meeting etiquette.

Module II **9 hours**

Making a Business Presentation: Planning-define the purpose, analyze audience and occasion, preparation-developing central idea, main ideas, gathering supporting materials, audio-visual aids, organization-introduction, body and conclusion, delivery-addressing the audience, body language, eye contact, use of appropriate language, style and tone.

Module III **8 hours**

Business Letters: Form and structure, style and tone, letters of enquiry, letters placing orders/ giving instructions/urging action, letters of complaint and adjustment.

Module IV **9 hours**

Proposals and Reports: Proposals, types, structure, prefatory parts, body of the proposal, supplementary parts, reports, types, informative, analytical, formal/informal, oral/written, individual/group, format and structure.

Module V **8 hours**

Resume, Cover Letter, Interview and Telephone Etiquette: Resume, design and structure, cover letter, cover letters, accompanying resumes, opening, body, closing; Interview, planning, purpose, pre-interview preparation, conversation, two-way interaction, projecting a positive image, telephone etiquette-guidelines for telephone conversations in a professional context.

References

1. Seely, John, Oxford Guide to Effective Writing and Speaking, Oxford University Press, India, 2013.
2. Olsen Leslie, Huckin Thomas, Technical Writing and Professional Communication for Non-Native Speakers, McGraw Hill, 1991.
3. Rizvi, M. Ashraf, Effective Technical Communication, Tata McGraw Hill, 2005.

EOE315: ETHICS, INTEGRITY AND ATTITUDE
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Basic Concepts: Terminology, morals, ethics, values, integrity and spirituality, edicts-religious, social and constitutional edicts, the question of universality, personal and professional ethics, emotional intelligence, dimensions of ethics.

Module II **8 hours**

Rights and Responsibilities: As citizens, as professionals, concepts of justice and fairness, preservation, production, exchange for mutual fulfilment vs. storage for future use, social responsibility and individual rights.

Module III **9 hours**

Global Issues in Ethics: Technology and globalization, business ethics, corporate social responsibility, environmental ethics, media ethics, protecting the common good while respecting the values and beliefs of nations/ethnic groups, issues of compliance and governance, equal opportunities.

Module IV **8 hours**

Ethical Integrity and Attitudes: Integrity as wholeness and consistency of character, beliefs, actions, methods and principles, core group of values, accountability, prioritization, subjectivity and objectivity, attitude, components (cognitive, behavioral and affective), attitude formation and attitude change.

Module V **9 hours**

Ethical Living: Needs of life, materialistic and non-materialistic, qualitative and quantitative, harmony in living, self (physical and mental well being), family, building trust, sharing of responsibilities, cultivating sense of security, society, peace, non-violence, diversity, multiculturalism and oneness, nature, environmental sustainability, reorganizing living conditions, reappraising economic sectors and work practices, developing green technologies, ethical consumerism.

References

1. G. Subba Rao, Roy Chowdhury, P.N. Ethics, Integrity and Aptitude: For Civil Services Main Examination Paper V, Access Publishing, 2013.
2. Singer, Peter. Practical Ethics, Cambridge University Press, 1999.
3. Swami Tathagatananda, Healthy Values of Living, Advaita Ashrama, Kolkata, 2010.
4. M. Frost (Ed), Values and Ethics in the 21st Century, BBVA, Available at https://www.bbvaopenmind.com/wp-content/uploads/2013/10/Values-and-Ethics-for-the-21st-Century_BBVA.pdf

EOE317: PERSONALITY DEVELOPMENT
(Elective)

L	T	P	C
3	0	0	3

Module I **8 hours**

Self Awareness: Know yourself, have a snapshot of yourself, assess your personal traits, discover natural potential. Activities and Tasks: Class discussion, questionnaires, Johari Window, SWOC analysis (strengths, weaknesses, opportunities and challenges).

Module II **8 hours**

Self Discipline: Importance of self discipline, characteristics of a self disciplined achiever, self discipline in personal life and career. Activities and Tasks: Viewing short videos followed by discussion and analysis, brainstorming in small groups, creating an action plan to realize academic and career goals.

Module III **8 hours**

Motivating Oneself: Self motivation, confidence building, goal setting, decision making. Activities and Tasks: Discussion and analysis of case studies, completing self-assessment questionnaires.

Module IV **9 hours**

Managing Oneself: Handling emotions, time management, stress management, change management. Activities and Tasks: Discussion and analysis of case studies, completing self-assessment questionnaires.

Module V **9 hours**

Interpersonal Behaviour: Attitude towards persons and situations, team work, leadership skills, problem solving skills, interpersonal adaptability, cultural adaptability. Activities and Tasks: Team-building games and activities.

References

1. Hurlock Elizabeth B., Personality Development, McGraw Hill Education, India, 1979.
2. Covey, Stephen R., The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change, Free Press, 2004.
3. Carnegie, Dale, Levine, Stuart. R., The Leader In You: How to Win Friends, Influence People and Succeed in a Changing World, Pocket Books, 1995.
4. Swami Vivekananda, Personality Development, Advaita Ashrama, 1993.

* This will be supplemented by materials and activities from internet-related sources.

EPH101: ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

Module I **10 hours**

Interference: Introduction, interference in thin films due to reflected light, interference in wedge shaped film, Newton's rings, Michelson's interferometer, Applications: To find the diameter of a wire, to find the wavelength of light and refractive index of liquids and thin transparent sheets, flatness of surface, thickness of thin-film coating, anti-reflection coatings. **Diffraction:** Introduction, Fraunhoffer diffraction at single slit, diffraction due to N-slits (diffraction grating), highest possible orders, determination of wavelength of light with a plane transmission grating, resolving power of a grating, dispersive power of a grating.

Module II **8 hours**

Polarisation: Introduction, double refraction, double refraction in calcite crystal, negative and positive crystals, Nicol's prism, retarders (quarter and half-wave plates), production and detection of linearly, circularly and elliptically polarised lights, analysis of polarized light. Applications: Sunglasses, photography, optical microscopy, liquid crystal display, photoelasticity.

Module III **8 hours**

Lasers: Introduction, spontaneous and stimulated emissions, population inversion, components of a laser, lasing action, types of lasers-ruby laser, He-Ne laser, semiconductor laser, applications: in industry, medicine, new materials. **Fiber Optics:** Introduction, structure of an optical fiber, principle of propagation, acceptance angle, numerical aperture, types of optical fibers, single mode and multimode step index fibers, multimode graded index fiber, classification of fibers based on materials, fibre optics in communication, applications of fiber optics.

Module IV **8 hours**

Modern Physics (Quantum Physics): Introduction, matter waves and its properties, Davisson-Germer experiment, GP Thomson experiment, Heisenberg's uncertainty principle, Schrodinger's time independent wave equation, physical significance of wave function, particle in a one-dimensional infinite well, rectangular potential barrier (transmission coefficient), band theory of solids (qualitative), distinction between metals, insulators and semiconductors, introduction to Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstien statistics.

Module V **9 hours**

Ultrasonics: Introduction, properties of ultrasonic waves, production of ultrasonics by magnetostriction and piezoelectric effects, detection (Kundt's tube, sensitive flame, acoustic grating and piezoelectric methods), applications of ultrasonics. Electromagnetism: Coulomb's law, Flux, Gauss' law of electrostatics in free space, significance of gradient, divergence, and curl operators, divergence of electric field, differential form of Gauss' law, Ampere's law, Gauss' law for magnetism, integral form of Faraday's law, equation of continuity, displacement current, Maxwell's equations.

Text Book(s)

1. M.N. Avadhanulu, P.G. Kshirsagar, A Textbook of Engineering Physics, S.Chand, 2014.

References

1. Resnick, Halliday, Krane, Physics, Part I and II, 5/e, Wiley India, 2007.
2. A.Ghatak, Optics, 4/e, Tata McGraw Hill Education, 2008.
3. Arthur Bieser, Concepts of Modern Physics, 6/e, Tata McGraw Hill, 2009.
4. A Marikani, Engineering Physics, 2/e, Prentice Hall of India, 2013.

EPH102: MATERIALS SCIENCE
(Elective)

L	T	P	C
3	0	0	3

Module I **10 hours**

Crystallography: Forces between atoms, bonding in solids, ionic, covalent and metallic bonding; Fundamental concepts of crystals, lattice points and space lattice, crystal systems, Bravais lattices, directions, planes and Miller indices, atomic packing fraction, structure of simple cubic, body centered cubic (CsCl), face centered cubic (NaCl), hexagonal closed packed (HCP), diamond structure; X-ray diffraction, Bragg's law.

Module II **8 hours**

Characterization Techniques: X-ray diffraction, powder X - ray diffractometer, construction and working, crystalline phase analysis, fundamentals of transmission electron microscopy and scanning electron microscopy(SEM), study of crystal structure using TEM, study of microstructure using SEM, scanning electron microscopy with EDS, construction and working, grain size and chemical analysis atomic force microscopy, construction and working, scanning tunneling microscope, construction and working.

Module III **10 hours**

Crystal Imperfections: Point defects, vacancies and self interstitials, impurities in solids, dislocations, linear defects, interfacial defects, bulk or volume defects edge and screw dislocation. **Mechanical Behaviour:** Elastic behaviour of metals, stress-strain relation, Hooke's law, atomic model of elastic behaviour, plasticity, ductile and brittle materials, tensile strength, hardness, fatigue, creep, fracture, types of fracture.

Module IV **8 hours**

Diffusion and Phase Transformation in Solids: Fick's laws of diffusion, experimental determination of diffusion coefficient, Kirkendall effect, atomic model of diffusion. Time scale of phase changes, nucleation and growth, nucleation kinetics, applications, solidification and crystallization, glass transition.

Module V **10 hours**

Nanoscience: Overview of nanotechnology, quantum effect, nanotechnology in nature, energy levels in nano films, nanowires and nanodots. Growth techniques, physical vapor deposition, ball milling, lithography techniques, properties at nanoscale, size dependence, struc-

tural, chemical, optical, mechanical, electrical and magnetic properties. Applications of Nanomaterials: Sensors and actuators, catalysis, biomedical, advanced electronic materials, current challenges and future trends, safety and societal implications.

Text Book(s)

1. V. Raghavan, Materials Science and Engineering: A First Course, Prentice Hall of India, 2007.
2. Charles P. Poole, Frank J. Owens, Introduction to Nanotechnology, John Wiley and Sons, 2007.

References

1. S. O. Pillai, Solid State Physics, New Age International, 2008.
2. M. Arumugam, Materials Science, Anuradha Agencies, Kumbhakonam, 2007.
3. Rakesh Rathi, Nanotechnology: Technology Revolution of 21st Century, S. Chand, 2009.

EPH104: SOLID STATE PHYSICS
(Elective)

L	T	P	C
3	0	0	3

Module I **9 hours**

Crystallography: Classification of solids, forces between atoms, bonding in solids, ionic, covalent and metallic bonding, fundamental concepts of crystals, lattice points and space lattice, crystal systems, Bravais lattices, directions, planes and Miller indices, atomic packing fraction, structure of simple cubic, body centered cubic (CsCl), face centered cubic (NaCl), hexagonal closed packed (HCP), diamond structure, X-ray diffraction, Bragg's law.

Module II **8 hours**

Dielectric Properties: Introduction, fundamental definitions, local field, Claussius-Mossotti relation, different types of electric polarizations, electronic, ionic, and dipolar polarizations (qualitative and quantitative), dielectric loss, dielectric breakdown, piezoelectricity and ferroelectricity, spontaneous polarization in BaTiO3, applications of dielectrics and ferroelectrics.

Module III **7 hours**

Magnetic Properties: Introduction, fundamental definitions, classification of magnetic materials, Weiss theory of ferromagnetism, domain theory of ferromagnetism, hysteresis, soft and hard magnetic materials, eddy current losses, ferrites (structure and magnetic properties), Applications: transformer cores, magnetostrictive sensors, data storage.

Module IV **8 hours**

Semiconductors I: Introduction, intrinsic and extrinsic semiconductors, carrier concentration in intrinsic semiconductors, carrier concentration in n-type and p-type semiconductors, conductivity of extrinsic semiconductors, variation of carrier concentration and conductivity with temperature, drift and diffusion currents in semiconductors, carrier transport phenomena.

Module V **10 hours**

Semiconductors II: Recombination of electron hole pairs, p-n junction diode and junction layer formation, direct and indirect band gap of semiconductors, Hall effect and its applications, magneto resistance, optical and thermal properties of semiconductors, fundamentals of LED, photovoltaic cell (solar cell), tunnel diode.

Text Book(s)

1. M.N. Avadhanulu, P.G. Kshirsagar, A Text book of Engineering Physics, S. Chand, 2014.

References

1. Simon M. Sze, Kwok K. Ng, Physics of Semiconductor Devices, 3/e, John Wiley, 2006.
2. S. O. Pillai, Solid State Physics, 7/e, New Age International, 2014.
3. B.G. Streetman, S. Banerjee, Solid State Electronic Devices, 6/e, Prentice Hall of India, 2006.
4. P. K. Palanisamy, Applied Physics, SciTech Publications, 2009.
5. Marius Grundmann, The Physics of Semiconductors, 2/e, Springer, 2010.

EPH106: PHYSICS OF NANOMATERIALS
(Elective)

L	T	P	C
3	0	0	3

Module I **6 hours**

Nanotechnology: Introduction, significance of nanotechnology, finite size effects and properties, classification of nanostructure materials, challenges and future prospects.

Module II **8 hours**

Properties of Nanomaterials: Microstructure and defects in nanomaterials, dislocations, twins, stacking faults and voids, grain boundaries, effect of nanodimension on material, tunnelling, mechanical properties, melting point, diffusivity, grain growth characteristics, solubility, magnetic, electrical and thermal properties of nanomaterials.

Module III **10 hours**

Growth Techniques in Nanomaterials: Introduction, top down and bottom up approaches, lithographic process and limitations, non-lithographic processes, plasma arc discharge, sputtering, evaporation, chemical, tunnel deposition, molecular beam epitaxy, sol-gel technique, electrodeposition.

Module IV **10 hours**

Characterization Techniques of Nanomaterials: X-ray diffraction, small angle X-ray scattering, scanning electron microscopy with energy dispersive spectroscopy, transmission electron microscope, scanning, tunnelling microscope.

Module V **8 hours**

Application of Nanomaterials: Sectors influenced by nanomaterials-health, communication, energy, environment, safety, security and defence, nanophotonic devices, nanosensors, Quantum dots, MEMS and NEMS.

Text Book(s)

1. P.P. Charles, J.O. Frank, Introduction to Nanotechnology, Wiley Inter-Science, 2003.
2. K. K. Chattopadhyay, A.N. Banerjee, Introduction to Nanoscience and Nanotechnology, Prentice Hall of India, 2011.

References

1. L.W. Edward, Nanophysics and Nanotechnology: An Introduction to Modern Concepts in Nanoscience, 2/e, Wiley-VCH, 2006.
2. C. Guozhong, Ying Wang, Nanostructures and Nanomaterials: Synthesis, Properties, and Applications, 2/e, Imperial College Press, 2004.

EPH121: ENGINEERING PHYSICS LABORATORY

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List of Experiments

1. J - by Callender and Barne's method.
2. Thermal conductivity of a bad conductor-Lee's method.
3. Magnetic field along the axis of a circular coil carrying current Stewart and Gee's galvanometer.
4. Hall effect - measurement of hall coefficient.
5. Carey Foster's bridge - laws of resistance and specific resistance.
6. Calibration of low range voltmeter - potentiometer bridge circuit.
7. Thickness of a paper strip - wedge method.
8. Newton's rings - radius of curvature of a plano convex lens.
9. Diffraction grating - normal incidence.
10. Determination of refractive indices (o and e) of a bi - refringent material (Prism).
11. Cauchy's constants - using a spectrometer.
12. Dispersive power of a prism-using a spectrometer.
13. Determination of Rydberg constant.
14. LASER - diffraction.
15. Determination of band gap in a semiconductor.
16. Optical fibres - numerical aperture and loss of signal.
17. VI characteristics of a pn - junction diode.
18. Response of a series RLC circuit.

List of subjects

Chandrahas ICT Bhavan - Institute of Technology, Visakhapatnam Campus

School of Technology, Hyderabad Campus

Sir Visvesvaraya Bhavan - School of Technology, Bengaluru Campus

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GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)
Gandhi Nagar Campus, Rushikonda,Visakhapatnam-530 045, A.P. INDIA
Phones: +91-0891-2795311, 2840501, EPABX: +91-891-2790101, Fax: +91-891-2795311

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