Kongunadu College of Engineering and Technology (Autonomous)

Affiliated to Anna University, Chennai

B.E. Civil Engineering

Regulations: KNCET-UGR2020

Choice Based Credit System

I to VIII Semesters Curricula & Syllabi

(Applicable for the students Admitted from 2021-22 Onwards)

Semester I							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20EN101	Technical English-I	HSMC	3	0	0	3
2	20MA101	Mathematics-I	BSC	3	1	0	4
3	20PH101	Engineering Physics	BSC	3	0	0	3
4	20CY101	Engineering Chemistry	BSC	3	0	0	3
5	20GE101	Structured Programming Using C	ESC	3	0	0	3
6	20GE102	Engineering Graphics	ESC	2	0	2	3
7	20TA101*	தமிழர் மரபு/Heritage of Tamils	HSMC	1	0	0	1
Practicals							
8	20BS101L	Physics and Chemistry Laboratory	BSC	0	0	2	1
9	20GE103L	Structured Programming Using C Laboratory	ESC	0	0	2	1
10	20EEC101L	English for Effective Communication	EEC	0	0	2	1
			Total	**18**	**1**	**8**	**23**

Semester II							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20EN201	Technical English-II	HSMC	3	0	0	3
2	20MA201	Mathematics-II	BSC	3	1	0	4
3	20PH202	Materials Science	BSC	3	0	0	3
4	20BS201	Environmental Science	HSMC	3	0	0	3
5	20BE201	Engineering Mechanics	PCC	3	1	0	4
6	20BE202	Basic Electrical and Electronics Engineering	ESC	3	0	0	3
7	20TA201**	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	HSMC	1	0	0	1
Practicals							
8	20GE201L	Engineering Practices Laboratory	ESC	0	0	2	1
9	20CE201L	Building Drafting and Modeling Laboratory	PCC	0	0	2	1
10	20EEC201L	Soft Skills	EEC	0	0	2	1
			Total	**19**	**2**	**06**	**24**

* - Exempted for 2021-22 admitted students & in Semester II for the 2022-23 admitted students

** - Exempted for 2021-22 admitted students & in Semester III for the 2022-23 admitted students

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Semester III							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20MA302	Transforms and Partial Differential Equations	BSC	3	1	0	4
2	20CE301	Strength of Materials-I	PCC	3	0	0	3
3	20CE302	Mechanics of Fluids	PCC	3	0	0	3
4	20CE303	Surveying	PCC	3	0	0	3
5	20CE304	Construction Materials	PCC	3	0	2	4
6	20CE305	Engineering Geology	ESC	3	0	0	3
7	20MC003	Constitution of India	MC	2	0	0	0
Practicals							
8	20CE306L	Surveying Laboratory	PCC	0	0	2	1
9	20EEC301L	Soft Skills Development	EEC	0	0	2	1
			Total	**20**	**1**	**6**	**22**

Semester IV							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20MA401	Numerical Methods	BSC	3	1	0	4
2	20CE401	Strength of Materials-II	PCC	3	0	0	3
3	20CE402	Applied Hydraulic Engineering	PCC	3	0	0	3
4	20CE403	Construction Techniques, Equipments and Practice	PCC	3	0	0	3
5	20CE404	Soil Mechanics	PCC	3	0	0	3
6	20CE405	Highway Engineering	PCC	3	0	0	3
Practicals							
7	20EEC401L	Life Skills and Personality Development	EEC	0	0	2	1
8	20CE406L	Strength of Materials Laboratory	PCC	0	0	2	1
9	20CE407L	Hydraulic Engineering Laboratory	PCC	0	0	2	1
			Total	**18**	**1**	**06**	**22**

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Semester V							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20CE501	Design of Reinforced Concrete Elements	PCC	3	1	0	4
2	20CE502	Structural Analysis-I	PCC	3	0	0	3
3	20CE503	Railways, Airports and Harbour Engineering	PCC	3	0	0	3
4	20CE504	Foundation Engineering	PCC	3	0	0	3
5	20MC002	Universal Human Values 2: Understanding Harmony	MC	3	0	0	3
6		Professional Elective-I	PEC	3	0	0	3
Practicals							
7	20CE505L	Survey Camp (2 weeks - During IV Semester)	PCC	0	0	0	1
8	20CE506L	Geotechnical Engineering Laboratory	PCC	0	0	2	1
9	20CE507L	Highway Engineering Laboratory	PCC	0	0	2	1
10	20EEC501L	Professional Skills Development	EEC	0	0	2	1
			Total	**18**	**1**	**6**	**23**

Semester VI							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20CE601	Design of Steel Structures	PCC	3	0	0	3
2	20CE602	Structural Analysis-II	PCC	3	0	0	3
3	20CE603	Water Supply and Wastewater Engineering	PCC	3	0	0	3
4	20CE604	Estimation Costing and Valuation Engineering	PCC	3	0	0	3
5		Professional Elective-II	PEC	3	0	0	3
6		Open Elective-I	OEC	3	0	0	3
Practicals							
7	20CE605L	Structural Design and Drawing	PCC	0	0	2	1
8	20CE606L	Water Supply and Wastewater Engineering Laboratory	PCC	0	0	2	1
9	20EEC601L	Employability Skills	EEC	0	0	2	1
10	20CE607L	Mini Project-I	EEC	0	0	2	1
			Total	**18**	**0**	**8**	**22**

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Semester VII							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1	20CE701	Concrete Technology	PCC	3	0	0	3
2	20MG501	Principles of Management	HSMC	3	0	0	3
3		Professional Elective-III	PEC	3	0	0	3
4		Professional Elective-IV	PEC	3	0	0	3
5		Open Elective –II	OEC	3	0	0	3
Practicals							
6	20CE702L	Mini Project-II	EEC	0	0	2	1
			Total	**15**	**0**	**2**	**16**

Semester VIII							
S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
Theory							
1		Professional Elective - V	PEC	3	0	0	3
2		Professional Elective - VI	PEC	3	0	0	3
Practicals							
3	20CE801L	Project Work	EEC	0	0	20	10
			Total	**6**	**0**	**20**	**16**

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PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical 1	Vertical 2	Vertical 3	Vertical 4	Vertical 5	Vertical 6	Vertical 7	Vertical 8	Vertical 9
Transportation & Infrastructure	**Water Resources and Management**	**Geotechnical**	**Environment**	**Structures**	**Geo - Informatics**	**Materials and Construction Techniques**	**Economy and Project Management**	**Diversified Courses**
Urban Planning and Development	Irrigation Engineering	Ground Improvement Techniques	Groundwater Engineering	Prefabricated Structures	Remote Sensing Essentials	Precast Technology in Building	Engineering Economics	Coastal Engineering
Pavement Engineering	Hydrology	Geo-Environmental Engineering	Irrigation and Environmental Engineering Design and Drawing	Advanced RC Design	Advanced Geomatics Engineering	Non Destructive Testing for Structural Engineering	Project Management	Fundamentals of Nanoscience
Traffic Engineering and Management	Coastal and Offshore Engineering	Rock Engineering	Air Pollution and Control Engineering	Advanced Steel Design	Total Station and GPS Surveying	Maintenance and Repair of Concrete Structures	Professional Ethics in Engineering	Quantitative and Reasoning Aptitude
Bridge Engineering	Water Resources Systems Engineering	Geosynthetics and Reinforced Soil Structures	Industrial Waste Management	Prestressed Concrete Structures	Satellite Image Processing	Modern Construction Materials	Total Quality Management	Admixtures and Special Concretes
Industrial Structures	Integrated Water Resources Management	Earth and Rockfill Dams	Municipal Solid Waste Management	Basic Structural Dynamics and Earthquake Engineering	Cartography and GIS	Formwork Engineering	Construction Planning and Scheduling	Integrated Waste Management for a Smart City
Retrofitting and Rehabilitation of Civil Infrastructure	Rural Water Resources Management	Marine Geotechnical Engineering	Environmental Remediation of Contaminated Sites	Fire Protection Services and Maintenance Management of Building	Photogrammetry	Energy Efficient Buildings	Safety and Risk Analytics	Ocean Wave Dynamics
Introduction to Multimodal Urban Transportation Systems	Microwave Remote Sensing in Hydrology	Tunneling Engineering	Environmental, Health and Safety	Design of Masonry Structures	Hydrographic Surveying	Sustainable Construction and Lean Construction	Leadership and Team Effectiveness	Coastal Zone Management and Remote Sensing

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Registration of Professional Elective Courses from Verticals:

- Professional Elective Courses will be registered in Semesters V to VIII. These courses are listed in groups called verticals that represent a particular area of specialization / diversified group. Students are permitted to choose all the Professional Electives from a particular vertical or from different verticals. Further, only one Professional Elective course shall be chosen in a semester horizontally (row-wise). However, two courses are permitted from the same row.
- The registration of courses for B.E./B.Tech (Honours) or Minor degree shall be done from Semester V to VIII. The procedure for registration of courses explained above shall be followed for the courses of B.E/B.Tech (Honours) or Minor degree also.

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PROFESSIONAL ELECTIVE COURSES: VERTICALS

Vertical 1: Transportation & Infrastructure

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE603PE	Urban Planning and Development	PEC	3	0	0	3
2	20CE706PE	Pavement Engineering	PEC	3	0	0	3
3	20CE707PE	Traffic Engineering and Management	PEC	3	0	0	3
4	20CE808PE	Bridge Engineering	PEC	3	0	0	3
5	20CE801PE	Industrial Structures	PEC	3	0	0	3
6	20CE712PE	Retrofitting and Rehabilitation of Civil Infrastructure	PEC	3	0	0	3
7	20CE713PE	Introduction to Multimodal Urban Transportation Systems	PEC	3	0	0	3

Vertical 2: Water Resources and Management

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE504PE	Irrigation Engineering	PEC	3	0	0	3
2	20CE506PE	Hydrology	PEC	3	0	0	3
3	20CE711PE	Coastal and Offshore Engineering	PEC	3	0	0	3
4	20CE802PE	Water Resources Systems Engineering	PEC	3	0	0	3
5	20CE809PE	Integrated Water Resources Management	PEC	3	0	0	3
6	20CE811PE	Rural Water Resources Management	PEC	3	0	0	3
7	20CE507PE	Microwave Remote Sensing in Hydrology	PEC	3	0	0	3

Vertical 3: Geotechnical

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE601PE	Ground Improvement Techniques	PEC	3	0	0	3
2	20CE605PE	Geo-Environmental Engineering	PEC	3	0	0	3
3	20CE602PE	Rock Engineering	PEC	3	0	0	3
4	20CE606PE	Geosynthetics and Reinforced Soil Structures	PEC	3	0	0	3
5	20CE607PE	Earth and Rockfill Dams	PEC	3	0	0	3
6	20CE608PE	Marine Geotechnical Engineering	PEC	3	0	0	3
7	20CE609PE	Tunneling Engineering	PEC	3	0	0	3

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Vertical 4: Environment

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE804PE	Groundwater Engineering	PEC	3	0	0	3
2	20CE709PE	Irrigation and Environmental Engineering Design and Drawing	PEC	3	0	0	3
3	20CE502PE	Air Pollution and Control Engineering	PEC	3	0	0	3
4	20CE501PE	Industrial Waste Management	PEC	3	0	0	3
5	20CE803PE	Municipal Solid Waste Management	PEC	3	0	0	3
6	20CE812PE	Environmental Remediation of Contaminated Sites	PEC	3	0	0	3
7	20CE813PE	Environmental, Health and Safety	PEC	3	0	0	3

Vertical 5: Structures

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE805PE	Prefabricated Structures	PEC	3	0	0	3
2	20CE604PE	Advanced RC Design	PEC	3	0	0	3
3	20CE701PE	Advanced Steel Design	PEC	3	0	0	3
4	20CE702PE	Prestressed Concrete Structures	PEC	3	0	0	3
5	20CE705PE	Basic Structural Dynamics and Earthquake Engineering	PEC	3	0	0	3
6	20CE708PE	Fire Protection Services and Maintenance Management of Building	PEC	3	0	0	3
7	20CE714PE	Design of Masonry Structures	PEC	3	0	0	3

Vertical 6: Geo - Informatics

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE505PE	Remote Sensing Essentials	PEC	3	0	0	3
2	20CE508PE	Advanced Geomatics Engineering	PEC	3	0	0	3
3	20CE509PE	Total Station and GPS Surveying	PEC	3	0	0	3
4	20CE510PE	Satellite Image Processing	PEC	3	0	0	3
5	20CE511PE	Cartography and GIS	PEC	3	0	0	3
6	20CE512PE	Photogrammetry	PEC	3	0	0	3
7	20CE513PE	Hydrographic Surveying	PEC	3	0	0	3

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Vertical 7: Materials and Construction Techniques

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE703PE	Precast Technology in Building	PEC	3	0	0	3
2	20CE503PE	Non Destructive Testing for Structural Engineering	PEC	3	0	0	3
3	20CE806PE	Maintenance and Repair of Concrete Structures	PEC	3	0	0	3
4	20CE704PE	Modern Construction Materials	PEC	3	0	0	3
5	20CE610PE	Formwork Engineering	PEC	3	0	0	3
6	20CE611PE	Energy Efficient Buildings	PEC	3	0	0	3
7	20CE612PE	Sustainable Construction and Lean Construction	PEC	3	0	0	3

Vertical 8: Economy and Project Management

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20MG802PE	Engineering Economics	PEC	3	0	0	3
2	20ME807PE	Project Management	PEC	3	0	0	3
3	20GE601	Professional Ethics in Engineering	PEC	3	0	0	3
4	20MG701	Total Quality Management	PEC	3	0	0	3
5	20CE810PE	Construction Planning and Scheduling	PEC	3	0	0	3
6	20CE814PE	Safety and Risk Analytics	PEC	3	0	0	3
7	20CE816PE	Leadership and Team Effectiveness	PEC	3	0	0	3

Vertical 9: Diversified Courses

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20CE807PE	Coastal Engineering	PEC	3	0	0	3
2	20CE710PE	Fundamentals of Nanoscience	PEC	3	0	0	3
3	20MA601PE	Quantitative and Reasoning Aptitude	PEC	3	0	0	3
4	20CE715PE	Admixtures and Special Concretes	PEC	3	0	0	3
5	20CE514PE	Integrated Waste Management for a Smart City	PEC	3	0	0	3
6	20CE716PE	Ocean Wave Dynamics	PEC	3	0	0	3
7	20CE815PE	Coastal Zone Management and Remote Sensing	PEC	3	0	0	3

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Open Elective Course (OEC)

(Students shall choose the open elective courses, such that the course contents are not similar to any other course contents/title under other course categories)

Semester VI

Open Elective - I

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20ME601OE	Production Technology	OEC	3	0	0	3
2	20ME602OE	Basics of Automotive Components	OEC	3	0	0	3
3	20EC503PE	Internet of Things	OEC	3	0	0	3
4	20EC501OE	Sensors and Transducers	OEC	3	0	0	3
5	20EE501OE	Non-Conventional Energy Resources	OEC	3	0	0	3
6	20EE502OE	Industrial Automation	OEC	3	0	0	3
7	20IT501OE	Fundamentals of Operating Systems	OEC	3	0	0	3
8	20IT502OE	Introduction to Database	OEC	3	0	0	3
9	20CS506OE	Fundamentals of Software Engineering	OEC	3	0	0	3
10	20CS507OE	Introduction to Data Structures and Algorithms	OEC	3	0	0	3
11	20BM501OE	Basics of Biomedical Instrumentation	OEC	3	0	0	3
12	20BM502OE	Introduction to Cell Biology	OEC	3	0	0	3

Semester VII

Open Elective - II

S. No	Course Code	Course Title	Course Category	No of Hours/Week			Credit
				L	T	P	
1	20ME701OE	Basics of Hydraulic and Pneumatic Systems	OEC	3	0	0	3
2	20ME702OE	Alternative Energy Fuels	OEC	3	0	0	3
3	20EC701OE	Consumer Electronics	OEC	3	0	0	3
4	20EC702OE	RFID and Flexible Sensors	OEC	3	0	0	3
5	20EE701OE	Energy Storage Systems	OEC	3	0	0	3
6	20EE702OE	Electrical Safety Engineering	OEC	3	0	0	3
7	20IT701OE	Programming in Java	OEC	3	0	0	3
8	20IT702OE	Web Design	OEC	3	0	0	3
9	20CS706OE	E-Commerce	OEC	3	0	0	3
10	20CS708OE	Introduction to Computer Organization	OEC	3	0	0	3
11	20BM701OE	Bioinformatics	OEC	3	0	0	3
12	20BM702OE	Fundamentals of Nutrition	OEC	3	0	0	3

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(Choice of courses for Minor degree is to be made from any one vertical of other programmes or from anyone of the following verticals)

VERTICAL 1: FINTECH AND BLOCK CHAIN

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	20M101	Financial Management	PEC	3	0	0	3
2	20M102	Fundamentals of Investment	PEC	3	0	0	3
3	20M103	Banking, Financial Services and Insurance	PEC	3	0	0	3
4	20M104	Introduction to Blockchain and its Applications	PEC	3	0	0	3
5	20M105	Fintech Personal Finance and Payments	PEC	3	0	0	3
6	20M106	Introduction to Fintech	PEC	3	0	0	3

VERTICAL 2: ENTREPRENEURSHIP

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	20M201	Foundations of Entrepreneurship	PEC	3	0	0	3
2	20M202	Team Building and Leadership Management for Business	PEC	3	0	0	3
3	20M203	Creativity and Innovation in Entrepreneurship	PEC	3	0	0	3
4	20M204	Principles of Marketing Management for Business	PEC	3	0	0	3
5	20M205	Human Resource Management for Entrepreneurs	PEC	3	0	0	3
6	20M206	Financing New Business Ventures	PEC	3	0	0	3

VERTICAL 3: PUBLIC ADMINISTRATION

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	20M301	Principles of Public Administration	PEC	3	0	0	3
2	20M302	Elements of Public Administration	PEC	3	0	0	3
3	20M303	Public Personnel Administration	PEC	3	0	0	3
4	20M304	Administrative Theories	PEC	3	0	0	3
5	20M305	Indian Administrative System	PEC	3	0	0	3

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6	20M306	Public Policy Administration	PEC	3	0	0	3

VERTICAL 4: BUSINESS DATA ANALYTICS

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	20M401	Statistics for Management	PEC	3	0	0	3
2	20M402	Data Mining for Business Intelligence	PEC	3	0	0	3
3	20M403	Human Resource Analytics	PEC	3	0	0	3
4	20M404	Marketing and Social Media Web Analytics	PEC	3	0	0	3
5	20M405	Operation and Supply Chain Analytics	PEC	3	0	0	3
6	20M406	Financial Analytics	PEC	3	0	0	3

VERTICAL 5: ENVIRONMENT AND SUSTAINABILITY

S.No.	Course Code	Course Title	Course Category	No. of Hours/Week			Credit
				L	T	P	
1	20M501	Sustainable Infrastructure Development	PEC	3	0	0	3
2	20M502	Sustainable Agriculture and Environmental Management	PEC	3	0	0	3
3	20M503	Sustainable Bio Materials	PEC	3	0	0	3
4	20M504	Materials for Energy Sustainability	PEC	3	0	0	3
5	20M505	Green Technology	PEC	3	0	0	3
6	20M506	Environmental Quality Monitoring and Analysis	PEC	3	0	0	3
7	20M507	Integrated Energy Planning for Sustainable Development	PEC	3	0	0	3
8	20M508	Energy Efficiency for Sustainable Development	PEC	3	0	0	3

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ENROLLMENT FOR B.E. / B. TECH. (HONOURS) / MINOR DEGREE (OPTIONAL)

- A student can also optionally register for additional courses (18 credits) and become eligible for the award of B.E. / B. Tech. (Honours) or Minor Degree.
- For B.E. / B. Tech. (Honours), a student shall register for the additional courses (18 credits) from semester V onwards. These courses shall be from the same vertical or a combination of different verticals of the same programme of study only.
- For minor degree, a student shall register for the additional courses (18 credits) from semester V onwards. All these courses have to be in a particular vertical from any one of the other programmes, Moreover, for minor degree the student can register for courses from any one of the following verticals also.

Vertical for Minor Degree

(In addition to all the verticals of other programmes)

Vertical 1	Vertical 2	Vertical 3	Vertical 4	Vertical 5
Fintech and Block Chain	**Entrepreneurship**	**Public Administration**	**Business Data Analytics**	**Environment and Sustainability**
Financial Management	Foundations of Entrepreneurship	Principles of Public Administration	Statistics for Management	Sustainable Infrastructure Development
Fundamentals of Investment	Team Building and Leadership Management for Business	Elements of Public Administration	Data Mining for Business Intelligence	Sustainable Agriculture and Environmental Management
Banking, Financial Services and Insurance	Creativity and Innovation in Entrepreneurship	Public Personnel Administration	Human Resource Analytics	Sustainable Bio Materials
Introduction to Blockchain and its Applications	Principles of Marketing Management for Business	Administrative Theories	Marketing and Social Media Web Analytics	Materials for Energy Sustainability
Fintech Personal Finance and Payments	Human Resource Management for Entrepreneurs	Indian Administrative System	Operation and Supply Chain Analytics	Green Technology
Introduction to Fintech	Financing New Business Ventures	Public Policy Administration	Financial Analytics	Environmental Quality Monitoring and Analysis
-	-	-	-	Integrated Energy Planning for Sustainable Development
-	-	-	-	Energy Efficiency for Sustainable Development

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SUMMARY

S No	Course Category	Credits As Per Semester								Total Credit	Percentage
		I	II	III	IV	V	VI	VII	VIII		
1.	HSMC	4	7	-	-	-	-	3	-	14	8.33
2.	BSC	11	7	4	4	-	-	-	-	26	15.48
3.	ESC	7	4	3	-	-	-	-	-	14	8.33
4.	EEC	1	1	1	1	1	2	1	10	18	10.71
5.	PCC	-	5	14	17	16	14	3	-	69	41.07
6.	PEC	-	-	-	-	3	3	6	6	18	10.71
7.	OEC	-	-	-	-	-	3	3	-	6	3.57
8.	MC	-	-	-	-	3	-	-	-	3	1.79
Total		23	24	22	22	23	22	16	16	168	100.00

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CIVIL

20EN101 **TECHNICAL ENGLISH-I**

(Common to all branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to,

- Enable learners develop basic communication skills in English.
- Enhance the speaking skills for academic, professional and social purposes.
- Enable learners make use of the electronic media such as internet and other online resources for their language development.
- Inculcate the habit of reading and writing for the purpose of effective communication.
- Develop confidence in learners to communicate in English for all purposes.

UNIT I SHARING INFORMATION 9

Listening: Intensive and Extensive Listening, Barriers to Effective Listening; Speaking: Descriptions, Reading: Skimming and Scanning, Writing: Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.), Grammar: Parts of speech, Vocabulary: Word formation.

UNIT II INTRODUCTION TO WRITING 9

Listening: Listening lectures/talks, Speaking: Telephonic interview, Reading: Inferring inferential and contextual meaning from literary texts, Writing: Biographical writing - Writing a paragraph (Cause and Effect/Compare and Contrast/Narrative/Analytical) - Writing a set of recommendations – Writing a set of instructions, Grammar: Prepositions - Active and Passive voice - Present Tense, Vocabulary: Confused Words.

UNIT III IMPROVING SPEAKING 9

Listening: Listening to talks by eminent personalities - Focused audio tracks, Speaking: Role Play - Simulation - Group Interaction, Reading: Reading magazines, Writing: Business Letter (Order/Acceptance), Grammar: Past tense - Tag Questions - Subject - Verb Agreement, Vocabulary: Learning Words in Situations.

UNIT IV READING SKILLS 9

Listening: Techniques for Effective Listening, Speaking: Speaking in job Interviews, Reading: Reading for factual and inferential meaning, Writing: Interpreting Visual Materials (Line Graphs, Pie Charts etc.), Grammar: Adverbs - Future Tense, Vocabulary: Single word substitutes.

UNIT V PRONUNCIATION 9

Listening: Understanding different Accents, Listening to Radio and TV and taking notes, Speaking: Giving impromptu talks- Making presentations, Reading: Practice in speed reading, Writing: Business Letter (enquiry/Rejection), Grammar: Direct and Indirect Speech, Vocabulary: Phrasal Verbs.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the student will be able to,

- Use suitable vocabulary with confidence and express their ideas both in speech and writing.
- Write intelligibly avoiding grammatical errors, using a range of vocabulary, organizing their ideas logically on a topic.
- Speak confidently, with one or many listeners using appropriate communicative strategies.
- Read different genres of texts adopting various reading strategies.
- Understand different spoken discourses/excerpts in different accents.

Text Book:

1. Sanjay Kumar and Pushp Lata, "Communication Skills", Oxford University Press, 2nd edition, 2015.

References:

1. P Kiranmai and Rajeevan Geeta, "Basic Communication Skills", Foundation Books, revised edition, 2013.
2. Redston, Chris & Gillies Cunningham, "Face2Face (Pre-Intermediate Student's Book & Workbook",Cambridge University Press, New Delhi, 2nd edition,2005.
3. Perumal, Lakshmana.N and Sathiseelan S, "Technical English-I", Sri Krishna Hitech Publishing Company Pvt.Ltd, Chennai: 2014.
4. Mohan, Krishna and Banerji Meera, "Developing Communication Skills", Macmillan Publishers India Ltd., Delhi, 2nd edition,2009.
5. Hewings, Martin. "Advanced English Grammar: A self study reference and Practice book for advanced South Asian students" Cambridge University Press, New Delhi, revised edition, 1999.

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20MA101	MATHEMATICS-I (COMMON TO ALL BRANCHES)	L T P C 3 1 0 4

OBJECTIVES:

The Student should be made to:

- Develop the use of matrix algebra technique for practical application
- Apply the properties of arithmetic and geometric in sequences and series
- Familiarize the students with differential calculus
- Familiarize the student with functions of several variables, this is needed in many branches of engineering
- Acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage

UNIT I MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II SEQUENCE AND SERIES **12**

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.

UNIT III DIFFERENTIAL CALCULUS **12**

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules – Maxima and Minima of functions of one variable – Local maximum and minimum – absolute minimum and absolute maximum – increasing and decreasing – Concavity and inflection points – Rolle's theorem and mean value theorem(excluding proofs).

UNIT IV FUNCTIONS OF SEVERAL VARIABLES **12**

Limits and Continuity – Partial derivatives – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS **12**

Double integrals in Cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves – Change of variables in double integrals – Triple integrals – Volume of Solids: Volume as triple integral – Cylindrical coordinates – Spherical coordinates

TOTAL: 60 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Eigen values and eigenvectors, Diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices
- Determining and describing the nth term of arithmetic and geometric sequences
- Apply differential calculus tools in solving various application problems
- Apply differentiation to solve maxima and minima problems
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables

TEXT BOOKS:

1. Grewal B S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2014.
2. Narayanan S and Manicavachagom Pillay T K, "Calculus", Volume I and II, S Viswanathan Publishers Pvt. Ltd., Chennai, 2009.

REFERENCES:

1. Dass H K and Er. Rajnish Verma, "Higher Engineering Mathematics", S Chand Private Ltd., 2011.
2. Bali N P and Manish Goyal, "A Text Book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd., 2011.
3. Peter V O'Neil, "Advanced Engineering Mathematics", Cengage Learning, 7th Edition, 2012.
4. Veerarajan T, "Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

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20PH101	ENGINEERING PHYSICS (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Describe the basics of crystal structures and their growth techniques
- Explain the elastic properties of materials
- Analyze heat transfer mechanisms and their applications
- Develop an understanding of quantum mechanical concepts and their applications
- Gain fundamental knowledge of laser action, their production and fiber optics

UNIT – I CRYSTAL PHYSICS **9**

Crystalline and Amorphous materials – Crystal systems, Bravais lattices, Miller indices – Interplanar distance – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Crystal growth techniques – solution, Melt (Bridgman and Czochralski methods)

UNIT – II PROPERTIES OF MATTER **9**

Elasticity – Stress–Strain diagram and its uses – Factors affecting elastic modulus – Twisting couple – Torsion pendulum: Theory and Experiment – Bending of beams – Bending moment – Cantilever: Theory and Experiment – Uniform and Non–Uniform bending: Theory and Experiment I–shaped girders and its application.

UNIT – III THERMAL PHYSICS **9**

Modes of heat transfer – Thermal capacity – Newton's law of cooling – Rectilinear heat flow – Thermal conductivity – Forbe's and Lee's disc method: Theory and Experiment – Radial flow of heat – Thermal conductivity of rubber tube – Heat conduction through compound media (Series and Parallel) – Solar power – Advantages – Solar water heater.

UNIT – IV QUANTUM PHYSICS **9**

Black body radiation – Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh – Jean's Law from Planck's theory – de-Broglie wavelength – Properties of Matter waves – Schrodinger's wave equation – Time independent and time dependent wave equations – Physical significance of wave function – Particle in a one dimensional box – Extension to 3D – Degeneracy – Electron Microscope – Scanning Electron Microscope.

UNIT – V LASER AND FIBER OPTICS **9**

Lasers: Principles of laser – Population inversion – Einstein's A and B coefficients–derivation – Modes of vibration in CO_2 molecules – CO_2 Laser – Nd–YAG Laser – Basic principles of a homojunction semiconductor Laser – Industrial and Medical applications of Laser – Fiber optics: principle, numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode) – Fiber optic communication system (Block diagram).

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify crystal structure types and describe their growth techniques
- Analyze the elastic properties of materials
- Evaluate the thermal properties of materials
- Explain basic quantum mechanical concepts and their applications
- Elucidate the basic concepts of lasers and their applications

TEXT BOOKS:

1. Pandey B K and Chaturvedi S, "Engineering Physics", Cengage Learning India Pvt. Ltd., Delhi, 2018.
2. Malik H K and Singh AK, "Engineering Physics" TMH, New Delhi, 2010.

REFERENCES:

1. Gaur R K and Gupta S L, "Engineering Physics", DhanpatRai Publications, New Delhi, 2014.
2. Marikani A, "Engineering Physics", PHI learning Pvt. Ltd. New Delhi, Second Edition, 2013.
3. Avadhanulu M N, "Engineering Physics", SChand and Company Ltd, New Delhi, First Edition, 2007.
4. Wahab M A, "Solid State Physics", Narosa Publishing House, New Delhi, 2nd Edition, 2005.

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BoS(S&H)

20CY101	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the characteristics of water & to know the various treatment methods for effective applications.
- Understand the concept of electrochemistry and corrosion prevention.
- Know the significance and properties of polymers.
- Know the fundamentals of phase rule and its applications and to analyse the principle and generation of energy in batteries and fuel cells.
- Evaluate types of fuels based on calorific values and to know the significance of solid, liquid and gaseous fuels.

UNIT I WATER TECHNOLOGY 9

Sources of water – Hard and soft water – Boiler feed water-requirements – disadvantages of using hard water in boilers (Scale- Sludge- Caustic Embrittlement - Priming - Foaming) – Estimation of hardness of water by EDTA method – Internal conditioning (Phosphate, Calgon, Colloidal and Carbonate conditioning methods) – External conditioning – Zeolite and demineralization process – desalination and reverse osmosis.

UNIT II ELECTROCHEMISTRY AND CORROSION 9

Electrochemistry – Nernst equation and its Applications – Electrochemical series – Corrosion – Types – Dry and Wet corrosion – Galvanic corrosion – Differential aeration corrosion – Pitting corrosion – Corrosion control – sacrificial anodic method and impressed current cathodic protection method – Protective coatings – Paints and its constituents.

UNIT III POLYMERS 9

Polymers – definition – Classification – addition – condensation polymerization and copolymerization – mechanism of polymerization – (cationic, Anionic and free Radical) – Plastics – classification – preparation, properties and uses of PVC, Teflon, Nylon-6,6 and Epoxy resin – Rubber – vulcanization of rubber – butyl rubber, Styrene Butadiene Rubber.

UNIT IV PHASE RULE AND STORAGE DEVICES 9

Phase Rule – Terms involved – One Component system (water system) – Two component system (Lead-Silver system) – Thermal analysis – Storage devices – Cell and a battery – Alkaline battery – Lead acid battery – Nickel-Cadmium battery and lithium battery – Fuel cells – Hydrogen – Oxygen fuel cell.

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UNIT V FUELS AND COMBUSTION 9

Fuels – Introduction – Classification of fuels – coal – Analysis of coal (proximate and ultimate) – Carbonization – Manufacture of metallurgical coke (Otto Hoffmann method) – Petroleum – Manufacture of synthetic petrol (Bergius process) – Knocking – Anti knocking – Octane number – Cetane number – Gaseous fuels – LPG, CNG – Combustion: Calorific value – higher and lower calorific values – Theoritical calculation of calorific value – Flue gas analysis (ORSAT Method).

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on the water quality parameters.
- Identify the solutions to prevent corrosion.
- Analyse the applications of polymers.
- Achieve the knowledge about types of phase diagram and storage devices.
- Evaluate the characteristics of various fuels.

TEXT BOOKS:

1. Jain P C and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing, Company. New Delhi, 2013.
2. Dara S S, "A Text Book of Engineering Chemistry", S Chand & Co Ltd., New Delhi, 2013.

REFERENCES:

1. Shika Agarwal, "Engineering Chemistry", Cambridge University Press., Delhi, 2015.
2. Sivasankar B, "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3. Palanna O G, "Engineering Chemistry" ,Tata Mc.Graw Hill Education Private Limited, New Delhi, 2011
4. Prasanta Rath, "Engineering Chemistry", Cengage Learning India Pvt. Ltd., Delhi, 2018.

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BoS (S&H)

24/6/24

20GE101	STRUCTURED PROGRAMMING USING C (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Know the fundamentals of Computer and Programming
- Choose appropriate programming constructs in C language
- Construct programs using array and pointer
- Write programs using string and function
- Develop programs using the concept of structure, union and files

UNIT I FUNDAMENTALS OF COMPUTER AND PROGRAMMING 9

Computer System – CPU – Memory Unit – Data Representation – Number System and Conversion – Programming Fundamentals – Program Development Life Cycle – Algorithm – Control Structures – Flowchart – Pseudocode – Programming Paradigms – Problem Formulation and Problem Solving.

UNIT II BASICS OF C PROGRAMMING 9

Overview of C – C Character Set – Identifiers and Keywords – Declaration – Data types – Type Qualifiers and Type Modifiers – Variables and Constants – Structure of a C Program – Executing a C Program – Operators and Expressions – Decision-Making and Looping Statements.

UNIT III ARRAYS AND POINTERS 8

Introduction to Arrays – Single Dimensional Arrays – Multidimensional Array – Pointers – void Pointer – Null Pointer – Relationship between Arrays and Pointers – Arrays of Pointers – Pointer to a Pointer – Pointer to an Array.

UNIT IV STRINGS AND FUNCTIONS 9

Strings – Character Arrays – Reading String input – String Library Functions – List of Strings – Command Line Arguments – Functions: Types – Declaration – Definition – Function Call – Pass by Value – Pass by Reference – Passing arrays to functions – Recursion – Pointer to function.

UNIT V STRUCTURE, UNION AND FILES 10

Structures – Pointers to Structures – Array of Structures – Structures within a Structure – Functions and Structures – typedef and Structures – Unions – Practical Applications of Unions – Enumerations – Bit fields – Storage Classes – C Preprocessor – Files: Streams – File type – File operations – Command line arguments.

TOTAL: 45 PERIODS

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BoS(IT)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the fundamentals of Computer and Programming
- Choose appropriate data types, variables and statements for solving simple problems
- Construct programs using arrays and pointers for a given scenario
- Write programs using strings and functions
- Develop programs using structure, union and files for a given scenario

TEXT BOOKS:

1. Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Pearson India Education Services Pvt. Ltd., 2016.

REFERENCES:

1. Ajay Mital, "Programming in C - A Practical Approach", Pearson Education, 2015.
2. Dromey R G, "How to Solve it by Computer", Pearson Education, Fifteenth Impression, 2014.
3. Herbert Schildt, "C - The Complete Reference", Tata McGraw-Hill, 2013
4. Ashok N Kamthane, "Computer Programming", Pearson Education, Second Edition, 2012.
5. Juneja B L and Anita Seth, "Programming in C", Cengage Learning India Pvt. Ltd., 2011

CHAIRMAN
BoS(IT)

24/6/22

20GE102	ENGINEERING GRAPHICS (COMMON TO ALL BRANCHES)	L	T	P	C
		2	0	2	3

OBJECTIVES:

The Student should be made to:

- Explain the students with various concepts like dimensioning, standards, curves and free hand sketching
- Impart knowledge on projection of points, lines and plane surfaces
- Improve the visualization skills for better understanding of projection of solids
- Develop the imaginative skills of the students required to understand section of solids and development of surfaces
- Make the students to understand the viewing perception of a solid object in Isometric and Perspective projections

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION) **2**

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREE HAND SKETCHING **9+6**

Curves used in engineering practices: Conics – Construction of ellipse, Parabola and hyperbola by eccentricity method – Construction of cycloid, epicycloid – Drawing of tangents and normal to the above curves.

Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views – Freehand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES **9+6**

Projection of points – Projection of straight lines (only First angle projections) inclined to both the principal planes – Determination of true length and true inclination by rotating line method – Projection of planes inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS **7+6**

Projection of simple solids like prisms, pyramids, cylinder, cone when the axis is inclined to one of the principal planes by rotating object method.

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UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **9+6**

Sectioning of solids: prisms, pyramids, cylinder, cone in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids: prisms, pyramids, cylinder and cone.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS **9+6**

Principles of isometric projection – isometric scale – isometric projections of simple solids and truncated solids: Prisms, pyramids, cylinder, cone – Perspective projection of simple solids: Prisms, pyramids and cylinder by visual ray method.

TOTAL: 75 (45+30) PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the concepts of dimensioning, standards, curves and free hand sketching objects
- Sketch the projection of points, straight lines and plane surfaces
- Understand the projection of solids in various positions
- Construct projection of solids and development of surfaces
- Draw isometric and perspective sections of simple solids

TEXT BOOKS:

1. Natarajan K V, "A Text Book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2018.
2. Venugopal K and Prabhu Raja V, "Engineering Graphics", New Age International Pvt. Limited, 2015.

REFERENCES:

1. Bhatt N D and Panchal V M, "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C M, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K R, "Engineering Drawing", Vol. I and II Combined, Subhas Stores, Bangalore, 2007.

Special points applicable to End Semester Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

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BoS (MECH)

20TA101 தமிழர் மரபு L T P C

(அனைத்து துறைகளுக்கும் பொதுவானது) 1 0 0 1

பாடத்தின் நோக்கங்கள்:

மாணவர்கள் கண்டிப்பாக அறிய வேண்டுவன

- மொழி மற்றும் இலக்கியங்களை மதிப்பிடுதல்
- பாறை மற்றும் நவீன ஓவியங்களை பகுப்பாய்தல்
- நாட்டுப்புற மற்றும் தற்காப்பு கலைகளை புரிந்து கொள்ளுதல்
- திணையில் தமிழர்களின் கருத்தை பயன்படுத்துதல்
- இந்திய கலாச்சாரத்தில் தமிழர்களின் பங்கினை நினைவு கூறுதல்

அலகு 1 மொழி மற்றும் இலக்கியம் 3

இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விளக்கியங்கள் - சங்க இலக்கியத்தின் சமய சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மை கருத்துக்கள் - தமிழ் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் - பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

அலகு 2 மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை –சிற்பக்கலை 3

நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக்கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

அலகு 3 நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3

தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

அலகு 4 தமிழர்களின் திணைக் கோட்பாடுகள் 3

தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக்கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.

அலகு 5 இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3

இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிற பகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப் படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.

TOTAL : 15 PERIODS

Chairman
BoS/S&H

பாடத்தின் முடிவுகள்:

பாடத்தின் முடிவில், மாணவர்கள் அறிந்து கொள்வன

- மொழி மற்றும் இலக்கியங்களைப் பற்றி அறிந்து கொள்கிறார்கள்
- பாறை மற்றும் நவீன ஓவியங்களை பற்றிய அறிவுகளை கற்கின்றனர்
- நாட்டுப்புற மற்றும் தற்காப்பு கலைகளை வளர்க்க முடிகிறது
- தினைக் கூறும் கருத்துக்களை அறிய முடிகிறது
- நமது இந்திய கலாச்சாரத்தை புரிந்து கொள்ள முடிகிறது

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே. கே. பிள்ளை– (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை –ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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20TA101	HERITAGE OF TAMILS (Common to all branches)	L T P C 1 0 0 1

Course Objectives:

Students should be made to

- Evaluate classical language and literature
- Analyze rock art paintings to modern art
- Understand folk and martial arts
- Apply the concept of thinai in Tamils
- Remembering the concept of Tamils to Indian culture

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry – Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam,Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL : 15 PERIODS

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Course Outcomes:

At the end of the course, Students will be able to

- Know the classical language and literature
- Gain knowledge about rock art paintings and modern arts
- Develop folk and martial arts
- Learn concept of Thinai
- Understand our Indian culture

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் – கே. கே. பிள்ளை– (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை –ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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24/6/24

20BS101L **PHYSICS AND CHEMISTRY LABORATORY (COMMON TO ALL BRANCHES)** **L T P C 0 0 2 1**

OBJECTIVES:

The student should be made to:

- Understand the characteristics of an engineering material
- Know the physical properties of matter
- Estimate types of ions in drinking water
- Analyze the characteristics of acids
- Know the conductivity of a solution

LIST OF THE EXPERIMENTS - PHYSICS - Any six experiments to be conducted

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young's modulus by non-uniform bending method
3. (a) Determination of wavelength and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
4. Determination of thermal conductivity of a bad conductor – Lee's Disc method.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method.
9. Determination of Coefficient of Viscosity of liquids by Poiseuille's method.

LIST OF THE EXPERIMENTS - CHEMISTRY – Any seven experiments to be conducted

1. Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of chloride content of water sample by Argentometric method.
4. Determination of strength of given hydrochloric acid using pH meter.
5. Determination of strength of acids in a mixture of acids using conductivity meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Conductometric titration of strong acid Vs strong base.
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Estimation of iron content of the water sample using spectrophotometer.
10. Determination of rate of corrosion by weight loss method.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze the characteristics of engineering materials.
- Find out the physical properties of matter.
- Assess the water quality parameter.
- Analyze the pH of aqueous solutions.
- Gain knowledge on chemical properties of liquids.

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20GE103L	STRUCTURED PROGRAMMING USING C LABORATORY (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Develop C programs using conditional and looping statements
- Understand the concept of functions, arrays and strings
- Learn to access memory using pointers
- Group different kinds of information related to a single entity
- Understand the manipulation of data in permanent storage

PRACTICAL SYLLABUS:

1. Programs using decision making statements.
2. Programs using looping statements.
3. Programs using user defined functions and recursive functions.
4. Programs using one dimensional and two dimensional arrays.
5. Solving problems using string functions.
6. Programs using pointers and dynamic memory allocation.
7. Programs using structures and unions.
8. Programs using pointers to structures and other data types.
9. Programs using text files.
10. Programs using binary files.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Implement C programs using control statements
- Write C programs using functions, arrays and strings
- Access data in memory using pointers
- Use structures and other user defined data structures to manipulate heterogeneous data
- Manipulate data stored on permanent storage

CHAIRMAN
BoS(IT)

20EEC101L	ENGLISH FOR EFFECTIVE COMMUNICATION (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Develop and understand verbal and non-verbal communication
- Acquire grammar for effective communication
- Enable learners express different functions using appropriate language
- Enable learners develop their ability to converse in different situations
- Impart skills in using English at workplace effectively

UNIT I UNDERSTANDING COMMUNICATION **6**

Role and Importance of Communication – Verbal and Non-verbal Communication – Barriers to Communication – Communication Mediums – Effective Communication – Group Communication.

UNIT II VOCABULARY AND GRAMMAR **6**

Aspects of vocabulary learning – Word formation – Sentence formation - Short forms of verbs - Common Grammatical Errors – Connective sentences - usage of Idioms and Phrases.

UNIT III EXPRESSING VARIED FUNCTION **6**

Introducing yourself – Greeting – Conversation between stranger – permission – opinion – information – Refusing – Agree/disagree – Apology – Praising – Requesting.

UNIT IV CONVERSATION LANGUAGE **6**

Understanding conversation – Chunking –Telling a story – Understanding public speech – Recognize Instructions – Persuasive Speech –Introduction to emphatic stress – Intensifying important words – Emphasizing corrections.

UNIT V CORPORATE COMMUNICATION **6**

Listening to Videos – Telephone and Email Etiquette – Extempore – Drafting and Delivering a Speech – Making Presentations – Group Discussion.

TOTAL: 30 PERIODS

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BoS (S&H)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Create a group and discuss efficiently in a group communication
- Understand the Sentence formation with proper Vocabulary
- Sort out the language functions to foster a good conversation
- Get the proper pronunciation and usage of language
- Build Communication at workplace in various situations

REFERENCES:

1. Hancock Mark, "English Pronunciation in Use: Intermediate", Cambridge University Press, New Delhi, 2009.
2. Cheepen Christine and James Monaghan, "Spoken English: A Practical Guide", London: Pinter, 1990.
3. Sasikumar V and Dhamija P V, "Spoken English-A Self-Learning Guide to Conversation Practice", TMH, 1995.
4. Singh Ashish, "How to Communicate Effectively", Patridge, New Delhi, 2014.
5. Wilkinson Andrew M, "Spoken English", Edgbaston: University of Birmingham, 1966.

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20EN201

TECHNICAL ENGLISH -II

(Common to all branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The students should be made to

- Improve the reading skills for the purpose of effective communication.
- Make learners acquire listening and speaking skills in both formal and informal contexts.
- Enable learners improve their reading skills from online sources.
- Equip the learners with writing skills needed for academic as well as work place.
- Help the learners improve language skills at their own pace by using the language lab.

UNIT I CONVERSATIONS 9

Listening: Barriers to Effective Listening- Listening to informal conversations, Speaking: Short conversations in varied situations in student life, Reading: Reading Short text and longer passages for comprehension at deeper levels, Writing: Writing reviews (book / film), Grammar: Compound Nouns - Numerical Expression, Vocabulary: Homonyms-Homophones.

UNIT II INFORMAL USE OF LANGUAGE 9

Listening: Listening to Situation based Dialogues, Speaking: Using dictionary for learning pronunciation, stress, and syllable divisions. Reading: Reading a short story for appreciation and understanding, Writing: Informal Letter writing- Dialogue writing Grammar: Definition - Purpose expressions- Relative Pronouns, Vocabulary: Technical Vocabulary - Count/Un count nouns.

UNIT III GENERAL READING 9

Listening: Listening strategies for deeper understanding, Speaking: Asking about Routine actions and giving directions, Reading: an article from Newspaper- Critical reading, Writing: Minutes of meeting - Essay writing, Grammar: Degrees of Comparison, Vocabulary: Collocations.

UNIT IV ENGLISH FOR CAREER 9

Listening: Listening strategies for Effective conversation, Speaking: Group Discussion skills, Reading: pre reading and post reading tasks, Writing: Applying for a Job - Cover Letter -Resume preparation, Grammar: Articles, Vocabulary: Synonyms and Antonyms.

UNIT V REPORT WRITING 9

Listening: Listening and making notes, Speaking: Discussion on problems and solutions, Reading: Reading Journal Articles, Writing: Types of Reports - Feasibility / Accident /Project Report, Grammar: If Clause, Vocabulary: Idioms and their Meanings.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Speak fluently, express their opinions clearly, initiate a discussion, negotiate, and argue using appropriate communicative strategies.
- Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.
- Read different genres of texts, infer implied meanings and critically analyze and evaluate them for ideas as well as for method of presentation.
- Make effective presentations using power point and participate successfully in Group Discussions.
- Write efficiently and persuasively and create different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.

Text Book:

1. Bhatnagar, Nitin and Bhatnagar, Mamta, "Communicative English for Engineering and Professionals", Pearson Education India, 2010.

References:

1. Raman, Meenakshi and Sharma, Sangeetha, "Technical Communication Principles and Practice", Oxford University Press: NewDelhi, 2014.
2. Andrea J, Rutherfoord. "Basic Communication Skills for Technology" Pearson Education, Inc., 2001.
3. Rizvi M, Ashraf. "Effective Technical Communication "Tata McGraw Hill Education Pvt.Ltd., NewDelhi,2005.
4. Perumal, Lakshmana.N and Sathiseelan S, "Technical English-II", Sri Krishna Hitech Publishing Company Pvt.Ltd,Chennai, 2014.

Chairman
BoS/S&H

20MA201	MATHEMATICS-II (COMMON TO ALL BRANCHES)	L T P C 3 1 0 4

OBJECTIVES:

The student should be made to:

- Make the student acquire sound knowledge of techniques in solving ordinary differential equations obtained from engineering problems
- Acquaint the student with the concepts of vector calculus that is needed for problems in engineering disciplines
- Understand the Analytic Functions can be widely used for modelling the various laws of physics
- Familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- Make the student for appreciating the purpose of using transforms to create a new domain in which it is earlier to handle the problem that is being investigated

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients $(e^{ax}V, x^nV)$ – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS 12

Gradient, Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration: line integral – surface integral – Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs)

UNIT III ANALYTIC FUNCTIONS 12

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping $(w = z^2, z + k, 1/z, kz)$ and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor's and Laurent's series expansions – Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

UNIT V LAPLACE TRANSFORM 12

Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems – Transforms of derivatives and integrals – Initial and final value theorems – Transform of periodic functions – Inverse transforms – Convolution theorem – Solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

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BoS (S&H)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply various methods of solving differential equation which arise in many application problems
- Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals
- Examine analytic functions and its properties, conformal mapping and its applications
- Evaluate real and complex integrals using the Cauchy's integral formula and residue theorem
- Use knowledge of Laplace transform and its properties, inverse Laplace transform to solve linear differential equations

TEXT BOOKS:

1. Grewal B S, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2014.
2. Bali N P and Manish Goyal, "A Text Book of Engineering Mathematics", Eighth Edition, Laxmi Publications Pvt Ltd., 2011.

REFERENCES:

1. Dass H K and Er. Rajnish Verma, "Higher Engineering Mathematics", S Chand Private Ltd., 2011.
2. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education, 3rd Edition, 2012.
3. Jain R K and Iyengar S R K, "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
4. Veerarajan T, "Engineering Mathematics", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

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BoS (S&H)

24/6/21

20PH202	MATERIALS SCIENCE (COMMON TO CIVIL AND MECHANICAL)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Apply classical and quantum theories to explain properties of conductors and semiconductors
- Study the properties of dielectric materials and their applications
- Explain the magnetic and superconducting properties of materials
- Draw phase diagrams and apply them to different systems
- Describe the behaviour of new engineering materials

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 9

Classical free electron theory – Expression for electrical conductivity and Thermal conductivity expression of metals – Wiedemann-Franz law – Success and failures of CFT – Quantum free electron theory – Energy bands in solids – conductors-Insulators and semiconductors – Intrinsic semiconductors – Carrier concentration in intrinsic semiconductors – Extrinsic semiconductors – Carrier concentration in *n*–type & *p*–type semiconductors.

UNIT II DIELECTRIC MATERIALS 9

Dielectric materials – Polarization – Electronic polarization – Ionic polarization – Orientation polarization – Space charge polarization – Langevin-Debye equation – Temperature and Frequency effects on polarization – Internal field – Clausius Mosotti relation – Dielectric breakdown – Dielectric loss – Ferroelectric materials – Uses of dielectric materials.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of Magnetic moment – Bohr Magneton – Classification of magnetic materials – Ferromagnetism – Domain theory – Hysteresis – Hard and Soft magnetic materials and its applications – Superconducting materials and their properties – Type-I and Type-II superconductors – BCS theory of superconductors – Applications of superconductors – High temperature superconductor (Qualitative).

UNIT IV PHASE DIAGRAMS 9

Solid solutions – Hume Rothery's rules – the phase rule – One–component system of iron – Binary phase diagrams – Isomorphous systems – the tie–line rule – the lever rule – application to isomorphous system – Iron-Carbon equilibrium diagram – Phase transformations – T-T-T diagram – Pearlitic, Baintic and Martensitic transformations.

UNIT V NEW MATERIALS 9

Ceramics-types and applications – Composites: Classification, role of matrix and reinforcement, processing of fiber reinforced plastics – Metallic glasses – Melt spinning process – Applications – Shape Memory Alloys: phases, Shape Memory Effect, Pseudoelastic effect – Applications – Synthesis of nanomaterials – Top down approaches (Ball Milling) and Bottom up approaches (CVD).

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the electrical properties of materials
- Describe the properties of dielectric materials and their applications
- Apply the knowledge on magnetic and superconducting properties to engineering applications
- Analyze various phase diagrams and their applications
- Gain knowledge on ceramics, composites and various engineering materials

TEXT BOOKS:

1. Rajendran V, "Materials Science", TMH, New Delhi, 2011.
2. Marikani A, "Engineering Physics", PHI Learning Pvt. Ltd. New Delhi, 2nd Edition, 2013.
3. Uapadhyaya G S and Anish Uapadhyaya, "Materials Science and Engineering", Viva Books Pvt. Ltd., New Delhi, 2006.

REFERENCES:

1. Balasubramanian R and Callister's, "Materials Science and Engineering", Wiley India Pvt. Ltd., 2014.
2. Raghavan V, "Materials Science and Engineering, A First Course", PHI Learning, 2015.
3. Wahab M A, "Solid State Physics", Narosa Publishing House, New Delhi, 2nd Edition, 2005.
4. Salivahanan S, Rajalakshmi A, Karthie S and Rajesh N P, "Physics for Electronics Engineering and Information Science ", McGraw Hill Education, 2018.

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BoS (S&H)

20/6/24

20BS201	ENVIRONMENTAL SCIENCE (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Study the interrelationship between living organism and environment
- Understand and tackle the impacts of pollution.
- Attain sustainable development by conserving natural resources.
- Find and implement scientific, technological, economic and political solutions to environmental problems
- Analyze the problems faced by the over population.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 9

Definition, scope and importance of environment – concept of an ecosystem – structure and function of an ecosystem – Ecological succession – food chain – food web – structure and function of the (a) forest ecosystem (b) desert ecosystem (c) aquatic ecosystem – (pond and ocean) – Biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Endangered, Extinct and Endemic species – conservation of biodiversity: In-situ and ex-situ methods.

UNIT II ENVIRONMENTAL POLLUTION 9

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Marine pollution (d) Noise pollution (e) Thermal pollution (f) Nuclear hazards- solid waste Management – role of an individual in prevention of pollution – disaster management: floods, earthquake, cyclone and landslides.

UNIT III NATURAL RESOURCES 9

Forest resources: deforestation – mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water – dams-benefits and problems – Mineral resources: environmental effects of extracting and using mineral resources – Food resources: World food problems – Effects of modern agriculture – fertilizer-pesticide problems, water logging, salinity – Energy resources: renewable and non-renewable energy sources (Solar, wind, Coal, Petrol, Nuclear) Land resource: land degradation, Soil erosion and desertification – role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

Sustainable development – Water conservation – rain water harvesting – resettlement and rehabilitation of people; its problems and concerns – environmental ethics – global warming – acid rain , ozone layer depletion – wasteland reclamation – consumerism – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – Role of NGO's in environmental protection.

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UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Acquire knowledge on public awareness & about the environment & ecosystem.
- Able to identify the impacts of pollution.
- Frame solutions to achieve sustainable development.
- Able to analyze about the social issues in the environment.
- Apply the acquired knowledge to tackle the problems of over population.

TEXT BOOKS:

1. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.

REFERENCES:

1. Tyler Miller G and Scott Spoolman, "Introduction to Environmental Science", Cengage Learning India Pvt., Ltd., 2009.
2. Dharmendra S Sengar, "Environmental Law", Prentice hall of India Pvt Ltd, New Delhi, 2007

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BoS (S&H)

24/6/24

20BE201	ENGINEERING MECHANICS (COMMON TO CIVIL AND MECHANICAL)	L	T	P	C
		3	1	0	4

OBJECTIVES:

The students should be made to:

- Understand the basic concepts of forces and moments
- Gain knowledge to predict the forces involved in various rigid bodies
- Impart analytical skills to solve problems related to first and second moment of area
- Develop capacity to analyze the various frictional forces
- Analyze different types of motion in particles

UNIT I EQUILIBRIUM OF PARTICLES **12**

Introduction – Units and dimensions – Laws of mechanics –Lami's theorem, Parallelogram and triangular law of forces –Vectorial representation of forces and moments – Coplanar forces – Resolution and composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility.

UNIT II EQUILIBRIUM OF RIGID BODIES **12**

Free body diagram – Types of supports and their reactions – Moments and couples – Moment of a force about a point and about an axis –Vectorial representation of moments and couples – Scalar components of a moment –Varignon's theorem – Equilibrium of rigid bodies in two dimensions.

UNIT III PROPERTIES OF SURFACES **12**

Centroid – First moment of area and second moments of plane area of sections – Rectangle, circle, triangle from integration – T section and I section – Parallel axis theorem and perpendicular axis theorem.

UNIT IV FRICTION **12**

Frictional force – Laws of coulomb friction – Simple contact friction – Rolling resistance – Belt friction and ladder friction.

UNIT V DYNAMICS OF PARTICLES **12**

Displacements, velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton's law – Work energy equation of particles – Impulse and momentum – Translation and rotation of rigid Bodies – General plane motion of simple rigid bodies such as cylinder and sphere.

TOTAL: 60 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Illustrate vector representation of forces and moments
- Evaluate rigid bodies in equilibrium
- Analyze various properties of surfaces
- Determine various frictional forces applying laws of friction
- Solve dynamic forces and its effects

TEXT BOOKS:

1. Hibbeller R C, "Engineering Mechanics and Dynamics", Vol 1 Statics, Vol 2 Dynamics, Pearson Education Asia Pvt. Ltd., 14th Edition, 2016.
2. Ferdinand P Beer, Russell Johnston E, DevaidMazurek, Phillip J Cornwell, Brain Self and SanjeevSanghi, "Vector Mechanics for Engineers Statics and Dynamics", McGrawHill International,12th Edition, 2019.

REFERENCE BOOKS:

1. Parthasarathi NS and Vela Murali, "Engineering Mechanics", Oxford University Press, 2016.
2. Palanichamy M S, Nagan S, "Engineering Mechanics - Statics and Dynamics", Tata McGraw Hill, 3rd Edition, 2006.
3. Irving H Shames and Krishna MohanaRao G, "Engineering Mechanics - Statics and Dynamics", Pearson Education, 4th Edition, 2006.
4. Meriam JL, Kraige L G and Bolton J N, "Engineering Mechanics: Statics",John Wiley and Sons, 9th Edition, 2018.
5. Meriam J L, Kraige L G and Bolton J N, "Engineering Mechanics: Dynamics", Vol. 2 John Wiley and Sons, 9th Edition, 2018.

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20BE202	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (COMMON TO AGE AND CIVIL)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Explain the basic knowledge about laws used in electrical circuits
- Understand the modeling and operation of electrical machines
- Learn the principles and operation of measuring instruments and transducers
- Introduce the basic concepts of semiconductor devices
- Impart knowledge of various communication systems

UNIT I FUNDAMENTALS OF ELECTRICITY AND DC CIRCUITS 9

Introduction – Definition, symbol and unit of quantities – Ohm's law – Network terminology – Kirchhoff's law – Resistance in series and voltage division technique – Resistance in parallel and current division technique – Loop analysis – Nodal analysis – Star to delta and delta to star transformation.

UNIT II ELECTRICAL MACHINES 9

DC Machines: Principle, construction, EMF equation, types – Characteristics of DC motor.
AC Machines: Construction and working principle of transformer – Construction, working of three phase induction motor – Construction and types of single phase induction motors.

UNIT III ELECTRICAL MEASUREMENTS 9

Classification of instruments – Basic principle of indicating instruments – Moving iron instruments – Moving coil instruments – Energy meter – Watt meter – Classification of transducer, Capacitive and inductive transducer – LVDT – Hall effect – Piezoelectric transducer.

UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS 9

Introduction to semiconductors – PN junction diode, Zener diode and its characteristics – Half wave and full wave rectifiers. Bipolar Junction Transistor – CB, CE, CC configurations and characteristics. Power conditioning equipments: Linear mode power supply, SMPS and UPS. Display devices: LED and LCD.

UNIT V COMMUNICATION SYSTEMS 9

Introduction – Communication systems – Analog and digital signals. Basic principles of modulation: Amplitude Modulation, Frequency Modulation. Communication systems: Microwave Communication – Satellite Communication – Optical fibre communication – ISDN(Block diagram approach only).

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the fundamentals of electric circuits
- Explain the basic operation and performance of electrical machines
- Illustrate the working of measuring equipment and transducers
- Develop an electronic circuits using semiconductor devices
- Analyze the various communication systems

TEXT BOOK:

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical Electronics and Computer Science Engineering", 3rd reprint, The McGraw Hill, 2009.

REFERENCES:

1. Theraja B L, "Fundamentals of Electrical Engineering and Electronics". Chand & Co, 2008.
2. Sukhija M S and Nagsarkar T K, "Basic Electrical and Electronic Engineering", 3rd Edition, Oxford, 2017.
3. Mehta V K, "Principles of Electronics", 7th Edition, S.Chand & Company Ltd, 2014.

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20TA201	தமிழரும் தொழில்நுட்பமும் (அனைத்து துறைகளுக்கும் பொதுவானது)	L T P C 1 0 0 1

பாடத்தின் நோக்கம்

மாணவர்கள் கண்டிப்பாக அறிய வேண்டுவன

- நெசவு மற்றும் பீங்கான் தொழில்நுட்பம் பற்றிய அறிவைப் பெறுதல்
- வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பத்தை உருவாக்குதல்
- உற்பத்தி தொழில்நுட்பத்தை பகுப்பாய்வு செய்தல்
- விவசாயம் மற்றும் நீர்ப்பாசனத் தொழில்நுட்பத்தைப் பயன்படுத்துதல்
- அறிவியல் மற்றும் அறிவியல் தமிழ் மற்றும் தமிழ் கணிப்பொறியை நினைவுபடுத்துதல்

அலகு 1 நெசவு மற்றும் பானை தொழில் நுட்பம் 3

சங்க காலத்தில் நெசவுத்தொழில் – பானை தொழில் நுட்பம் – கருப்பு, சிவப்பு பாண்டங்கள் – பாண்டுகளில் கீறல் குறியீடுகள்.

அலகு 2 வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம் 3

சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு – சங்க காலத்தில் கட்டுமான பொருட்களும் நடுக்கல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் – சோழர் காலத்து பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் நாயக்கர் கால கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் – செட்டிநாட்டு வீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ – சாரோசெனிக் கட்டிடக்கலை.

அலகு 3 உற்பத்தித் தொழில்நுட்பம் 3

கப்பல் கட்டும் கலை – உலோகவியல் – இரும்பு தொழிற்சாலை – இரும்பை உருக்குதல், எஃகு – வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடிகள் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண் மணிகள் – சங்கு மணிகள் – எலும்பு துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு 4 வேளாண்மை மற்றும் நீர்ப்பாசன தொழில்நுட்பம் 3

அணை, குளங்கள், மதகு – சோழர்கால குமுளி தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்து குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார் சமூகம்.

அலகு 5 அறிவியல் தமிழ் மற்றும் கணித்தமிழ் 3

அறிவியல் தமிழின் வளர்ச்சி – கணித்தமிழ் வளர்ச்சி – தமிழ் நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மென்பொருட்கள் உருவாக்கம் – தமிழ் இணையக் கல்விக் கழகம் – தமிழ் மின் நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

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பாடத்தின் முடிவுகள்:

பாடத்தின் முடிவில், மாணவர்கள் அறிந்து கொள்வன

- பீங்கான் மற்றும் நெசவு தொழில்நுட்பத்தை புரிந்துகொள்வது
- புதிய வடிவமைப்பு மற்றும் கட்டுமான தொழில்நுட்பத்தை உருவாக்குதல்
- உற்பத்தித் தொழில்நுட்பத்தை அடையாளம் காணுதல்
- விவசாயம் மற்றும் நீர்ப்பாசனம் பற்றிய புரிதல்
- அறிவியல் தமிழ் மற்றும் தமிழ் கணினி பற்றிய அறிவு

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் – கே. கே. பிள்ளை– (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை –ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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20TA201	TAMILS AND TECHNOLOGY (Common to all branches)	L T P C 1 0 0 1

Course Objectives:

Students should be made to

- Gain knowledge about weaving and ceramic technology
- Creating a design and construction technology
- Analyzing manufacturing technology
- Applying agriculture and irrigation technology
- Remembering scientific and scientific Tamil and Tamil computing

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo -Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing Knowledge of Sea - Fisheries– Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL : 15 PERIODS

Course Outcomes:

At the end of the Course, Students will be able to

- Understand weaving under ceramic technology
- Develop new design and construction technology
- Identify the manufacturing technology
- Understand agriculture and irrigation
- Knowledge of scientific Tamil and Tamil computing

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TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு - மக்களும் பண்பாடும் – கே. கே. பிள்ளை– (வெளியீடு : தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் - முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை –ஆற்றங்கரை நாகரீகம். (தொல்லியல் துறை வெளியீடு).
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by:International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by : International Institute of Tamil Studies.)
9. Keeladi – 'Sangam City Civilization on the banks of the river Vaigai' (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
10. Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamilnadu Textbook and Educational Services Corporation, Tamilnadu.)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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20GE201L	ENGINEERING PRACTICES LABORATORY (COMMON TO ALL BRANCHES)	L	T	P	C
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OBJECTIVES:

The student should be made to:

- Access the areas of knowledge in application criteria's for plumbing, carpentry through practical manner
- Develop the engineering basis work in welding, machining and sheet metal works
- Make the specified skills in foundry, smithy and fitting operations
- Study the various basic domestic wiring circuits and measure the electrical parameters
- Impart the knowledge of basic electronic components and assemble simple electronic circuits in printed circuit boards

GROUP A (CIVIL AND MECHANICAL)

I. CIVIL ENGINEERING PRACTICE **5**

1. Buildings
   (a) Study of plumbing and carpentry components of residential and industrial buildings, Safety aspects.
2. Plumbing Works
   (a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
   (b) Study of pipe connections requirements for pumps and turbines.
   (c) Preparation of plumbing line sketches for water supply and sewage works.
   (d) Hands-on-exercise:
      (i) Basic pipe connections - Mixed pipe material connection - Pipe connections with different joining components.
      (ii) Demonstration of plumbing requirements of high-rise buildings.
3. Carpentry using Power Tools only
   (a) Study of the joints in roofs, doors, windows and furniture.
   (b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

II. MECHANICAL ENGINEERING PRACTICE **10**

1. Welding:
   (a) Arc Welding
      (i) Butt joints.
      (ii) Lap joints.
      (iii) T-joints.
   (b) Gas welding practice.
2. Basic Machining
   (a) Simple Turning, Facing.
   (b) Drilling Practice.
3. Sheet Metal Work
   (a) Model making-Cylinder, Funnel and Tray.
   (b) Different type of joints.

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4 Machine assembly practice:
(a) Study of Centrifugal pump
(b) Study of Air conditioner
5. Demonstration on:
(a) Smithy operations, upsetting, swaging, setting down and bending.
Example: Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley
(c) Fitting – Exercises – Preparation of square fitting and V-fitting models.

GROUP B (ELECTRICAL AND ELECTRONICS)

III. ELECTRICAL ENGINEERING PRACTICE **10**

1. a) Residential house wiring using switches, fuse, indicator, lamp and Energy meter.
b) Study of different type of electrical wiring joints systems.
c) Stair case wiring.
2. Industrial wiring using switches, fuse, indicator and Energy meter.
3. Measurement of electrical quantities - voltage, current, power & power factor in RLC circuit.
4. Measurement of energy using single phase energy meter.
5. Measurement of earth resistance using Megger.
6. Assembling of ceiling fan.

IV. ELECTRONICS ENGINEERING PRACTICE **5**

1. Study of Electronic components and equipments – Resistor colour coding, measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.
2. Study of logic gates AND, OR, NOT, NAND and NOR.
3. Soldering practice - Components Devices and Circuits - Using general purpose PCB.
4. Design of HWR and FWR.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the tasks of work in plumbing and carpentry in application areas regard to pipeline joints, household fittings, water supply and sewage works, joints in roofs, doors, windows and furniture
- Analyze the engineering knowledge through welding, sheet metal forming, bending and basic machining operations
- Understand the assembly works on study of pump, Air conditioner and demonstration works on Smithy, foundry and fitting operation
- Understand the basic domestic wiring circuits and measure the various electrical parameters
- Analyse the basic concept of digital circuits and assemble electronic circuits

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24/6/21

20CE201L BUILDING DRAFTING AND MODELING LABORATORY (FOR CIVIL BRANCH ONLY) **L T P C 0 0 2 1**

OBJECTIVES:

The students should be made to:

- Understand software knowledge required for drafting and modeling of various buildings
- Explain drafting plan, elevation and sectional views of buildings
- Analyze drafting of roofed structures and load bearing wall structures
- Evaluate plan, elevation and sectional views of industrial buildings
- Create various joinery details of residential buildings using AutoCAD commands

LIST OF THE EXPERIMENTS

1. Symbols and sign conventions related to buildings and architecture - Structure types - Components of a typical residential building - Developing plan, section and elevation of buildings.
2. Principles of planning, orientation and complete joinery details (Paneled and Glazed doors and windows) buildings with sloping roof.
3. R.C.C. framed structures.
4. Industrial buildings - North light roof structures.
5. Single storied residential building.
6. Buildings with load bearing walls.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Develop 2D and 3D views of buildings
- Model different views of components of residential buildings
- Assess various roof structures using suitable commands
- Construct all views of industrial buildings
- Analyze plan, section and elevation of buildings with sloped roof structures

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24/6/24

20EEC201L **SOFT SKILLS** **L T P C**
(COMMON TO ALL BRANCHES) **0 0 2 1**

OBJECTIVES:

The student should be made to:

- Develop in learners a deep sense of self- esteem
- Enhance learners' self-motivation
- Impart leadership skills
- Help learners enhance critical, creative and analytical skills
- Felicitate learners acquire problem solving skills

UNIT I IDENTITY CONSTRUCTION **6**

Identity formation – Theories of moral Development(Kohlberg) – Cultural heritage – Physical appearance – Problem of Identity Correspondence –Self acceptance– Knowing oneself – Self-confidence –Positive thinking – Self-development – Perception, attitude and Behavioural change, Personality development – Self-esteem.

UNIT II MOTIVATION AND MORALE **6**

Definition – types (Intrinsic and Extrinsic) – Theories (Maslow's hierarchical needs) – Factors that affect motivation – Motivational strategies – Motivational plan – Interruption and Distractions – Motivation in the Business World.

UNIT III PROFESSIONAL THEORIES **6**

Communication – Functions of leadership – Work pressure handling – Creative and critical thinking – Career planning and management – Emotional intelligence – Time management – Negotiation – Conflict management

UNIT IV APPLICATION SKILLS **6**

Visionary thinking – formulating strategies – shaping strategies – building organizations relationships – change management – Project Management Skills – Independent working skills - Writing skills – Public Speaking –Analytical skills – Neo Research and Development.

UNIT V PROBLEM SOLVING SKILLS **6**

Problem solving approaches and its components – Teamwork – Innovative and creative thinking– Tools and Techniques – Application of SMART analysis – Adaptability and flexibility– Decision making.

TOTAL: 30 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Know the detail information of individuals
- Increase the self-confidence and develop the moral identity
- Accumulate the learner's career building skills
- Improve professional and life skills
- Engage the imagination to explore new possibilities, Formulate and articulate ideas.

REFERENCES:

1. Covey Sean, "Seven Habits of Highly Effective Teens", New York, Fireside Publishers, 1998.
2. Thomas A Harris, "I am Ok, You Are Ok", Harper and Row,New York, 1972.
3. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.

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20MA302 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

(Common to AG, BME, CIVIL, ECE, EEE & MECH) **L T P C**

3 1 0 4

OBJECTIVES:

The student should be made to,

- Introduce the basic concepts of PDE for solving standard partial differential equations.
- Introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- Acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- Acquaint the student with Fourier transform techniques used in wide variety of situations.
- Introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS **12**

Formation of partial differential equations –Singular integrals -Solutions of standard types of first order partial differential equations -Lagrange's linear equation -Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES **12**

Dirichlet's conditions –General Fourier series –Odd and even functions –Half range sine series –Half range cosine series –Complex form of Fourier series –Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS **12**

Classification of PDE –Method of separation of variables -Fourier Series Solutions of one dimensional wave equation –One dimensional equation of heat conduction –Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS **12**

Statement of Fourier integral theorem –Fourier transform pair –Fourier sine and cosine transforms –Properties –Transforms of simple functions –Convolution theorem –Parseval's identity.

UNIT V Z -TRANSFORMS AND DIFFERENCE EQUATIONS **12**

Z-transforms -Elementary properties –Inverse Z-transform (using partial fraction and residues) –Initial and final value theorems -Convolution theorem -Formation of difference equations–Solution of difference equations using Z-transform.

TOTAL: 60 PERIODS

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OUTCOMES:

On successful completion of this course, the student will be able to,

- Understand how to solve the given standard partial differential equations.
- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

Text Books:

1. Grewal B.S.,"Higher Engineering Mathematics",Khanna Publishers, New Delhi, 43rd edition, 2014.
2. Narayanan S.,Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", S.Viswanathan Publishers Pvt. Ltd, Chennai, Vol. II & III. 1998.

References:

1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematics", Laxmi Publications Pvt. Ltd, 9th edition, 2014.
2. Erwin Kreyszig, "Advanced Engineering Mathematics ",John Wiley, India, 10th edition, 2016.
3. James. G., "Advanced Modern Engineering Mathematics", Pearson Education, 3rd edition, 2007.
4. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 11th edition, 2015.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, New Delhi, 6th edition, 2012.

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20CE301	STRENGTH OF MATERIALS-I	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand state of stresses and strains in structural components as aresult of different loading conditions
- Provide knowledge on shear force and bending moment for all statically determinate beams by recognizing the beam type and its loadings
- Determine the concepts of internal stress in beams of various cross sections
- Analyze elements under complex state of stress by means of analytical and graphical methods
- Develop knowledge on behavior of members subjected to pure torsion and shear

UNIT I TENSION, COMPRESSION AND SHEAR 9

Introduction – Normal stress and strain – Hooke's law – Poisson's ratio – Shear stress and strain – Deformation of axially loaded member– Elastic constants– Thermal stresses and composite bars.

UNIT II SHEAR FORCE AND BENDING MOMENT 9

Introduction –Types of beams, loads and reactions – Shear force and bending moment for statically determinate beams –Relationships between load, shear force and bending moment – Shear force and bending moment diagrams.

UNIT III STRESSES IN BEAMS 9

Introduction – Pure bending and non-uniform bending – Longitudinal strains in beams – Normal stresses in beams – Stress distribution due to bending moment – Shear stresses in beams of rectangular, circular, T and I section.

UNIT IV PRINCIPAL STRESS AND STRAIN 9

Principal stresses and principal planes – Maximum shear stress –Plane strain – State of stress in two dimensions – Stresses on inclined planes –Maximum shear stress – Mohr's circle method.

UNIT V TORSION OF SHAFTS AND SPRING 9

Theory of torsion –Stresses and deformations in solid and hollow circular shafts –Combined bending moment and torsion of shafts – Power transmitted to shaft – Shaft in series and parallel – Closed and open coiled helical springs – Springs in series and parallel.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Realize the state of stresses and strains in structural components under tension,compression and shear
- Plot the shear force and bending moment diagrams for all statically determinatebeams
- Analyze the internal stresses induced in beams
- Evaluate the elements subjected to complex state of stress by means of analytical andgraphical methods
- Comprehend the behavior of members under pure torsion and shear

TEXT BOOKS:

1. Rajput R K, "Strength of Materials", S Chand and Co, New Delhi, 2018.
2. Bansal RK, "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi,2019.

REFERENCE BOOKS:

1. Punmia B C, Ashok Kumar Jain and Arun Kumar Jain, "SMTS - I Strength of Materials",LaxmiPublications, New Delhi,2015.
2. Singh DK, "Strength of Materials", Ane Books Pvt. Ltd., New Delhi. 2016..

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24/6/24

20CE302 **MECHANICS OF FLUIDS** **L T P C**
3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand the basic properties and characteristics of fluids
- Develop knowledge on fluid kinematics and fluid dynamics
- Determine the complexities involved in solving the fluid flow problems
- Illustrate the basic concepts of flow through pipes
- Analyze the boundary layer problems

UNIT I FLUID PROPERTIES AND STATICS **9**

Fluid – Definition, fluid statics concept of fluid static pressure, absolute and gauge pressures – Properties of fluids – Density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, capillarity and surface tension – Pressure measurements by manometers–Forces on planes – Centre of pressure –Hydrostatic forces on submerged bodies, buoyancy, flotation and stability.

UNIT II FLUID KINEMATICS AND DYNAMICS **9**

Fluid Kinematics – Classification and types of flow – Velocity field and acceleration –Continuity equation, derivation and applications to one dimensional flow (one and three dimensional differential forms)– Velocity potential function – Flow net – Fluid dynamics – Equations of motion derivation of Euler's equation and Bernoulli's energy equation, examples illustrating the use of energy equations –Venturi meter, orifice meter and pitot tube– Linear momentum equation and its application to pipe bend– Differential momentum equation, impact of jets–Force on fixed and moving vanes, flat and curved.

UNIT III FLOW THROUGH PIPES **9**

Reynold's experiment – Laminar flow through circular pipe (Hagen poiseulle's)– Laminar flow between parallel plates –Hydraulic and energy gradient –Flow through pipes – Darcy – Weisbach's equation – Pipe roughness –Friction factor– Moody's diagram– Major and minor losses of flow in pipes – Pipes in series and in parallel.

UNIT IV DIMENSIONAL ANALYSIS AND MODEL STUDIES **9**

Fundamental dimensions – Dimensional homogeneity – Rayleigh's method and Buckingham Pi-theorem– Reynolds, froude and mach number and their applications in model testing– dimensionless parameters –Similitudes and model studies – Distorted models.

UNIT V BOUNDARY LAYER **9**

Boundary layer –Definition–Boundary layer on a flat plate –Laminar and turbulent boundary layer displacement, energy and momentum thickness – Momentum integral equation–Boundary layer separation and control – Drag on flat plate.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Develop basic knowledge of fluids in statics, kinematics and dynamic equilibrium conditions
- Understand and solve problems related to equations of motion
- Illustrate various types and losses of flow in pipes
- Analyze dimensional and model analysis
- Evaluate and solve the boundary layer problems

TEXT BOOKS:

1. Bansal R K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2019.

REFERENCES:

1. Munson B R, Young D F and Oklishi T H, "Fundamentals of Fluid Mechanics", JohnWiley and Sons., Singapore, 2006.
2. Subramanya K, "Fluid Mechanics and Hydraulic Machines", Tata McGraw Hill Education Private Limited, New Delhi, 2010.
3. JainA K, "Fluid Mechanics Including Hydraulic Machines", Khanna Publishers, 12th Edition, 2016.
4. Rajput R K, "Fluid Mechanics", S Chand and Co, New Delhi, 2000.

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20CE303	SURVEYING (COMMON TO CIVIL AND AGE)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Evaluate linear and angular measurements using chain and compass.
- Understand the applications of theodolite survey in angular measurements.
- Gain knowledge on various concepts of control surveying and its adjustments.
- Demonstrate the basic concepts of astronomical surveying.
- Develop skills to operate different types of advanced surveying techniques by learning its working principles.

UNIT I INTRODUCTION OF SURVEYING 9

Definition - Principles - Classification - Scales - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Prismatic compass - Bearing - Systems and conversions - Local attraction - True and magnetic meridians - Magnetic declination - Dip - Traversing - Level line - Horizontal line - Spirit level - Temporary and permanent adjustments - Fly and check leveling.

UNIT II THEODOLITE AND TACHEOMETRIC SURVEYING 9

Theodolite - Description and uses - Temporary and permanent adjustments - Horizontal - Vertical angles - Heights and distances - Traversing - Closing error and distribution - Gale's table - Tacheometry - Principle - Systems - Tangential - Stadia methods - Horizontal and inclined sights - Staff - Vertical and normal - Fixed and movable hairs - Stadia constants - Analytic lens - Contour.

UNIT III CONTROL SURVEYING AND ADJUSTMENTS 9

Triangulation - Classification - Signals and towers - Baseline measurement - Instruments and accessories - Tape corrections - Extension of baseline - Satellite stations - Reduction to centre - Trigonometrical leveling - Classification - True and most probable values - Laws of weights - Weighted observations - Principle of least squares - Normal equation and method of correlates.

UNIT IV ASTRONOMICAL SURVEYING 9

Celestial sphere - Astronomical terms and definitions - Motion of sun and stars - Apparent altitude and corrections - Celestial co-ordinate systems - Spherical trigonometry - Latitude and longitude of a place - Field observations and calculations for azimuth - Nautical almanac.

UNIT V ADVANCED SURVEYING TECHNIQUES 9

Total Station - Advantages - Fundamental quantities measured - Parts and accessories - Working principle - On board calculations - Field procedure - Errors and good practices in using total station GPS surveying - Different segments - Space, control and user segments - Orbit determination and representation - Anti spoofing and selective availability - Hand held and geodetic receivers - Data processing - Remote sensing application.

TOTAL: 45 PERIODS

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BoS(CIVIL)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Demonstrate various surveying instruments to calculate linear and angular measurements.
- Measure horizontal angles and vertical angles using theodolite and tacheometric instruments.
- Understand different methods of levelling.
- Evaluate astronomical surveying and methods to determine time, longitude, latitude and azimuth.
- Develop knowledge on concepts and principles of modern surveying.

TEXT BOOKS:

1. Punmia B C, Ashok K Jain and Arun K Jain, "Surveying Vol. I & II", Lakshmi Publications Pvt. Ltd., 16th Edition, New Delhi, 2011.
2. Kanetkar T P and Kulkarni S V, "Surveying and Levelling", Parts 1 & 2, Pune Vidyarthi Griha Prakashan, Pune, 2008.

REFERENCE BOOKS:

1. Arora K R., "Surveying Vol I & II", Standard Book house, 17th Edition, 2019.
2. Satheesh Gopi, Sathishkumar R and Madhu N, "Advanced Surveying, Total Station GPS and Remote sensing", Pearson Education, 2007.

V. Gopi

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BoS(CIVIL)

24/6/21

20CE304	CONSTRUCTION MATERIALS	L	T	P	C
		3	0	2	4

OBJECTIVES:

The students should be made to:

- Provide knowledge on properties of stones, bricks, aggregates and other construction materials through theory classes and laboratory experiments
- Understand the properties of lime, cement and ceramic materials used in construction
- Explain various types of commercially available damp proofing and waterproofing materials
- Develop knowledge on different forms of timber and roofing materials
- Evaluate properties of fresh and hardened concrete

UNIT I STONES, BRICKSAND AGGREGATES 9

Stones – Classification – Quarrying and dressing – Selection – Composition and mineral constituents – Common building stones and their uses – Characteristics of good stone – Physical tests – Deterioration and preservation of stones – Stone veneering – Artificial stones – Brick earth – Composition and harmful constituents – Bricks –Manufacturing process, classification, types, dimensions, sampling and testing as per IS Codal provisions – Qualities of good brick – Brick substitutes– Aggregates – Properties and test.

UNIT II LIME, CEMENT AND CERAMIC MATERIALS 9

Lime – Manufacturing process, cementing action, classification as per IS 712 -1973, tests and comparison with cement– Cement properties – Manufacturing process of cement – Ceramic materials – Components, raw materials, classification and ceramic coating – Floor tiles – Selection and applications – Ceramic sanitary appliances – Roof tiles – Acid resistant materials– Mineral binders – Air setting and binding materials – Hydraulic binding materials.

UNIT III DAMP PROOFING AND WATER PROOFING MATERIALS 9

Definition – Damp proof course – System of water proofing – Paints, varnishes, distempers and adhesives –Sealants –Joint materials and asphalts – Organic binders – Bitumen, tars, emulsions and mastics – Polymers and plastics – Polymer based building materials for walls, pipes and sanitary ware – Glues and mastics.

UNIT IV TIMBER AND ROOFING MATERIALS 9

Timber – Market forms, industrial products, moisture content as per IS 287-1993, popular species used in building construction, physical properties, seasoning of wood and preservative treatment – Plywood – Pressed wood – Particle board – Hard board –Fibre board – Lamina board – Bamboo and its products – Roofing materials – Asbestos sheets and GI sheets – Tubes and light weight roofing materials – Assembling and fixing methods.

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UNIT V CONCRETE **9**

Ingredients – Manufacturing process – Ready mix concrete – Principle of concrete mix design – IS method – Fresh concrete – Workability – Hardened concrete – Strength – Segregation and bleeding – Chemical and mineral admixtures – Special concrete – Ferro cement.

THEORY: 45 PERIODS

CONSTRUCTION MATERIALS LABORATORY

I. TEST ON CEMENT

1. Consistency of cement.
2. Initial and final setting time of cement.
3. Fineness of cement.

II. TEST ON FINE AGGREGATES

1. Grading of fine aggregates.
2. Test for specific gravity.
3. Compacted and loose bulk density of fine aggregates.

III. TEST ON COARSE AGGREGATE

1. Determination of impact value of coarse aggregates.
2. Determination of elongation index.
3. Determination of flakiness index.
4. Determination of aggregate crushing value of coarse aggregates.

IV. TEST ON CONCRETE

1. Test for slump.
2. Test for compaction factor.
3. Test for compressive strength
4. Test for split tensile strength.
5. Test for flexural strength.

V. TEST ON BRICKS AND BLOCKS

1. Test for compressive strength of bricks and blocks.
2. Test for water absorption of bricks and blocks.
3. Determination of efflorescence of bricks.

PRACTICALS: 30 PERIODS
TOTAL: 75 PERIODS

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23/6/21

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze different types of stones, bricks, aggregates and other construction materials for various construction works with the exposure of both theory and practical knowledge.
- Understand various lime, cement and ceramic materials with their specifications
- Acquire sufficient knowledge to use damp proofing and water proofing materials
- Determine suitable timber and roofing materials for structural and non-structural applications
- Gain knowledge about concrete and its properties

TEXT BOOKS:

1. Varghese PC, "Building Materials", PHI Learning Pvt. Ltd., New Delhi, 2015.
2. Rajput R K, "Engineering Materials", S Chand and Company Ltd., 2008.

REFERENCES(THEORY):

1. Jagadish K S, "Alternative Building Materials Technology", New Age International,2017.
2. Gambhir ML and Neha Jamwal, "Building Materials, Products, Properties and Systems", Tata McGraw Hill Educations Pvt. Ltd., New Delhi,2014.
3. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 2010.

REFERENCES(PRACTICALS):

1. "Construction Materials Laboratory Manual", Anna University, Chennai-600 025.
2. IS 4031 (Part 1), "Indian Standard Method for Determination of Fineness by Dry Sieving", 1996.
3. IS 2386 (Part 1 to Part 6), "Indian Standard Methods for Test for Aggregate for Concrete", 1963.
4. IS 383, "Indian Standard Specification for Coarse and Fine Aggregates from Natural Sources for Concrete", 1970.

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20/6/24

20CE305 ENGINEERING GEOLOGY L T P C
3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand the importance of geology and relate the structure and dynamic properties of earth caused by earthquakes, ground water exploration and sea water intrusion
- Provide knowledge on various properties of minerals with their engineering significance
- Classify various types of rocks with its properties
- Demonstrate the geodynamics and rock mechanics in structures
- Elaborate geological site investigation for dams, tunnels etc., through aerial and geophysical survey

UNIT I INTRODUCTION TO GEOMORPHOLOGY AND HYDROGEOLOGY 9

Geology in civil engineering – Branches of geology – Earth structures and composition – Continental drift and plate technologies –Weathering – Types– Landforms of rivers, wind and sea. hydrological cycle – Properties of water bearing geological formation – Aquifers and their types – Ground water exploration – Sea water intrusion and remedial measures importance in civil engineering.

UNIT II MINERALOGY 9

Crystallographic systems –Physical properties of minerals – Rock forming minerals – Quartz and feldspar family, augite, hornblende, biotite, muscovite, calcite, garnet – Properties, behavior and engineering significance of clay minerals – Coal and petroleum – Origin and occurrence in India.

UNIT III PETROLOGY 9

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Description, occurrence, engineering properties – Igneous rocks –Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt – Sedimentary rocks – Sandstone, limestone, shale, conglomerate and breccias– Metamorphic rocks –Quartizite, marble, slate, phyllite, gniess and schist.

UNIT IV GEODYNAMICS AND ROCK MECHANICS 9

Forces caused for uncertainty of structures – Earthquake – Types - Earthquake belts in India – Volcano –Types – Landslides, causes, effects and remedial measures – Stress, strain and deformational effects on different rocks – Attitude of beds – Outcrops – Study of structures – Fold, fault and joint – Influence in civil engineering – Seismic and electrical methods for civil engineering investigations.

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UNIT V GEOLOGICAL INVESTIGATIONS FOR CIVIL ENGINEERING STRUCTURES 9

Site selection for civil engineering projects – Study of topo sheets and geological maps –Litho logical and structural features studies for construction of dams, reservoirs, tunnels, bridges and highways through seismic and electrical methods of geophysical investigations.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain earth structure with its composition and various properties of water bearing geological formation
- Demonstrate various crystallographic systems and physical properties of various minerals
- Identify different types of rocks with its various engineering properties
- Analyze the forces caused due to uncertainty of structures
- Interpret air photos and satellite imageries using sub surface geological survey

TEXT BOOKS:

1. Parbin Singh, "Engineering and General Geology", Katson Publication House, New Delhi, 2010.

REFERENCE BOOKS:

1. Venkat Reddy D, "Engineering Geology", Vikas Publishing House Pvt. Ltd, 2010.
2. Varghese P C, "Engineering Geology for Civil Engineering", Prentice Hall of India Learning Private Limited, New Delhi, 2012.
3. Mukerjee P K, "Text Book of Geology", World Press Pvt. Ltd., Kolkatta, 2001

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20MC003	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

OBJECTIVES:

The student should be made to:

- To teach history and philosophy of Indian constitution.
- To summarize powers and functions of Indian government.
- To explain structure and functions of local administration.
- To demonstrate the organization and working of the Judiciary.
- To discuss financial power and emergency provisions.

UNIT I INTRODUCTION **6**

Historical background – Government of India act – Indian councils act – Making of the constitution -Philosophy of the Indian constitution – Preamble.

UNIT II GOVERNMENT OF THE UNION **6**

Powers and Functions of President and Prime Minister - Council of Ministers – President in relation to his council - Legislature structure and functions of Loksabha and Rajyasabha – Speaker.

UNIT III GOVERNMENTS OF THE STATES AND LOCAL GOVERNMENT **6**

The state executive: General structure – Governor – Council of ministers – State legislature. Local government - Panchayat –Municipality– Powers, Authority and Responsibilities of municipalities.

UNIT IV THE JUDICATURE **6**

Organization and Composition of Judiciary – Constitution – Appointment - Qualifications - Powers and functions of the supreme court– High courts – Control over subordinate courts.

UNIT V THE FEDERAL SYSTEM **6**

Distribution of financial powers: Need, principles-Underlaying distribution of tax revenues- Distribution of legislative power – Interstate relation - Emergency provisions.

TOTAL: 30 PERIODS

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OUTCOMES:

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

- Understand history and philosophy of Indian constitution
- Realize powers and functions of Indian government
- Acquire awareness on structure and functions of local administration
- Enhance knowledge about organization and composition of judiciary
- Explore the distribution of financial powers and emergency provisions

TEXT BOOKS:

1. Basu D.D,"Introduction to Indian Constitution",Prentice Hall of India,New Delhi,2015.
2. Gupta D.C,"Indian Government and Politics",Vikas Publishing House,New Delhi, 2010.

REFERENCES:

1. Pylee M.V,"Introduction to the Constitution of India",Vikas Publishing House,NewDelhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010.
3. The Constitution of India, 1950 (Bare Act), Government Publication.
4. Jain M P, Indian Constitution Law, Seventh Edition, Lexis Nexis, 2014.
5. Busi S N, Ambedkar B R framing of Indian Constitution, First Edition, 2015.

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AUE

20CE306L	SURVEYING LABORATORY (COMMON TO CIVIL AND AGE)	L T P C 0 0 2 1

OBJECTIVES:

The students should be made to:

- Impart knowledge on measuring area and offset by using chain surveying
- Evaluate concepts of bearing and area measurements using different compass
- Develop training on different methods of plane table surveying
- Acquire knowledge to calculate reduced levels using different methods of levelling
- Determine the elevation between two inaccessible points using total station

LIST OF EXPERIMENTS

1. Study of chains and its accessories, aligning, ranging, chaining and marking perpendicular offset.
2. Setting out works – Foundation marking using tapes single room and double room.
3. Compass traversing – Measuring bearings and arriving included angles.
4. Fly levelling using dumpy level and tilting level.
5. Check levelling.
6. Measurements of horizontal angles by reiteration and repetition and vertical angles.
7. Determination of elevation of an object using single plane method when base is accessible /inaccessible.
8. Determination of tacheometric Constants.
9. Location of points by resection method – Three point problem.
10. Plotting of contours.
11. Traverse using total station and area of traverse.
12. Determination of distance and difference in elevation between two inaccessible points using total station.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Demonstrate conventional surveying instruments such as chain/tape, compass, plane table and theodolite
- Evaluate levelling using various instruments and to plot contour
- Measure horizontal and vertical angles by reiteration and repetition method
- Determine tacheometric constants
- Calculate the distance and elevation between two accessible and inaccessible points

REFERENCES:

1. Punmia BC, Ashok K Jain and Arun K Jain, "Surveying" Vol. I and II, Lakshmi Publications, Pvt Ltd, New Delhi, 2005.
2. Venkatramaiah, "Text Book of Surveying", University Press, New Delhi, 2014.

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V.G.D.P.C

20EEC301L	SOFT SKILLS DEVELOPMENT (COMMON TO ALL BRANCHES)	L T P C 0 0 2 1

OBJECTIVES:

The Student should be made to:

- Enhance the development of students by focusing on soft skills
- Develop skills of the students through individualand group activities
- Shape students attitude and behavior through activities
- Analyze the characteristics of the students for self-development
- Prepare themselves for the recruitment processes

UNIT ISOFT SKILLS ARE IMPORTANT FOR SUCCESS **6**

Importance of Soft Skills – Types – Industrial needs – Development of skills – Employees Expectation – Success of Employees.

UNIT II CORPORATE COMMUNICATION **6**

Needs and Development of Communication – Customers Relationship – Improving Informal Communication – Formation of Presentations – Public Speaking – Telephone and Email Etiquettes.

UNIT III DISCUSSIONS **6**

Introduction to Discussion – Importance and types of Discussion – Spontaneous conversation – Plan for Discussions – Panel Discussions – Visual Aid Discussions – Debate.

UNIT IV SELF ANALYSIS **6**

Who am I –Identifying or searching one's own Strength, Weakness –, opportunities and threats (SWOT Analysis) – Benefits of SWOT Analysis – Importance of Self Confidence, Self Esteem, Self Development and Self Introspection.

UNIT V CREATIVITY AND GOAL SETTING **6**

Thinking out of the box – Lateral Thinking – Positive Thinking – Results of Smart Work – Application of Creativities – Short Term and Long term Goals – Life Time Goals.

TOTAL: 30 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Learners will recognize the importance of Soft skills in Professional life
- Improve oral and Listening Skills
- Enhance students' ability in GDs, Presentations and interviews
- Develop one's strength in setting of goals and developing creative
- Become a good team worker in the society

TEXT BOOKS:

1. "Soft Skills", Career Development Centre, Green Pearl Publications, 2015.

REFERENCES :

1. Covey Sean, "Seven Habits of Highly Effective Teens", New York, Fireside Publishers, 1998.
2. Carnegie Dale, "How to Win Friends and Influence People", New York: Simon and Schuster, 1998.
3. Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, 2011.

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20MA401	NUMERICAL METHODS (COMMON TO CIVIL, EEE AND MECH)	L T P C 3 1 0 4

OBJECTIVES:

The student should be made to:

- Introduce the basic concepts of solving algebraic and transcendental equations
- Introduce the numerical techniques of interpolation in various intervals in real life situations
- Understanding the numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines
- Acquaint the knowledge of various techniques and methods of solving ordinary differential equations
- Understand the knowledge of various techniques and methods of solving various types of partial differential equations

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations – Fixed point iteration method – Newton Raphson method – Solution of linear system of equations – Gauss elimination method – Pivoting – Gauss Jordan method – Matrix Inversion by Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel – Eigen values of a matrix by Power method.

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals – Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines – Interpolation with equal intervals – Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's method – Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

Single Step methods – Taylor's series method – Euler's method – Modified Euler's method – Fourth order Runge-Kutta method for solving first order equations – Multi step methods – Milne's and Adams-Bash forth predictor corrector methods for solving first order equations.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving two-point linear boundary value problems – Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the basic concepts and techniques of solving algebraic and transcendental equations
- Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations
- Apply the numerical techniques of differentiation and integration for engineering problems
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations
- Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications

TEXTBOOKS:

1. Grewal B S and Grewal J S, "Numerical Methods in Engineering and Science", Khann Publishers, 9th Edition, New Delhi, 2007.
2. Gerald C F and Wheatley P O, "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.

REFERENCES:

1. Chapra S C and Canale R P, "Numerical Methods for Engineers", Tata McGraw Hill, 5th Edition, New Delhi, 2007.
2. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
3. Sankara Rao K, "Numerical Methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007.

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24/6/24

20CE401	STRENGTH OF MATERIALS-II	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Analyze plane and space trusses using different methods
- Illustrate thin and thick cylinders subjected to fluidpressure and various failure theories
- Evaluatebehavior of short and long columns under axial and eccentric loads
- Calculatedeflection in beams using different methods
- Determine bending stresses and shear centre in symmetrical and unsymmetrical sections

UNIT I ANALYSIS OF TRUSSES **9**

Perfect, deficient and redundant trusses – Degree of redundancy – Internal and external redundancy –Methods of analysis – Method of joints – Method of section– Method of tension coefficient– Analysis of space truss.

UNIT II THIN AND THICK CYLINDERS AND THEORIES OF ELASTIC FAILURE **9**

Thin cylinders – Circumferential stress – Longitudinal stress – Volumetric strain – Stresses in thick cylindrical shell – Stresses in compound cylinders – Failure theories – Maximum principal stress theory– Maximum shear stress theory– Maximum principal strain theory – Strain energy theory– Maximum shear strain energy theory.

UNIT III COLUMNS AND STRUTS **9**

Short and slender columns– Axial and bending stress – Buckling and stability – Columns with pinned ends columns with other support conditions – Columns with eccentric loads – Euler's theory and Rankine's formula.

UNIT IV DEFLECTION OF BEAMS **9**

Deflection of trusses–Deflection of beams – Double integration method – Macaulay's method – moment–Area method – Conjugate beam method for determinate beams.

UNIT V UNSYMMETRICAL BENDING **9**

Unsymmetrical bending– Symmetrical and unsymmetrical sections – Bending stresses in beams – Shear centre – Shear centre for thin walled beam of mono– Symmetric and unsymmetrical open sections.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Calculate member forces acting on plane and space trusses by using different methods
- Analyze the problems related to thin and thick cylinders subjected to fluid pressure
- Understand the behavior of short and long columnsunder axial and eccentric loads with different support conditions
- Determine slope and deflection in determinate beams using various methods
- Acquire knowledge on stresses acting on unsymmetrical bending sections

TEXT BOOKS:

1. Rajput R K, "Strength of Materials (Mechanics of Solids)", SChand and company Ltd., New Delhi, 2018.
2. Bansal RK, "Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi,2019.

REFERENCE BOOKS:

1. Singh D K, "Strength of Materials", Ane Books Pvt. Ltd., New Delhi, 2016.
2. Punmia B C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", SMTS, Vol.II, Laxmi Publishing Pvt. Ltd., New Delhi, 2017.

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24/6/24

20CE402	APPLIED HYDRAULIC ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand the different properties of fluids on uniform flow in open channels
- Realize the concepts of gradually varied flow and its computational methods
- Acquire knowledge on applications of rapidly varying flow and hydraulic jump with surges
- Distinguish the importance of turbines and jets classified based on characteristics
- Explore and demonstrate the classification of pumps with its work efficiency

UNIT I UNIFORM FLOW **9**

Definition and differences between pipe flow and open channel flow – Types of flow – Properties of open channel – Velocity distribution in open channel – Steady uniform flow (Chezy's equation, Manning equation) – Best hydraulic sections for uniform flow – Wide open channel – Specific energy and specific force – Critical flow.

UNIT II GRADUALLY VARIED FLOW **9**

Dynamic equations of gradually varied flows – Types of flow profiles – Classifications – Computation by direct step method –Standard step method – Control section.

UNIT III RAPIDLY VARIED FLOW **9**

Application of the momentum equation for RVF – Hydraulic jumps – Types – Energy dissipation – Rapidly varied unsteady flows (positive and negative surges).

UNIT IV TURBINES **9**

Impact of jet on flat curved plates, stationary and moving – Classification of turbines –Pelton wheel – Modern Francis turbine – Kaplan turbine – Specific speed – Characteristic curves of turbines – Draft tube and cavitations.

UNIT V PUMPS **9**

Classification of pumps – Centrifugal pumps – Work done – Minimum speed to start the pump – NPSH – Multistage pumps –Characteristics curve – Reciprocating pumps – Negative slip – Indicator diagrams and its variations – Air vessels –Submersible pumps–Deep well pumps.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply their knowledge of fluid mechanics in addressing problems in open channels
- Solve dynamic equations of gradually varied flows
- Analyze problems in rapidly varied flows in steady and unsteady state conditions
- Understand the basic concepts and working methodology of turbines and elucidate problems
- Determine work done and efficiency of different pumps

TEXT BOOKS:

1. Bansal R K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications Pvt. Ltd., New Delhi, 2019.
2. Subramanya K, "Flow in Open Channels", Tata McGraw Hill, New Delhi, 2019.

REFERENCES:

1. Ven Te Chow, "Open Channel Hydraulics", McGraw Hill, New York, 2009.
2. Hanif Chaudhry M, "Open Channel Flow", Springer, 2nd Edition, 2007.
3. Jain AK, "Fluid Mechanics (Including Hydraulic Machines)", Khanna Publishers, 12th Edition, 2016.

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24/6/24

20CE403	CONSTRUCTION TECHNIQUES, EQUIPMENTS AND PRACTICE	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand various practices involved in the construction field
- Apply the appropriate techniques used for sub –structure constructions
- Analyze various innovative technologies involved in super structure constructions
- Develop awareness among the learners about industrial structures and their utilities
- Study the characteristics and suitability of equipments employed in different works

UNIT I CONSTRUCTION PRACTICES **9**

Site selection and site plan – Foundations and basements – Masonry – Bonds – Brick masonry – Stone masonry – Concrete hollow block masonry – Precast paver blocks – Flooring – Construction joints – Movement and expansion joints – Contraction joints – Form works – Centering and shuttering – Slip forms – Scaffoldings, shoring and underpinning – Fabrication and erection of trusses – Acoustics – Sound insulation – Fire protection.

UNIT II SUB STRUCTURE CONSTRUCTION **9**

Box jacking – Pipe jacking – Arch jacking – Tunneling techniques – Underground and underwater diaphragm walls – Piling techniques – Coffer dams – Well foundation and caisson – Sinking operations – Cable anchoring and grouting – Sheet piling – Shoring for deep cutting – Dewatering techniques and pumping equipment.

UNIT III SUPER STRUCTURE CONSTRUCTION **9**

Launching girders – Bridge decks – Off shore platforms –Special forms of shells and domes – Techniques for heavy decks – In –situ pre –stressing in high rise structures – Material handling and erecting light weight components on tall structures – Articulated structures – Braced domes – Space decks.

UNIT IV INDUSTRIAL STRUCTURES **9**

Chimneys – Cooling towers – Silos – Bunkers – High tension transmission and telecommunication towers – Support structures for heavy equipment and conveyors – Escalators – Vertical conveyors.

UNIT V CONSTRUCTION EQUIPMENT **9**

Earth work – Selection of equipment for earth work – Earth moving operations – Types of earthwork equipment – Tractors, motor graders, scrapers, front end waders and earth movers – Equipment for compaction, batching, mixing and concreting – Equipment for material handling and erection of structures – Equipment for trenching, tunneling and dredging.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply various practices exercised in the construction field
- Acquire knowledge on various techniques used for underground and under water structures
- Illustrate various construction techniques involved in super structure
- Develop knowledge about various industrial structures and their utilities
- Adopt suitable equipments in construction towards speedy completion of projects

TEXT BOOKS:

1. Arora SP and Bindra S P, "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 2010.
2. Varghese PC, "Building Construction", Prentice Hall of India Pvt. Ltd., New Delhi, 2007.

REFERENCE BOOKS:

1. Deodhar SV, "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2012.
2. Shetty M S, "Concrete Technology –Theory and Practice", S Chand and Co. Pvt. Ltd.,New Delhi, 2009.
3. Peurifoy RL, Ledbetter W B and Schexnayder C, "Construction Planning, Equipment and Methods", McGraw Hill, Singapore, 5th Edition, 1995.

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20CE404	SOIL MECHANICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand the various properties and classification of soil
- Develop knowledge on permeability of soil and stress distribution in soil medium
- Determine various methods of compaction and consolidation of soil
- Analyze shear strength behavior of cohesive and non –cohesive soil
- Evaluate shear strength behavior of soil using stability analysis of slopes

UNIT I SOIL CLASSIFICATION AND COMPACTION 9

Nature of soil – Phase relationships – Soil description and classification for engineering purposes – Significance – Index properties of soils – BIS classification system – Soil compaction – Theory–Comparison of laboratory and field compaction methods – Compaction – Proctor's test – Moisture – Density relations –Factors influencing compaction behavior of soils.

UNIT II EFFECTIVE STRESS PRINCIPLE AND PERMEABILITY 9

Soil water – Static pressure in water – Effective stress concepts in soils – Capillary stress – Permeability measurement in the laboratory and field pumping in and pumping out tests – Factors influencing permeability of soils – Seepage – Introduction to flow nets – Simple problems.

UNIT III STRESS DISTRIBUTION CONCEPT AND SETTLEMENT 9

Stress distribution – Soil media – Boussines theory – Use of new marks influence chart – Settlement – Components of settlement –Immediate and consolidation settlement – Methods of minimising settlement –Terzaghi's one dimensional consolidation theory – Computation of rate of settlement – Square root t and log t methods – e–log p relationship – Factors influencing compression behaviour of soils.

UNIT IV SHEAR STRENGTH BEHAVIOUR 9

Shear strength of cohesive and cohesionless soils –Mohr –Coulomb's failure theory – Relationship between principal stresses at failure – Measurement of shear strength–Direct shear test – Triaxial compression test – Unconfined compression test and vane shear test – Pore pressure parameters – Cyclic mobility – Liquefaction.

UNIT V STABILITY OF SLOPES 9

Slope failure mechanisms – Types – Infinite slopes – Finite slopes –Total stress analysis for saturated clay –Fellenius method –Friction circle method –Factor of safety – Use of stability number–Slope protection measures.

TOTAL: 45 PERIODS

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BoS(CIVIL)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Impart the fundamental concepts of soil mechanics and identify the soil properties
- Understand the importance of engineering properties such as consolidation and compaction of soils
- Evaluate the stress developed in the soil medium
- Estimate the shear strength of various types of soil
- Analyze the stability of slopes using different methods

TEXT BOOKS:

1. Punmia B C, Ashok K Jain and Arun K Jain, "Soil Mechanics and Foundations", Laxmi Publications, New Delhi, 17th Edition, 2018.
2. Murthy V N S, "Text Book of Soil Mechanics and Foundation Engineering", CBS Publisher and Distributors, New Delhi, 2018.

REFERENCE BOOKS:

1. GopalRanjan and Rao A S R, "Basic and Applied Soil Mechanics" New Age International, New Delhi, 3rd Edition, 2018.
2. Dr Arora K R, "Soil Mechanics and Foundations Engineering", Standard Publishers Distributors, 7th Edition, 2019.

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20CE405	HIGHWAY ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The students should be made to:

- Understand the basics and objectives of planning and alignment in highway
- Impart knowledge on geometric design of highways
- Design flexible and rigid pavements as per design principles
- Acquire knowledge on traffic engineering
- Analyze pavement evaluation and techniques needed for strengthening of pavements

UNIT I HIGHWAY PLANNING AND ALIGNMENT 9

Objectives of highway planning – History of road development in India – Highway planning in India – Factors controlling alignment – Engineering surveys for alignment, objectives, conventional and modern methods – Classification of highways – Typical cross section of urban and rural roads.

UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9

Cross sectional elements – Sight distances – Horizontal curves, super elevation, transition curves, widening at curves – Vertical curves – Gradients, special consideration for hill roads – Hairpin bends.

UNIT III DESIGN OF FLEXIBLE AND RIGID PAVEMENTS 9

Pavement components and their role – Design principles – Design practice for flexible and rigid pavements (IRC method only) – Embankments – Problems in flexible pavement design.

UNIT IV TRAFFIC ENGINEERING 9

Scope of traffic engineering – Traffic characteristics – Traffic flow and roadway capacity – Traffic regulations – Traffic control devices – Design of road intersections – Design of parking facility – Pedestrian facilities – Highway lighting – Traffic planning and management.

UNITV HIGHWAY CONSTRUCTION MATERIALS, EVALUATION AND MAINTENANCE OF PAVEMENTS 9

Highway construction materials, properties and testing methods – CBR test for soil subgrade – Test on aggregate and bitumen – Highway drainage – Pavement distress in flexible and rigid pavements – Pavement management systems – Structural evaluation – Strengthening of pavements–Highway project formulation.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Demonstrate planning, alignment and cross sections of urban and rural roads
- Develop knowledge on basic principles involved in geometric design of highways
- Design flexible and rigid pavements as per IRC
- Realize the importance of traffic planning and management
- Recognize pavement construction and techniques needed for strengthening of pavements

TEXT BOOKS:

1. Khanna S K, Justo CEG and Veeraragavan A, "Highway Engineering", Nemchand Publishers, 2018.

REFERENCES:

1. Kadiyali L R, "Principles and Practices of Highway Engineering", Khanna Technical Publications, Delhi, 2017.
2. IRC Standards, IRC 37 – 2018 and IRC 58 – 2015.

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24/6/24

20EEC401L	LIFE SKILLS AND PERSONALITY DEVELOPMENT (COMMON TO ALL BRANCHES)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The student should be made to:

- Create self- confident among the students by the training
- Develop good personality for mature outlook in different circumstances
- Encourage effective presentation skills
- Dramatize role play by assigning the best role
- Enhance team building and time management skills

UNIT I CAREER PLANNING **6**

Introduction – Benefits of Career Planning – Expectation and Development – Guidelines for choosing a Career – Future Planning – Evaluation of planning

UNIT II ATTITUDE **6**

Introduction – Rightness of Attitude and behavior – Formation of attitudes – Evolving Behavior of a person – Creating right attitudes – Approaches of Challenges – Lessons from Attitude.

UNIT III ROLE PLAYING **6**

Introduction – settings of role plays – Principles and Purpose – importance of communication in role plays – Arrangement of points and character – Extempore Talk – Debates – Emotional Intelligence.

UNIT IV TEAM BUILDING **6**

Purpose of Creating Team – Exploring Team roles and Processes – Importance of Building and Developing Strong Team – Leadership Qualities – Success of Team Building.

UNIT V TIME MANAGEMENT **6**

Value of time – Concept and applications of time management – Causes for Wasting of Time – Methods of Time Management – Diagnosing Time Management – Planning for presentation – To-do-list – Prioritizing work.

TOTAL: 30 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Improve the leadership skills by identifying the strengths of a team
- Learn to lead a team on a project in an organization
- Helps students to perform on a distinct role and learn to face the challenges
- Build a strong team to achieve their goals with the right choice of people
- Develop the time management skills to achieve success

TEXT BOOKS:

1. "Soft Skills", Career Development Centre, Green Pearl Publications, 2015.

REFERENCES :

1. Thomas A Harris, "I Am Ok, You Are Ok", Harper and Row, New York, 1972.
2. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.
3. NiraKonar, "Communication Skills for Professionals", Eastern Economy Edition, 2010.
4. Daniel Coleman, "Emotional Intelligence", Bantam Book, 2006.

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20CE406L	STRENGTH OF MATERIALS LABORATORY (COMMON TO CIVIL AND AGE)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The students should be made to:

- Understand the stress strain behavior of mild steel rod
- Obtain the hardness value of various metals
- Analyze the deflection acting on springs by applying tensile and compressive load
- Determine impact strength of mild steel
- Evaluate the properties of wood by conducting compression test

LIST OF EXPERIMENTS:

1. Tension test on mild steel rod.
2. Torsion test on mild steel rod.
3. Compression test on wood.
4. Tests on open coiled helical springs.
5. Tests on close coiled helical springs.
6. Izod and charpy impact tests.
7. Determination of rockwell and brinell hardness number.
8. Static bending test on metal beam.
9. Yield strength, ultimate strength, percentage of elongation and young's modulus for the mild steel rod and HYSD bars using UTM.
10. Maximum shear strength of the mild steel and aluminium bar using double shear test.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Illustrate the behaviour of mild steel under the action of tensile and compressive load
- Calculate the hardness value of the various metal specimens
- Determine the torsional and impact strength of mild steel
- Understand the properties of wood when the load is acting parallel to grain
- Evaluate the stiffness and deflection of open coiled, close coiled springs

REFERENCES:

1. "Strength of Materials Laboratory Manual", Anna University, Chennai-600 025.
2. IS1786-2008, "High Strength Deformed Bars and Wires for Concrete Reinforcement – Specification", 2008.

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20/6/24

20CE407L	HYDRAULIC ENGINEERING LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

The students should be made to:

- Demonstrate the working principle, components, functions of orifice meter and venturimeter
- Determine the major and minor losses in pipes
- Analyze the flow through orifices, mouthpieces and notches
- Understand the performance of centrifugal, reciprocating, submersible and gear pumps
- Evaluate the characteristics of pelton wheel and francis turbines

I. FLOW MEASUREMENT

1. Calibration of Rotameter.
2. Calibration of Venturimeter / Orifice meter.
3. Bernoulli's experiment.

II.LOSSES IN PIPES

1. Determination of friction factor in pipes.
2. Determination of min or losses.

III. PUMPS

1. Characteristics of Centrifugal pumps.
2. Characteristics of Gear pump.
3. Characteristics of Submersible pump.
4. Characteristics of Reciprocating pump.

IV. TURBINES

1. Characteristics of Pelton wheel turbine.
2. Characteristics of Francis turbine/ Kaplan turbine.

V. DETERMINATION OF METACENTRIC HEIGHT

1. Determination of Metacentric height of floating bodies.

TOTAL: 30 PERIODS

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BoS(CIVIL)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Evaluate the discharge in orifice meter and venturimeter
- Measure frictional losses in pipes
- Determine the flow rate in orifice and mouthpiece
- Illustrate characteristics of various pumps
- Understand discharge abilities of various turbines

REFERENCES:

1. Sarbjit Singh, "Experiments in Fluid Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2009.
2. "Hydraulic Laboratory Manual", Centre for Water Resources, Anna University, 2004.
3. Modi PN and Seth S M, "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi, 2000.
4. Subramanya K, "Flow in Open Channels", Tata McGraw Hill Publishing Company, 2001.

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BoS(CIVIL)

24/6/24

20CE501 DESIGN OF REINFORCED CONCRETE ELEMENTS **L T P C**
3 1 0 4

OBJECTIVES:

The student should be made to:

- Understand basic concepts in the behavior and design of reinforced concrete elements using working stress method
- Analyze design principles of RC beams subjected to shear, bond, and torsion
- Gain knowledge related to design of slabs and staircase in accordance with limit state method
- Learn concepts of RC Column design using limit state method
- Impart knowledge on design of various RC footings

UNIT I INTRODUCTION **12**

Materials and properties – Grades of concrete and steel – Stress – Strain characteristics of concrete and steel – Fatigue effects. Type of loads and load combinations – Factor of Safety – Concept of elastic method, ultimate load method and limit state method – Advantages of limit state method over other methods – Design codes and specifications – Design of singly and doubly reinforced beams by working stress method.

UNIT II LIMIT STATE DESIGN OF BEAM **12**

Design of singly and doubly reinforced sections and flanged section subjected to flexure, shear and torsion – Flexural and anchorage bonds – Development length – Detailing of reinforcement.

UNIT III LIMIT STATE DESIGN OF SLAB AND STAIRCASE **12**

Introduction – Types of slab – Design of one way slab – Design of two way slabs with various boundary conditions – Design of cantilever slab – Check for shear and deflection – Detailing of reinforcement. Design of doglegged stair case – Detailing of reinforcement.

UNIT IV LIMIT STATE DESIGN OF COLUMN **12**

Estimation of effective length of a column – Code requirements: Slenderness limits – minimum eccentricities and reinforcements – Compression members – Classification of columns – Design of short columns and Long columns – Axial and eccentric loading using interaction curve – Detailing of reinforcement.

UNIT V LIMIT STATE DESIGN OF FOOTING **12**

Introduction – Types of footing – Selection of footing – Soil pressures under isolated footings – General design considerations and Code requirements – Design of Isolated square and rectangular footing – Combined rectangular footing – Strap footing – Mat footing – Detailing of reinforcement.

TOTAL: 60 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand various design methodologies in design of RC elements
- Evaluate design of beams by limit state method
- Design various types of slabs and staircase by limit state method
- Determine columns subjected to axial and eccentric loadings
- Execute design of footings by limit state method

TEXT BOOKS:

1. Krishna Raju N, "Design of Reinforced Concrete Structures", CBS Publishers and Distributors, New Delhi, 2013.

REFERENCE BOOKS:

1. Varghese P C, "Limit State Design of Reinforced Concrete", Prentice Hall of India Pvt. Ltd, New Delhi, 2010.
2. Gambhir M L, "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Pvt. td, New Delhi, 2006.
3. Unnikrishna Pillai S and Devdas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd, New Delhi, 2015.

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20CE502	STRUCTURAL ANALYSIS-I	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Gain knowledge on deflection of trusses, beams and frames using energy methods
- Draw influence lines for statically determinate and indeterminate structures
- Analyze various arch structures
- Calculate slope and deflection of indeterminate structures
- Understand concepts of distribution of moments and internal forces in indeterminate structures

UNIT I ENERGY METHODS AND INDETERMINATE FRAMES **9**

Principle of virtual work – Deflections of trusses, beams and frames – Strain energy theorem – Analysis of beams, frames indeterminate trusses by strain energy method and consistent deformation method (up to two degrees of redundancy).

UNIT II MOVING LOADS AND INFLUENCE LINES **9**

Influence lines for reactions in statically determinate structures – Influence lines for member forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads – EUDL – Muller Breslau's principle – Indirect model analysis for influence lines of indeterminate structures – Begg's deformeter.

UNIT III ARCHES **9**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

UNIT IV SLOPE DEFLECTION METHOD **9**

Slope deflection method – Equilibrium conditions – Analysis of statically indeterminate beams with and without support settlement, Analysis of portal frames with and without sway.

UNIT V MOMENT DISTRIBUTION METHOD **9**

Distribution and carryover of moments – Stiffness and carry over factors – Analysis of continuous beams – Plane rigid frames with and without sway – Kanis method.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Calculate deflections of beams, frames and trusses
- Draw influence lines for statically determinate and indeterminate structures
- Solve shear and bending moment subjected to arches at various loadings
- Determine slope and deflection in indeterminate beams and portal frames
- Evaluate distribution of moments in indeterminate structures by iterative procedure

TEXT BOOKS:

1. Vaidyanathan R and Perumal P, "Comprehensive Structural Analysis – Vol. I and II", Laxmi Publications, New Delhi, 2007
2. Bhavikatti S S, "Structural Analysis – Vol. 1 and Vol. 2", Vikas Publishing House Pvt. Ltd., New Delhi, 2010.

REFERENCES:

1. Punmia B C, Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", Laxmi Publications, New Delhi, 2017
2. Gambhir M L, "Fundamentals of Structural Mechanics and Analysis", PHI Learning Pvt. Ltd., New Delhi, 2014.
3. Ghali A, Nebille and Brown T G, "Structural Analysis-A Unified Classical and Matrix Approach", Sixth Edition, Spon Press, New York, 2009.

CHAIRMAN
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20CE503 RAILWAYS, AIRPORT AND HARBOUR ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Study planning and alignment of railways
- Impart knowledge on geometric designs, stations, yards, laying and maintenance of tracks
- Analyze the planning and design of airports
- Learn about air traffic control facilities and navigation aids
- Acquire knowledge of various harbors, ports and docks

UNIT I RAILWAY PLANNING AND DESIGN **9**

Role of Indian railways in national development – Railways for urban transportation – LRT and MRTS – engineering surveys for track alignment – obligatory points – Conventional and modern methods – Remote Sensing, GIS & GPS, EDM and other equipment – Permanent way – components and their functions – Rails – types, fastenings, gauge, coning of wheels, creeps and kinks – Sleepers – functions, materials, density – Ballast – functions, materials – ballast less tracks.

UNIT II GEOMETRIC DESIGN OF RAILWAY TRACKS **9**

Gradients and grade compensation, super elevation, widening of gauges in curves, transition curves, horizontal and vertical curves – Points and crossings – Turnouts – design, working principle – Track circuiting, signaling, interlocking – construction – maintenance – conventional, modern methods and materials – Track drainage – Track modernization – Automated maintenance and upgrading, relaying of track – Lay outs of railway stations and yards – rolling stock, tractive power, track resistance – Level crossings.

UNIT III AIRPORT PLANNING AND DESIGN **9**

Role of air transport – Components of airports – Airport planning – Air traffic potential, site selection, design of components – Cost estimates, evaluation and institutional arrangements – Runway – design, orientation, cross wind component, wind rose diagram – Geometric design and corrections for gradients – drainage – taxiway – geometric design elements, minimum separation distances, design speed – airport drainage.

UNIT IV AIRPORT VISUAL AIDS AND AIR TRAFFIC CONTROL **9**

Airport zoning – Clear zone, approach zone, buffer zone, turning zone, clearance over highways and railways – Airport layouts – Apron, terminal building, hangers, motor vehicle parking area and circulation pattern – Case studies of airport layouts – Airport buildings – Primary functions, planning concept, passenger facilities – Visual aids – Runway and taxiway markings, wind direction indicators, runway and taxiway lightings – Air traffic control – Basic actions and network – Helipads – Service equipment.

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UNIT V HARBOURS 9

Introduction – Harbours, ports and docks – Components, factors influencing the site selection, wind, wave characteristics – Breakwater – Components and types – Tetrapods and other special blocks – Erosion – Tides – Types of tides –Docks – Types of docks – Warehouses – Transit sheds, fenders – Quays and jetties – Dolphins – Containerization – Mooring, types of mooring – Goods transport – Container movement.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Design different railway components
- Understand geometric design of railway tracks
- Recognize design concepts of various components of airport
- Know about the air traffic control facilities and visual aids
- Learn various harbour elements in harbour planning

TEXT BOOKS:

1. Saxena S C, Arora S P, "A Text Book of Railway Engineering", Dhanpat Rai Publications, 2016.
2. Khanna S K, Arora M G and Jain S S, "Airport Planning and Designing", Nemchand and Bros, 2012.

REFERENCE BOOKS:

1. Rangwala, "Railway Engineering", Charotar Publishing House, 2013
2. Rangwala, "Airport Engineering", Charotar Publishing House, 2013.
3. Rangwala, "Harbor Engineering", Charotar Publishing House, 2013.
4. Dr Bindra S P, "A Course in Docks and Harbour Engineering", Dhanpat Rai Publications, 2013.

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24/4/24

20CE504	FOUNDATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Get basic knowledge of geotechnical site investigation
- Understand various types of foundation and design principles
- Learn design concepts of different types of footings
- Discuss different types of pile foundation with its carrying capacity
- Study various earth pressure theories

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION **9**

Scope and Objectives – Methods of exploration – Depth and spacing of bore holes – Sampling of soil – Methods of sampling – Penetration tests (SPT, SCPT and DCPT) – Interpretation – Bore log report – Requirements of good foundation – Factors governing location and depth of foundation – Types and Selection of foundation.

UNIT II SHALLOW FOUNDATION **9**

Bearing capacity of shallow foundation on homogeneous deposits – Terzaghi's formula and BIS formula – Bearing Capacity from insitu tests (SPT, SCPT and Plate load) – Settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits – Allowable settlements (As per IS Codal provisions) – Methods of minimising total and differential settlement.

UNIT III FOOTINGS AND RAFT **9**

Contact pressure distribution below footings – Isolated, combined footings and Mat foundation – Types, uses and proportioning – Allowable bearing pressure for raft foundation as per IS Codal provisions

UNIT IV PILE FOUNDATIONS **9**

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil – Static formula – Dynamic formulae (Engineering news and Hiley's) – Capacity from insitu tests (SPT, SCPT and Pile load test) – Negative skin friction – Group capacity by different methods (Feld's rule and block failure criterion) – Settlement of pile groups

UNIT V EARTH PRESSURE **9**

Active and passive earth pressure – Rankine's theory – Coloumb's wedge theory – Earth pressure on retaining walls including the effect of surcharge for C and C-ϕ soil under dry and saturated conditions.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Acquire knowledge on soil investigation report including the lab and field investigation test results
- Evaluate bearing capacity of soil and design of shallow foundation
- Design various types of footings as per IS Codal provisions
- Determine load carrying capacity of piles and design of pile foundations
- Perform lateral earth pressure analysis by various earth pressure theories

TEXT BOOKS:

1. Punmia B C and Jain A K, "Soil Mechanics and Foundations", Laxmi Publications, New Delhi, 2015.
2. Dr Arora K R, "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors, 2008.

REFERENCES:

1. Gopal Ranjan Rao, "Basic and Applied Soil Mechanics", New Age International, New Delhi, 2018.
2. Murthy V N S, "Text Book of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 2018.

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20/6/24

20MC002	UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

Objectives

The students should be made to:

- Understand the need of value education and human aspiration
- Know the difference between self and body
- Recognize the harmony in the family and society
- Understand harmony in nature
- Identify the human values and ethics

UNIT I INTRODUCTION TO VALUE EDUCATION 9

Value Education – need and process, Self-Exploration – process, Basic Human Aspirations - Continuous Happiness and Prosperity, Basic requirement for fulfillment of Human Aspirants, Understanding Happiness and Prosperity – Continuity of Happiness from Physical Facility.

UNIT II HARMONY IN THE HUMAN BEING 9

Human being as a co-existence of the self and the Body - The needs of Self and Body, Body as an Instrument - The Self as the Seer- Doer-Enjoyer, Harmony in the self, Harmony of the Self with the Body –Programme for Self – regulation and health.

UNIT III HARMONY IN THE FAMILY AND SOCIETY 9

Family as the basic unit of human interaction , Understanding Relationship, Trust as the foundational value, Respect as the Right Evaluation, Harmony in the society – Understanding Human Goal, Harmony from Family Order to World Family Order – Universal Human Order - Scope.

UNIT IV HARMONY IN THE NATURE AND EXISTENCE 9

Nature - as Collections of Units, Classification of Units into Four Orders, Interconnectedness, and mutual fulfillment among the four orders of nature, self-regulation in Nature, Understanding Existence as Units in Space, Existence as Co-existence.

UNIT V IMPLICATIONS OF THE ABOVE HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS 9

Natural Acceptance of Human Values - Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Constitution, Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production System and Management Models – Typical case, Strategies for Transition towards value based life and profession.

TOTAL: 45 PERIODS

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Outcome:

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

- Understand the significance of value education and distinguish between values and skills.
- Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
- Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings.
- Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
- Distinguish between ethical and unethical practices and understand the human values.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics, Excel Books, New Delhi, 2nd Revised Edition, 2019.

References:

1. Tripathi A N, "Human Values", New Age Intl. Publishers, New Delhi, 2009.
2. Govindarajan M, Natrajan S and Senthilkumar V S, "Engineering Ethics (Including Human Values)" Eastern Economy, PHI, 12th Edition, 2011.
3. Govindarajan M and Natrajan S, "Professional Ethics and Human Values", PHI, 2011.
4. Banerjee B P, "Foundation of Ethics and Management", Excel Publication, 2005.
5. Bajpai B L, "Indian Ethos and Modern Management", New Royal Book Co, Lucknow, Reprinted 2008.
6. Seebauer and Robert L Berry, "Fundamentals of Ethics for Scientist and Engineers", Oxford University Press, 2000.

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20CE505L	SURVEY CAMP (2 WEEKS - DURING IV SEMESTER)	L T P C 0 0 0 1

OBJECTIVES:

The Students should be made to:

- Acquire knowledge to get practical training on traversing
- Understanding radial tachometric contouring, block level and L.S and C.S
- Develop skills on alignment of roads and canals
- Calculate latitude, longitude and azimuth using GPS
- Plot offset of buildings and setting of curve

The objective of the survey camp is to enable the students to get practical training in the field work. Groups of not more than six members in a group will carry out each exercise in survey camp. The camp must involve work on a large area of not less than 40 acres outside the campus (Survey camp should not be conducted inside the campus). At the end of the camp, each student shall have mapped and contoured the area. The camp record shall include all original field observations, calculations and plots.

Two weeks Survey Camp will be conducted during summer vacation in the following activities:

1. Traverse - using Total station
2. Contouring
   i. Radial tachometric contouring - Radial Line at every 45 Degree and Length not less than 60 Meter on each Radial Line
   ii. Block Level / by squares of size at least 100 meter x 100 meter at least 20 meter interval
   iii. L.S & C.S - Road and canal alignment for a length of not less than 1 Kilo Meter at least L.S at every 30 m and C.S at every 90 m.
3. Offset of Buildings and Plotting the Location
4. Sun observation to determine azimuth (guidelines to be given to the students)
5. Use of GPS to determine latitude and longitude and locate the survey camp location
6. Traversing using GPS
7. Curve setting by deflection angle

Apart from above students may be given survey exercises in other area also based on site condition to give good exposure on survey. The students will be evaluated through a viva-voce examination by a team of internal staff.

OUTCOMES:

On successful completion of this course, the students will be able to,

- Evaluate traversing using GPS and total station
- Plot contour and map area using radial tachometric contouring
- Determine road and canal alignment by L.S and C.S
- Measure azimuth readings from sun observations
- Execute offset of buildings to plot the location and setting of curves from field observations

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20CE506L	GEOTECHNICAL ENGINEERING LABORATORY (COMMON TO CIVIL AND AGE)	L	T	P	C
		0	0	3	1

OBJECTIVES:

The student should be made to:

- Develop skills to test the soils for their index and engineering properties
- Characterize the soil based on their properties
- Determine insitu density and compaction characteristics
- Understand permeability characteristics of soil
- Learn consolidation and shear properties of soil

I. DETERMINATION OF INDEX PROPERTIES

1. Specific gravity of soil solids
2. Grain size distribution – Sieve analysis
3. Grain size distribution – Hydrometer analysis
4. Liquid limit and Plastic limit tests
5. Shrinkage limit and Differential free swell tests

II. DETERMINATION OF INSITU DENSITY AND COMPACTION CHARACTERISTICS

1. Field density Test (Sand replacement method and core cutter method)
2. Determination of moisture – density relationship using standard proctor compaction test.
3. Determination of relative density.

III. DETERMINATION OF ENGINEERING PROPERTIES

1. Permeability determination (Constant head and falling head methods)
2. One dimensional consolidation test (Determination of Co-efficient of consolidation only)
3. Direct shear test in cohesionless soil.
4. Unconfined compression test in cohesive soil.
5. Laboratory vane shear test in cohesive soil.
6. Tri-axial compression test in cohesionless soil (Demonstration only).
7. California Bearing Ratio test.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Calculate index properties of soil
- Perform grain size distribution using both sieve analysis and hydrometer analysis
- Execute compaction and field density test
- Determine permeability of soil using both constant and falling head method
- Enumerate consolidation and shear test in soil

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REFERENCES:

1. "Soil Engineering Laboratory Instruction Manual" Published by Engineering College Cooperative Society, Anna University, Chennai, 2010.
2. Lambe T W, "Soil Testing for Engineers", John Wiley and Sons, New York, 1951. Digitized 2008.
3. Saibaba Reddy E, Rama Sastri K, "Measurement of Engineering Properties of Soils", New Age International Pvt. Limited Publishers, New Delhi, 2002.
4. IS Code of Practice (2720) Relevant Parts, as amended from time to time, Bureau of Indian Standards, New Delhi.

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24/6/24

20CE507L	HIGHWAY ENGINEERING LABORATORY	L	T	P	C
		0	0	2	1

OBJECTIVES:

The student should be made to:

- Understand basic properties of coarse aggregates
- Learn abrasion property of coarse aggregates
- Study specific gravity of bitumen
- Determine viscosity, penetration and softening test on bitumen
- Perform marshall stability test on bitumen mixes

I. TEST ON AGGREGATES

1. Specific gravity of aggregates
2. Fineness modulus of aggregates – Sieve analysis
3. Los angeles abrasion test
4. Water absorption of aggregates

II. TEST ON BITUMEN

1. Specific gravity of bitumen
2. Penetration test
3. Viscosity test
4. Softening test

III. TESTS ON BITUMINOUS MIXES

1. Stripping test
2. Determination of binder content
3. Marshall stability and flow values

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Characterize various pavement materials through relevant tests
- Determine various properties of coarse aggregates
- Calculate basic properties test on bitumen
- Enumerate penetration, viscosity values of bitumen
- Evaluate tests on bitumen mixes

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REFERENCES:

1. "Highway Materials and Pavement Testing", New Chand and Bros., Roorkee, Revised Fifth Edition, 2009.
2. IS 1201–1978 to IS 1220–1978, "Methods for Testing Tar and Bituminous Materials", Bureau of Indian Standards.
3. IS 2386 – 1978, "Methods of Test for Aggregates", Bureau of Indian Standards.
4. "Mix Design Methods Asphalt Institute Manual Series No.2", Lexington, USA. 6th Edition,1997,

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20EEC501L	PROFESSIONAL SKILLS DEVELOPMENT (COMMON TO ALL BRANCHES)	L	T	P	C
		0	0	2	1

OBJECTIVES:

The student should be made to:

- Sharpen problem solving skills and to improve thinking ability of the students
- Drive the students to use language with great commitment and cooperation
- Expertise the creative thinking and presentation skills to meet company needs
- Develop and foster the soft skills through individual and group activities
- Expose students to right attitudinal and behavioral thoughts

UNIT I INTRODUCTION TO BASIC ARITHMETIC AND PERSONALITY TRAIT **6**

Aptitude – Numbers, Average, Percentage, Profit and loss, Picture pattern; Soft skills – Personality development, Professional ethics, Perception insights, attitude and behavioral changes.

UNIT II CONCEPT OF PROPORTIONALITY AND INTERPERSONAL SKILLS **6**

Aptitude – Time and work, Pipes and cisterns, Series completion, Critical reasoning; Soft skills – Developing self esteem, Significance of interpersonal behavior and interpersonal relationships.

UNIT III AN APPROACH TO COGNITIVE APTITUDE AND LEADERSHIP SKILLS **6**

Aptitude – Time, speed and distance, Boats and streams, Races and games, Syllogism; Soft skills – Leadership – Characteristics and importance of leadership, Roles and responsibilities of a good Leader.

UNIT IV CONTEMPORARY APTITUDE AND SITUATIONAL RESPONSES **6**

Aptitude – Crypt arithmetic, Ranking, Logarithms, Cubes, Analogy; Soft skills – Decision making – Process and challenges, Creative and Critical thinking.

UNIT V NON-VERBAL REASONONG AND INFLUENCING OTHERS **6**

Aptitude – Clocks, Non – verbal reasoning, Permutation, Classifications; Soft skills – Presentation skills – Make use of visual aids with modern tools, Insights on persistence and perseverance.

TOTAL: 30 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Ability to solve both analytical and logical problems in an effective manner
- Practice to organize and convey the information in such an optimistic way
- Deliver a professional and constructive presentation
- Recognize explicit assumptions and their consequences
- Access the needed information effectively and efficiently

TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing New Delhi, Revised Edition, 2017.
2. Murty G R K, "Soft Skills for Success", DGM Icfai Books, Revised Edition, 2005.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education; Sixth edition, 2016.
2. Aggarwal R S, "A Modern Approach to Verbal and Non-Verbal Reasoning", S Chand Publishing, New Delhi, 2018.
3. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education; Eighth Edition, 2018.
4. Covey Sean, "Seven Habits of Highly Effective Teens", Fireside Publishers, New York, 1998.
5. Carnegie Dale, "How to Win Friends and Influence People", Simon and Schuster, New York, 1998.

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20CE601 DESIGN OF STEEL STRUCTURES **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand concepts of limit state and working stress method of design of structural steel members and various types of connections.
- Determine net area and effective sections in tension members, tension splices, lug angles and gussets.
- Execute design of compression members as per IS Codal practice.
- Analyze concepts of design of flexural members.
- Design structural systems such as roof trusses, gantry girders as per provisions of IS 800 – 2007 of practice for limit state method.

UNIT I INTRODUCTION **9**

Introduction to steel structures – Comparison of Working stress and Limit state method of design – Properties of steel – Structural steel sections – Types of connections – Design of bolted and welded connections for axial load – Efficiency of joint.

UNIT II TENSION MEMBERS **9**

Introduction to types of tension members – Calculation of net area – Net effective sections for angles and Tee in tension – Design of tension members – Design of tension splices, Lug Angles and Gussets.

UNIT III COMPRESSION MEMBERS **9**

Introduction to types of compression members – Loads on compression member – Influence of effective length and slenderness ratio on the strength of column – Codal provisions for compression members – Design of compression members – Design of lacing – Design of Battening.

UNIT IV DESIGN OF BEAMS **9**

Introduction to design of flexural members – Design of laterally supported and unsupported beams – Design of plate girders – Intermediate and bearing stiffeners.

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UNIT V MISCELLANEOUS TOPICS 9

Roof trusses – Roof and side coverings – Design of purlin and elements of truss, end bearing – Design procedure of gantry girder.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze different types of bolted and welded connections.
- Develop skills to design tension members, splices, lug angles and gussets.
- Elaborate IS Code design practice of various compression members.
- Design laterally supported and unsupported beams, built-up beams, plate girders and stiffeners.
- Acquire knowledge about components of industrial structures, Gantry girders and roof trusses.

TEXT BOOKS:

1. Bhavikatti S S, "Design of Steel Structures", By Limit State Method as per IS: 800 – 2007, IK International Publishing House Pvt. Ltd., 2019.
2. Subramanian N, "Design of Steel Structures", Oxford University Press 2011.

REFERENCE BOOKS:

1. Duggal S K, "Limit State Design of Steel Structures", Tata, McGraw Hill Education Pvt. Ltd., New Delhi, 2017.
2. Shiyekar M R, "Limit State Design in Structural Steel", PHI Learning Private Limited, New Delhi, 2nd Edition, 2013.
3. IS: 800 – 2007, IS: 800 – 1984, "General Construction in Steel – Code of Practice", BIS, New Delhi, 3rd Edition, 2017.

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24/6/24

20CE602 STRUCTURAL ANALYSIS-II

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Analyze statically indeterminate structures by flexibility matrix method.
- Evaluate structure stiffness matrix to solve indeterminate structures by stiffness method.
- Understand the basic concepts of finite element method and its applications in structural analysis.
- Acquire knowledge on plastic analysis of indeterminate beams and frames.
- Determine analysis of space and cable structures.

UNIT I FLEXIBILITY METHOD 9

Equilibrium and compatibility – Determinate vs Indeterminate structures – Indeterminacy – Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

UNIT II STIFFNESS METHOD 9

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames (with redundancy limited to two).

UNIT III FINITE ELEMENT METHOD 9

Introduction – Discretization of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain – Triangular elements.

UNIT IV PLASTIC ANALYSIS OF STRUCTURES 9

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

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UNIT V SPACE AND CABLE STRUCTURES 9

Analysis of Space trusses using method of tension coefficients – Beams curved in plan – Suspension cables – suspension bridges with two and three hinged stiffening girders.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze pin-jointed and rigid plane frames, continuous beams by flexibility matrix method.
- Solve statically indeterminate structures using stiffness matrix method.
- Apply finite element method in structural analysis.
- Calculate collapse loads for beams and frames by plastic analysis.
- Determine the member forces acting on suspension bridges and space truss.

TEXT BOOKS:

1. Vaidyanathan R and Perumal P, "Comprehensive Structural Analysis – Vol. I and II", Laxmi Publications, New Delhi, 4th Edition, 2019.
2. Bhavikatti S S, "Structural Analysis – Vol. 1 and Vol. 2", Vikas Publishing House Pvt. Ltd., New Delhi, 2010.

REFERENCE BOOKS:

1. Punmia B C, Ashok Kumar Jain and Arunkumar Jain, "Theory of Structures", Laxmi Publications, New Delhi, 2017.
2. Ghali A, Neville A M and Brown T G, "Structural Analysis a Unified Classical and Matrix Approach", 6th Edition, SPON Press New York, 2009.

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24/6/24

20CE603 WATER SUPPLY AND WASTE WATER ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart knowledge on basic principles of water supply system, planning and sources of water.
- Understand the various conveyance systems of water from the sources.
- Design various water treatment plant units and distribution system.
- Analyze principles of planning, sources and estimation of wastewater.
- Acquire knowledge on design, construction and operation of primary and secondary treatment of sewage.

UNIT I SOURCES OF WATER SUPPLY **9**

Importance and necessity for planned public water supplies – Planning and execution of modern water supply systems – Design period, population forecasting, water demand – Sources of water and their characteristics – Surface and ground water storage reservoir – Development and selection of source – Surface water quality – Characterization significance – Drinking water quality standards (IS – WHO).

UNIT II CONVEYANCE FROM THE SOURCES **9**

Intake structures – Factors governing the location of an intake – Types of intakes – Functions – Pipes and conduits for transporting water – Pipe materials – Hydraulics of flow in pipes – Transmission main design – Laying, jointing and testing of pipes – Appurtenances of pipes – Types of pumps – Selection of pumps.

UNIT III WATER TREATMENT **9**

Unit operation and process – Design of water treatment plant units, aerators flash mixers, sedimentation, coagulation, and flocculation – Clariflocculator and sand filters principles of disinfection – Residue management – Construction, operation and maintenance of treatment plants.

UNIT IV SEWERAGE SYSTEMS PLANNING AND SOURCES **9**

Sources of wastewater generation – Sewerage – Planning – Steps involved – Objectives – Design period – Effects – Population forecasting methods – Estimation of sanitary sewage flow – Estimation of storm runoff – Characteristics and composition of sewage – Significance

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UNIT V TREATMENT OF SEWAGE 9

Objectives – Unit operation and processes – Primary treatment – Principles, functions, design and drawing of screen, grit chambers and primary sedimentation tanks – Onsite sanitation – Septic tank – Secondary treatment – Objectives – Selection of treatment methods – Principles, functions, design and drawing of units – Activated sludge process and trickling filter – Oxidation ditches, UASB and waste stabilization ponds – Recent advances in sewage treatment – Sewage treatment plants – Construction, operation and maintenance.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze the various characteristics and sources of water supply.
- Classify the intake structures, pipes and pumps.
- Design water treatment plant and other unit operations.
- Plan and design the collection system of wastewater from its sources.
- Apply suitable method for the treatment of waste water.

TEXT BOOKS:

1. Garg S K, "Environmental Engineering Vol I. Water Supply Engineering", Khanna Publishers, New Delhi, 2019.
2. Garg S K, "Environmental Engineering Vol II. Sewage Disposal and Air Pollution Engineering", Khanna Publishers, New Delhi, 2016.

REFERENCE BOOKS:

1. Punmia B C, Ashok K Jain and Arun K Jain, "Water Supply Engineering", Lakshmi Publications (P) Ltd., New Delhi, 2016.
2. Modi P N, "Water Supply Engineering – I", Standard Book House, New Delhi, 2018.
3. Punmia B C, Ashok K Jain and Arun K Jain, "Waste Water Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 2016.
4. Metcalf and Eddy, "Wastewater Engineering – Treatment and Reuse", Tata McGraw Hill, New Delhi, 2017.
5. Patwardhan A D, "Industrial Waste Water Treatment", PHI Learning Pvt. Ltd., New Delhi, 2013.

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24/6/24

20CE604 ESTIMATION COSTING AND VALUATION ENGINEERING **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Impart knowledge on basic concepts of estimation.
- Analyze the rate of each work item according to the specifications.
- Identify various items of works in building and calculate their quantities using appropriate methods.
- Understand different methods of estimation of various civil engineering structures.
- Acquire skills to calculate valuation of buildings.

UNIT I INTRODUCTION TO ESTIMATION AND SPECIFICATION **9**

General introduction to estimation – Purpose of estimates – Types of estimates – Units of measurements for works and materials – Degree of accuracy in measurements – Purpose and basic principles of general and detailed Specifications – Detailed specifications for various items of work – Report accompanying the estimate.

UNIT II RATE ANALYSIS, TENDERS & CONTRACTS **9**

Data – Lead statement – Schedule of rates – Standard data book – Lump sum provision – Task out turn of work – Rate analysis for various work items – Tender and process of tendering – Contracts – Types of contracts – Arbitration and legal requirements.

UNIT III BUILDING ESTIMATE **9**

Taking out quantity – Measurement, abstract sheets and recording of measurements – Centre line method and long wall – Short wall method – Detailed estimate of masonry buildings and R.C.C works – Preparation of bar bending schedule – Various types of arches – Calculation of brick work and RCC works in arches – Deductions for openings – Preparation of bills of quantities Approximate estimates – Case studies.

UNIT IV ESTIMATE OF OTHER STRUCTURES **9**

Industrial sheds – Steel trusses – Water supply and sanitary works – Septic tank, soak pit, manhole – Roads – Earth work, pitching of slopes, hill roads – Estimation of R.C.C. slab culvert, pipe culvert – Irrigation works – Canals, aqueducts.

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UNIT V VALUATION 9

Purpose of valuation – Types – Book value – Market value – Salvage value – Scrap value – Depreciation – Obsolescence – Sinking fund – Land valuation – Mortgage and lease – Problems on valuation – Annuity – Definition and types only – Fixation of rent – Outgoing – Gross and net income – Years purchase – Capital cost – Standard rent.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Prepare estimation corresponding to the available specification.
- Arrive rates of various work items and get familiarized with tendering and contract process.
- Calculate the quantities of various items of work in a building by entering them in a standard measurement sheet.
- Measure quantities and estimate different civil engineering structures.
- Determine the valuation of properties considering various factors.

TEXT BOOKS:

1. Dutta B N, "Estimating and Costing in Civil Engineering Theory and Practice," UBS Publishers Pvt. Ltd., 2017.
2. Patil B S, "Civil Engineering Contracts and Estimates", Universities Press (India) Pvt. Ltd., 2015.

REFERENCE BOOKS:

1. Birdie G S, "A Text Book on Estimating and Costing", Dhanpat Rai Co. Pvt. Ltd., New Delhi, 2013.
2. Chakraborti M, "Estimating, Costing, Specification and Valuation in Civil Engineering", M Chakraborty Publication, 2006.

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Rej 1/6/24

20CE605L STRUCTURAL DESIGN AND DRAWING

L	T	P	C
0	0	3	1

OBJECTIVES:

The student should be made to:

- Acquire knowledge on liquid retaining structures and retaining wall.
- Explain about the detailing of various RC and Steel structures.
- Analyze and design solid slab, flat slab, bridge, culverts and tanks.
- Design earth, gravity dams and diverting structures.
- Determine dimensions of slab base and gusseted base.

LIST OF EXPERIMENTS

1. Design and drawing of Reinforced Concrete cantilever and counterfort retaining walls
2. Design and drawing of Reinforced Concrete rectangular and circular water tank
3. Design of solid slab and RCC T beam bridge deck.
4. Design of box culvert and pipe culvert.
5. Design of flat slab
6. Design of tank surplus weir
7. Design of tank sluice with tower head
8. Design principles of earth dam and gravity dam
9. Design of hemispherical bottomed steel tank
10. Design of slab base
11. Design of gusseted base

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand design and detailing of different types of retaining walls.
- Design and draw reinforced concrete water tanks, dams, culverts.
- Execute the dimensions and draw the detailing of tank surplus weir, tank sluice.
- Calculate the dimensions of flat slab, solid slab, T-beam deck bridge.
- Analyze and design the dimensions of slab base and gusseted base.

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REFERENCES:

1. Krishna Raju N, "Structural Design and Drawing", University Press (India) Pvt. Ltd., New Delhi, 3rd Edition, 2006.
2. Varghese P C, "Advanced Reinforced Concrete Design", Prentice Hall International Edition, 2011.

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24/6/24

20CE606L WATER SUPPLY AND WASTEWATER ENGINEERING LABORATORY

L	T	P	C
0	0	3	1

OBJECTIVES:

The student should be made to:

- Determine pH, turbidity, hardness, chlorides, and other characteristics of water.
- Calculate alkalinity and acidity of water.
- Measure BOD, COD, DO, residual chlorine and optimum coagulant dosage.
- Execute the calculation of suspended, volatile, settle able and fixed solids.
- Analyze SVI of biological sludge.

LIST OF EXPERIMENTS

1. Determination of pH and turbidity.
2. Determination of hardness and chlorides.
3. Determination of alkalinity and acidity.
4. Determination of COD.
5. Determination of BOD.
6. Determination of dissolved oxygen.
7. Determination of phosphates and sulphates.
8. Determination of sodium and potassium.
9. Determination of fluoride.
10. Determination of residual chlorine.
11. Determination of optimum coagulant dosage.
12. Determination of suspended, settleable, volatile and fixed solids.
13. Determination of SVI of biological sludge.
14. Determination of MPN index of given water sample.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Evaluate percentage of fluorides, phosphates, sulphates, sodium, potassium and other permissible standard limits of water.
- Measure BOD, COD and dissolved oxygen of waste water.
- Determine optimum coagulant dosage using jar test.
- Calculate MPN index and different amount of solids present in water.
- Analyze the amount SVI present in biological sludge.

REFERENCES:

1. Garg S K, "Environmental Engineering", Volume – I and II, Khanna Publishers, New Delhi, 28th Edition, 2013.
2. Manual on Water Supply and Treatment, CPHEEO, New Delhi, 3rd Edition, 2010.
3. "Standard Methods for Examination of Water and Wastewater Engineering", American Public Health Association, Washington, 22nd Edition, 2005.
4. http://web.iitd.ac.in/~arunku/files/CVL212_Y15/Lab_CVL212v1.pdf.
5. https://www.slideshare.net/RambabuPalaka/environmental-engineering-lab-manual.

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20EEC601L	EMPLOYABILITY SKILLS	L T P C 0 0 2 1

OBJECTIVES:

The student should be made to:

- Learn the application of mathematical and project management to different contexts
- Focus on quantitative ability and employability skills through modern practices
- Enhance job skills and analytical ability of students
- Improve reasoning skills and employability skills
- Practice the skills on logical reasoning and interview techniques

UNIT I INTRODUCTION TO NUMERIC ABILITY AND PROJECT MANAGEMENT **6**

Aptitude – Ratio and Proportion – Partnership – Allegation of Mixtures – Coding and Decoding - Number Sequence.

Soft Skills – Managerial Skills – Project Cost, Risk and Task Management, Conflict Management and Resolution.

UNIT II QUANTITATIVE ANALYSIS AND EMPLOYERS EXPECTATIONS **6**

Aptitude – Number System – Data Interpretation – Chain Rule – Surds and Indices – Direction Sense.

Soft Skills – Employers Needs and Expectations – Mind Mapping – Situation Reaction Test (SRT).

UNIT III ANALYTICAL SKILLS AND JOB READINESS **6**

Aptitude – Combination – Probability – Problems on Ages – Seating Arrangements.

Soft Skills – Job Application – Resume Building – Exploring and Identifying Career Options.

UNIT IV REASONING ABILITY AND INSIGHT ON INTERVIEWS **6**

Aptitude – Mensuration – SI and CI – Cause and Effect – Statement, Assumptions and Conclusions.

Soft Skills – Interview Techniques – Job Description – Roles and Responsibilities – Work Etiquettes.

UNIT V LOGICAL REASONING AND READY RECKONERS FOR INTERVIEWS **6**

Aptitude – Input – Output Tracing – Trains – Calendar – Blood Relations.

Soft Skills – Types of Interview – Interview Process – Analyzing the Interviewer – HR Questions – Mock Interviews.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Develop numerical ability and project management skills
- Achieve quantitative skills and employability skills
- Understand both analytical and job readiness in a productive manner
- Acquire reasoning ability and interview techniques
- Obtain logical skills and interviewers expectations

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TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing New Delhi, Revised Edition, 2017.
2. Murty G R K, "Soft Skills for Success", DGM ICFAI books, Revised Edition, 2005.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education, Sixth Edition, 2016.
2. Carnegie Dale, "How to Win Friends and Influence People", Simon and Schuster New York, 1998.
3. Thomas A Harris, "I'm OK - You're OK", Harper and Row New York, 1972.
4. Rajesh Verma, "Fast Track Objective Arithmetic", Arihant Publications (India) Limited, 2012.
5. Arun Sharma, "How to Prepare for Quantitative Aptitude for CAT", McGraw Hill Education, Eighth Edition, 2018.

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BoS/S&H

20CE607L MINI PROJECT-I

L	T	P	C
0	0	2	1

OBJECTIVES:

The student should be made to:

- Identify the real time problems.
- Analyze new solutions and techniques to the existing problems.
- Demonstrate the working principles of various models.
- Apply Civil Engineering knowledge to do a mini project.
- Acquire skills in the area of design, fabrication and modeling.

STRATEGY

To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

TOTAL: 30 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the problems and develop solutions to it.
- Express ideas and updated technologies in a novel way.
- Implement different technical ideas and methodologies in practical aspects.
- Apply new tools, fabrication, designs, algorithms and techniques that contribute to obtain the solution in an ideal manner.
- Develop skills of team spirit and effective presentation.

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24/6/24 civil

20CE701 CONCRETE TECHNOLOGY **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Evaluate various requirements of cement, aggregates and water for making concrete.
- Understand various effects of admixtures on properties of concrete.
- Gain knowledge on different concepts and procedure of mix design as per IS method.
- Determine properties of concrete at fresh and hardened state.
- Execute the importance and application of special concretes.

UNIT I CONCRETE MAKING MATERIALS **9**

Cement – Chemical composition and properties – Tests on cement – IS Specifications – Hydration of cement – Aggregates – Classification, grading and tests as per BIS specification – Alkali aggregate reaction – Thermal properties of aggregates, water – Quality of water for use in concrete.

UNIT II CHEMICAL AND MINERAL ADMIXTURES **9**

Accelerators – Retarders – Plasticizers – Super plasticizers – Water proofers – Mineral Admixtures like fly ash, silica fume, ground granulated blast furnace slag and metakaoline – Effects on concrete properties.

UNIT III CONCRETING METHODS AND MIX DESIGN **9**

Concrete – Manufacturing process, methods of transportation, placing, compacting and curing – Admixtures – Their effects on concrete properties – Principles of concrete mix design – Factors influencing mix design – Nominal and design mix – IS method of concrete mix design.

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE **9**

Fresh concrete – Workability – Measurement of workability – Factors affecting workability – Hardened concrete – Strength – Stress strain characteristics – segregation and bleeding – Shrinkage – Creep – Durability of concrete – Water absorption – Permeability – Corrosion test – Acid resistance.

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UNIT V SPECIAL CONCRETES 9

Properties and applications – Light weight concrete – Ferro-cement – Fiber reinforced concrete – Polymer concrete – Air entrained concrete – High performance concrete – High strength concrete – Self compacting concrete – Vacuum concrete – Ready mix concrete – SIFCON – Geopolymer concrete.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply knowledge on various requirements of concrete making materials.
- Analyze the effect of chemical and mineral admixtures on properties of concrete.
- Understand various concreting methods and mix design procedure as per IS method.
- Recognize various fresh and hardened properties of concrete.
- Enumerate properties and applications of special concrete.

TEXT BOOKS:

1. Shetty M S, "Concrete Technology Theory and Practice", S Chand and Company Ltd, New Delhi, 2019.

REFERENCE BOOKS:

1. Gupta B L and Amit Gupta, "Concrete Technology", Jain Book Agency, 4th Edition, 2010.
2. Santhakumar A R, "Concrete Technology", Oxford University Press India, 2nd Edition, 2018.
3. IS: 10262 – 2009, Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 1st Edition, 1998.

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CIVIL

20MG501	PRINCIPLES OF MANAGEMENT	L	T	P	C
	(COMMON TO CIVIL, CSE, ECE, EEE, IT AND MECH)	3	0	0	3

OBJECTIVES:

The Student should be made to:

- Know about the overview of the Management
- Understand various planning tools and techniques
- Learn various structures and designs of organization
- Familiarize with various directing approaches and its impact
- Impart knowledge on the concepts and applications of controlling

UNIT I OVERVIEW OF MANAGEMENT 9

Introduction to Management and Organizations – Management Functions – Types of Managers – Managerial Roles and Skills – Evolution of Management Theory – Managing in a Global Environment – Social Responsibility and Managerial Ethics – Organization's Culture – Source, Types of Organization.

UNIT II PLANNING 9

Foundation of Planning – Purposes of Planning – Types of Plan – Process of Planning – Policies – Planning Tools and Techniques – Importance of Strategic Management – Process – Types of Organizational Strategies – MBO – Decision Making Process – Types of decision.

UNIT III ORGANISING 9

Organization Structure – Organizational Design – Departmentation – Span of Control – Centralization and Decentralization – Human Resource Management – Process – HR Planning – Recruitment – Selection –Training – Performance Management – Career Development– Forces of Managing Change – Types of Change – Innovation.

UNIT IV DIRECTING 9

Foundations of Behavior – Motivation Theories – Leadership – Functions, Style and Theories of Leadership – Team and Team work – Types , Characteristics of Teams – Communication – Process of Communication – Barrier to Effective Communication – Communication and IT.

UNIT V CONTROLLING 9

Foundation of Control – Importance, Process and Tools – Budgetary and Non-Budgetary Control Methods – Types of Budgets – Auditing – MIS – Operation System – Importance of Operations Management – Designing Operations System – Reporting.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply various managerial roles and skills
- Use planning tools and techniques for effective decision making
- Implement the applications of organizational structures
- Execute various directing approaches for effective communications
- Evaluate the applications of controlling in an organization

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BoS (MECH)

TEXT BOOKS:

1. Stephen P Robbins and Mary Coulter, "Management", Prentice Hall of India, 14th Edition, 2019.
2. James A F Stoner, Edward Freeman R and Daniel R Gilbert Jr., "Management", Pearson Education, 6th Edition, 2015.

REFERENCES:

1. Prasad L M, "Principles and Practice of Management", Sultan Chand and Sons, 10th Edition, 2020.
2. Hellriegel, Slocum and Jackson, "Management-A Competency Based Approach", Thomson South Western, 10th Edition, 2007.
3. Harold Koontz, Heinz Weihrich and Mark V Cannice, "Management-A global & Entrepreneurial Perspective", Tata Mcgraw Hill, 12th Edition, 2007.
4. Andrew J Dubrin, "Essentials of Management", Thomson South-western, 7th Edition, 2007.

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BoS (MECH)

20CE702L MINI PROJECT-II

L	T	P	C
0	0	2	1

OBJECTIVES:

The student should be made to:

- Execute design calculations in all structures related to the core area of civil engineering.
- Calculate loads and support conditions acting on the structures.
- Analyze specifications and data's required for the design of structures as per standards.
- Elaborate drawings in detail for the executed design.
- Evaluate skills in report preparation and project presentation.

The objective of this course is to impart and improve the design capability of the student. This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than three. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

Evaluation Procedure

The method of evaluation will be as follows:

1. Internal Marks: 20 marks (Decided by conducting 3 reviews by the guide appointed by the Institution)
2. Evaluation of Project Report: 30 marks (Evaluated by the external examiner appointed the University). Every student belonging to the same group gets the same mark.
3. Viva voce examination: 50 marks (Evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal weight age)

TOTAL: 30 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Design structures related to all specialization of civil engineering with its required standards.
- Analyze load calculations, support conditions, materials and stability requirements.
- Understand specifications, calculations and data's required for the design of structures.
- Execute drawings in different views as per design both manually and using software.
- Develop skills in innovation, report preparation, project presentation and team spirit.

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20CE801L PROJECT WORK

L	T	P	C
0	0	20	10

OBJECTIVES:

The student should be made to:

- Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach.
- Reproduce, improve and refine technical aspects for engineering projects.
- Critically analyze existing systems, thereby select and justify parameters to be improved.
- Achieve precision in uses of the tools related to their experiments/fabrication.
- Validate theoretical and reported data with results obtained from numerical/ experimental/ analytical study.

The objective of this course is to impart and improve the innovation of the student in peer review procedure from the prerequisites of technical knowledge as gained. This course conceives purely understanding of professional, ethical responsibilities, also review, evaluate the literature available related to chosen problem in any one of the disciplines of Civil Engineering, Formulate new expressions, ideas to solve that selected problem to enhance problem solving skill. The problem can be allotted to either an individual student or a group of students comprising of not more than three. At the end of the course the group should submit a complete report on the civil innovation problem.

The method of evaluation will be as follows:

1. Internal Marks: 20 marks (Decided by conducting 3 reviews by the guide appointed by the Institution)
2. Evaluation of Project Report: 30 marks (Evaluated by the external examiner appointed the University). Every student belonging to the same group gets the same mark.
3. Viva voce examination: 50 marks (Evaluated by the internal examiner appointed by the HOD with the approval of HOI, external examiner appointed by the University and Guide of the course – with equal weight age)

TOTAL: 300 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify thrust area in civil engineering and finalize problem statement.
- Evaluate overall technical knowledge and industry readiness.
- Analyze various applications of civil engineering in real life problem solving.
- Recognize scope of future studies.
- Develop skills in innovation, report preparation, project presentation and team spirit.

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24/8/24

20CE603PE URBAN PLANNING AND DEVELOPMENT **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on introduction to urban transportation planning.
- Analyze the different types, methods of module C trip generation.
- Understand the concepts, types and various methods of module D trip distribution.
- Learn the various types and effects of module E modal split.
- Gain knowledge on various trips, directions, network properties and algorithm, curves of module F traffic assignment.

UNIT I INTRODUCTION TO URBAN TRANSPORTATION PLANNING **9**

Urbanization – Urban transportation – Impacts – Behavioral changes – Urban transportation problems and externalities – Congestion – Safety – Emissions – Introduction to transport planning – Transport planning morphology – Problem definition – Solution generation – Solution analysis, evaluation and choice – Implementation – Hierarchical levels of urban transport planning – Conceptual plan – Outline plan – Master plans, statutory or advisory plans – Detailed development plans.

UNIT II MODULE-C: TRIP GENERATION **9**

Introduction – Basic considerations in trip generation – Amount of urban activity – Character of urban activity – Other considerations – Special generators – Trip classification – Factors affecting trip generation – Methods of trip generation – Regression analysis – Trip rate analysis – Cross classification analysis – Multiple linear regression – Regression analysis concept – Multiple linear regression – Trip generation model calibration.

UNIT III MODULE-D: TRIP DISTRIBUTION **9**

Introduction – Basic considerations in trip distribution – P-A matrix to O-D matrix – Factors affecting trip distribution – Properties of transport network, spatial separation between various zones growth factor methods – Uniform factor method, Average factor method, Detroit method, Fratar method – Furness method, Synthetic methods – Introduction to gravity model – Calibration – BPR approach of calibration intervening opportunities model – Concept – Advantages and limitations.

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UNIT IV MODULE-E: MODAL SPLIT 9

Introduction – Types of modal split models – Trip end type and trip interchange type – Limitations – Aggregate and disaggregate models – Elements of choice decision process – Utility theory – Probabilistic choice theory – Binary choice models – Binary logit model, discriminant analysis and probit analysis – Logit model – Multinomial logit model – Nested logit model, estimation of logit models, two-stage modal split models.

UNIT IV MODULE-F: TRAFFIC ASSIGNMENT 9

Person trips and vehicle trips – Diurnal patterns of demand – Trip directions – Network properties – Characteristics of link (capacity, free flow speed and travel time), link flows – Zonal flows – Network connectivity, minimum spanning tree and shortest path – Network algorithms – Kruskal, prims Dijkstra and Floyd – Route choice behavior – User equilibrium – System equilibrium – Stochastic equilibrium – Diversion curves – California diversion curves – Detroit diversion curves – Bureau of public roads diversion curves.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the concepts of urban transportation planning.
- Execute the various methods, characters of module C trip generation and calibration.
- Evaluate the different concepts of module D trip distribution.
- Analyze the types, limitations, and elements of module E modal split.
- Attain knowledge on various concepts of module F traffic assignment.

TEXT BOOKS:

1. Kadiyali L R, "Traffic Engineering and Transport Planning", Khanna Publishers, 9th Edition, 2017.

REFERENCE BOOKS:

1. Jotin Khisty C and Kent Lall B, "Transportation Engineering", Pearson Publishers, 3rd Edition, 2017.
2. Papacostas C S and Prevedouros P D, "Transportation Engineering and Planning", Pearson Education India, 3rd Edition, 2015.

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20/6/24

20CE706PE PAVEMENT ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand types of pavement and its stress distribution.
- Design flexible pavements as per IRC guidelines.
- Acquire skills on various IRC standards in design of rigid pavements.
- Evaluate performance, quality and serviceability conditions of roads.
- Measure stabilization of pavements as per standards.

UNIT I TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM **9**

Introduction – Pavement as layered structure – Pavement types rigid and flexible – Resilient modulus – Stress and deflections in pavements under repeated loading.

UNIT II DESIGN OF FLEXIBLE PAVEMENTS **9**

Flexible pavement design factors influencing design of flexible pavement, empirical – Semi empirical and theoretical methods – Design procedure as per IRC guidelines – Design and specification of rural roads.

UNIT III DESIGN OF RIGID PAVEMENTS **9**

Cement concrete pavements factors influencing CC pavements – Modified Westergaard approach – Design procedure as per IRC guidelines – Concrete roads and their scope in India.

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE **9**

Pavement Evaluation – Causes of distress in rigid and flexible pavements – Evaluation based on surface appearance, cracks, patches and pot holes, undulations, raveling, roughness, skid resistance – Structural evaluation by deflection measurements – Pavement serviceability index – Pavement maintenance (IRC Recommendations only).

UNIT V STABILIZATION OF PAVEMENTS **9**

Stabilization with special reference book to highway pavements – Choice of stabilizers – Testing and field control – Stabilization for rural roads in India – Use of geosynthetics in roads.

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TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Calculate stress and deflections in pavements under repeated loading.
- Design flexible pavement as per IRC standards.
- Understand design concepts of rigid pavement as per IRC guidelines.
- Execute various techniques to evaluate performance and maintenance of pavements.
- Evaluate stabilization of pavements as per reference book of highway pavements.

TEXT BOOKS:

1. Wright P H, "Highway Engineers", John Wiley and Sons, Inc., New York, 2003.
2. Khanna S K, Justo C E G and Veeraragavan A, "Highway Engineering", Nem Chand and Brothers, Roorkee, 10th Edition, 2014.
3. Kadiyali L R, "Principles and Practice of Highway Engineering", Khanna Tech. Publications, New Delhi, 2016.

REFERENCE BOOKS:

1. Yoder R J and Witchak M W, "Principles of Pavement Design", John Wiley, 2015.
2. Rajib B Mallick, Tahar El Korchi, "Pavement Engineering Principles and Practice", CRC Press, 2nd Edition, 2017.
3. IRC: 37 – 2018, "The Indian Roads Congress, Guidelines for the Design of Flexible Pavements", New Delhi, 2001.
4. IRC: 58 – 2015, "The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways", New Delhi, 1991.

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20CE707PE TRAFFIC ENGINEERING AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the functions, organizations and importance of traffic engineering.
- Acquire knowledge on traffic surveys and methods of measuring spot speeds.
- Evaluate different alignment and geometric design of intersections.
- Familiarize with various traffic signs, signals and control measures.
- Attain skills required for traffic management, level of service and simulation of traffic.

UNIT I TRAFFIC PLANNING AND CHARACTERISTICS 9

Definitions – Functions – Organizations – Importance of traffic engineering under Indian conditions – Human factor governing road user behavior – Power performance of vehicles – Other vehicle characteristics.

UNIT II TRAFFIC SURVEYS 9

Introduction – Use of speed, journey and delay surveys – Methods of measuring spot speeds – Vehicle volume counts, classification and occupancy – Origin and Destination survey – Parking surveys.

UNIT III GEOMETRIC DESIGN 9

Introduction – Highway classification – Traffic – Horizontal alignment – Vertical alignment – Combination of horizontal and vertical alignment – Sight distance – Cross sectional elements – Control of access – Intersection – Grade separated intersection – Bus facilities – Driveway – Design of pedestrian facilities – Design criteria for separate cycle tracks.

UNIT IV TRAFFIC CONTROLS 9

Importance of traffic signs – General principles of traffic signing – Types of traffic signs – Route marker signs – Types of road marking – Center line – Traffic lane lines – Pedestrian crossing – Route direction arrows – Object marking – Signal indication – Signal face – Number and location of signal faces – Warrants for signals – Area traffic controls – Road accidents – Effect of accidents – Pedestrian safety – Road safety audit.

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UNIT V TRAFFIC MANAGEMENT 9

Introduction – Travel demand management – Traffic management – Passenger car unit – Level of service – Capacity of urban street – Relationship between the variables – Fundamental diagram of traffic flow – Car following theory – Simulation of traffic.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the basics of traffic planning and characteristics.
- Attain adequate knowledge on traffic surveys and studies.
- Acquire skills on geometric design of intersections, pedestrian facilities and cycle tracks.
- Execute various traffic control measures, warrants for signals and road safety.
- Evaluate the concepts of travel demand, traffic management strategies.

TEXT BOOKS:

1. Dr Kadiyali L R, "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2011.

REFERENCE BOOKS:

1. Fred L Mannering and Scott S Washburn, "Principles of Highway Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 7th Edition, 2019.
2. Garber Nicholas J and Lester A Hoel, "Principles of Traffic and Highway Engineering", Thomson Press, India Ltd., 1st Edition, 2010.

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20CE808PE BRIDGE ENGINEERING **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand fundamentals of road bridge, river bridge, railway bridge and highway bridge.
- Calculate longitudinal analysis, transverse analysis, temperature analysis, distortional analysis.
- Design truss bridges, plate girder bridges.
- Analyze slab bridges, T-beam bridges, PSC bridges.
- Evaluate different types of foundation and bridge bearings and expansion joints.

UNIT I INTRODUCTION **9**

History of bridges – Classification of road bridges – Selection of site and initial decision process – Survey and alignment – Geotechnical investigations and interpretations – River bridge – Selection of bridge site and planning – Collection of bridge design data – Hydrological calculation - Road bridges – IRC codes – Standard loading for bridge design – Influence lines for statically determinate and indeterminate structures –Transverse distribution of live loads among deck longitudinal – Load combinations for different working state and limit state designs - Loadings for railway bridges – railroad data – Pre design considerations – Railroad vs. highway bridges.

UNIT II SUPERSTRUCTURES **9**

Bridge decks – Structural forms and behavior – Choices of superstructure types – Behavior and modeling of bridge decks – Simple beam model – Plate model – Grillage method – Finite element method – Different types of superstructure (RCC and PSC) – Longitudinal analysis of bridge – Transverse analysis of bridge - Temperature analysis – Distortional analysis – Effects of differential settlement of supports – Reinforced earth structures.

UNIT III DESIGN OF STEEL BRIDGES **9**

Design of Truss Bridges – Design of Plate girder bridges.

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UNIT IV DESIGN OF RC AND PSC BRIDGES 9

Design of slab bridges – T beam bridges – PSC bridges.

UNIT V SUBSTRUCTURE, BEARINGS AND EXPANSION JOINTS, PARAPETS AND RAILINGS 9

Substructure – Pier – Abutment – Wing walls – Importance of soil structure interaction – Types of foundations – Open foundation – Pile foundation – Well foundation – Simply supported bridge – Continuous bridge – Different types of bridge bearings and expansion joints – Parapets and railings for highway bridges.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify loads on bridges and selection of type of bridge for the site condition.
- Analyze the super structure by various methods.
- Calculate load acting on components of trussed bridge and plate girder bridges.
- Execute design calculation of reinforced and prestressed concrete bridges.
- Evaluate different types of foundation, bridge bearings and expansion joints.

TEXTBOOKS:

1. Johnson Victor D, "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 2009.
2. Jagadeesh T R and Jayaram M A, "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013.

REFERENCE BOOKS:

1. Phatak D R, "Bridge Engineering", Satya Prakashan, New Delhi, 1990.
2. Ponnuswamy S, "Bridge Engineering", Tata McGraw Hill, New Delhi, 1996.
3. Rajagopalan N, "Bridge Superstructure", Alpha Science International, 2006.

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20CE801PE INDUSTRIAL STRUCTURES **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the basic types, roof system and elements of industrial buildings.
- Execute basic functional requirements of industrial buildings as per IS standards.
- Design various industrial steel structures such as industrial roofs, gantry girders, bunkers, silos and steel chimneys.
- Develop design concepts of R.C. structures such as deep beams, shear walls.
- Acquire knowledge about prefabrication.

UNIT I INTRODUCTION **9**

Industrial building – Types – Factors affecting site selection – Roof system – Elements in industrial buildings.

UNIT II FUNCTIONAL REQUIREMENTS **9**

Lighting – Ventilation – Heating – ISO Standards – Staircases – Crane columns – Bracings – Longitudinal and Transverse directions.

UNIT III DESIGN OF STEEL STRUCTURES **9**

Industrial roofs – Crane gantry girders – Design of bunkers and silos – Types of steel chimneys.

UNIT IV DESIGN OF R.C. STRUCTURES **9**

Design of R.C. members for fire resistance – Deep beams – Design – Design of shear walls.

UNIT V PREFABRICATION **9**

Construction of precast segments – Cast in-situ construction – Prestressed concrete truss – Folded plates – Pressure vessels.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Attain basic knowledge on industrial buildings.
- Idealize the requirements of industrial buildings as per IS standards.
- Design gantry girders, bunkers and silos and chimneys.
- Analyze and design various types of R.C. structures used in industries.
- Demonstrate construction procedure of precast segments, pre stressed concrete truss, folded plates and pressure vessels.

TEXT BOOKS:

1. Varghese P C, "Advanced Reinforced Concrete Design", PHI Learning Pvt. Ltd., New Delhi, 2009.
2. Ramachandra and Virendra Gehlot, "Design of Steel Structures – 2", Standard Publishers, 2010.

REFERENCE BOOKS:

1. Henn W, "Buildings for Industry, Vol. I and II", London Hill Books, 1995.
2. "Handbook on Functional Requirements of Industrial Buildings", SP32 – 1986, Bureau of Indian Standards, New Delhi 1990.

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20CE712PE RETROFITTING AND REHABILITATION OF CIVIL INFRASTRUCTURE

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the overview of the retrofitting techniques.
- Illustrate on fibre reinforced polymer composites retrofitting.
- Evaluate the performance on concrete overlay.
- Impart knowledge on the retrofitting of building structures.
- Attain skills on the retrofitting of steel structures.

UNIT I OVERVIEW OF RETROFITTNG **9**

Overview of Retrofitting and Rehabilitation of Civil Infrastructure - Condition Evaluation and Testing - General Repair and Strengthening of Concrete Structures

UNIT II FIBER REINFORCED POLYMER COMPOSITES **9**

Fiber Reinforced Polymer Composites (FRPC) and its Characteristics - Retrofitting by FRP Composites.

UNIT III CONCRETE OVERLAY **9**

Concrete Overlay for Pavement Rehabilitation - Retrofitting of Masonry Structures

UNIT IV RETROFITTING OF BUILDING STRUCTURES **9**

Retrofitting of Building structures damaged due to seismic event- Retrofitting of Special structures damaged due to seismic events

UNIT V RETROFITTING OF STEEL STRUCTURES **9**

Retrofitting of Steel Structures - Seismic Retrofit of Steel Structures – Steel Structures retrofitting techniques

TOTAL:45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on various concepts of repair, retrofitting and strengthening of concrete structures.
- Interpret the ideas of fibre reinforced polymer composites retrofitting.
- Identify the key elements on performance of concrete overlay.
- Execute the retrofitting of building structures.
- Evaluate the concepts of retrofitting of steel structures.

TEXT BOOKS:

1. A.M.Neville, J.J.Brooks, "Concrete Technology", Pearson Education Limited, England, 2010.
2. Thomas Dyer, "Concrete Durability", CRC Press, London, 2014.

REFERENCE BOOKS:

1. V.M.Malhotra, " Handbook on Nondestrucive Testing of Concrete", CRC Press, London 2004
2. L. C. Bank, "Composites for Construction", John Wiley & Sons, Inc, 2006.
3. ACI 440.2R-08, "Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures", American Concrete Institute,2008.

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20CE713PE INTRODUCTION TO MULTIMODAL URBAN TRANSPORTATION SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand key issues and challenges in urban transportation.
- Acquire knowledge on various concepts and elements of public transportation.
- Gain information on non motorized transportation systems.
- Evaluate bicycle facilities and level of service.
- Execute sustainable strategies for urban transportation.

UNIT I OVERVIEW OF URBAN TRANSPORTATION 9

Urbanization and Transport -Key issues in urban transportation - Challenges in urban transportation - Travel demand modelling overview - Vehicular Level of Service (LOS) overview.

UNIT II PUBLIC TRANSPORTATION 9

Introduction to public transportation - Basic operating elements of public transportation - Basic operating elements of public transportation - Bus Transportation - Financing public transportation - Transit marketing - Rail transportation - Intermediate Public Transportation - Measuring performance of transit systems - Advanced operation concepts of public transportation - Bus & Rail Transit Capacity - Transit Stop Location

UNIT III NON-MOTORISED TRANSPORTATION (NMT) PLANNING 9

Introduction to NMT Systems - Assessing existing NMT scenario - Data collection and analysis in NMT Planning - Complementarity and Selection of Interventions - Alternative Selection through Economic & Financial Analysis - Pedestrian Data Collection and Flow Characteristics - PTS Case Studies Pedestrian flow characteristics on facilities - Pedestrian Level of Service (PLOS) based on Flow models.

UNIT IV BICYCLE FACILITIES AND LEVEL OF SERVICE 9

Types of Pedestrian Level of Service - 32: HCM 2010 Methodology for PLOS - Bicycle Facilities and Level of Service - BLOS and Bicycle Compatibility Index - NMT Design Principles - Design of Pedestrian Infrastructure - Design of Cycling Infrastructure - Travel Demand Management (TDM) – Push and Pull measure- Parking Studies - Transit Oriented Development

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UNIT V URBAN TRANSPORT SUSTAINABILITY 9

Introduction to Intelligent Transportation Systems- ITS components, applications and communication - ITS Architecture - Electronic Toll Collection - Public Bicycle Sharing (PBS) System with ITS - Multimodal transportation (MMT) environment - Multimodal Level of Service - Design of multimodal transfer facilities - Road crash estimation and elements of predictive methods - Predicting Vehicle-Pedestrian and Vehicle-Bicycle conflicts - Environmental Concerns of Urban Transport - Sustainable strategies for Urban Transportation

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze key issues and challenges in urban transportation.
- Learn various operating elements of public transportation.
- Understand various NMT systems, Pedestrian Level of Service (PLOS) based on Flow models.
- Design pedestrian infrastructure, cycling infrastructure.
- Attain knowledge on Intelligent Transportation Systems, NMT environment, and sustainability measures of urban transportation.

TEXT BOOKS:

1. Gerd Sammer, "Travel Demand Management and Road User Pricing" Taylor & Francis Group, 2009.
2. Rodney Tolley, "Sustainable Transport: Planning for Walking and Cycling in Urban Environments' Woodhead Publishing Ltd,2003

REFERENCE BOOKS:

1. Stephen Ison, Tom Rye, "The Implementation and Effectiveness of Transport Demand Management Measures -An International Perspective", Taylor & Francis Group, 2008.
2. Fruin, J.J, "Pedestrian Planning and Design", McGraw Hill Publication, 1987
3. Hudson, M, "The Bicycle Planning", Open Books Publishing Ltd, 1978

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20CE504PE	IRRIGATION ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand basic types of irrigation, irrigation standards and crop water assessment
- Comprehend different methods of irrigation
- Design of canal structures as per IS Code practice
- Acquire knowledge about diversion and impounding structures
- Understand various issues connected with irrigation water management

UNIT I INTRODUCTION 9

Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop seasons – Consumptive use of water – Duty – Factors affecting duty – Irrigation efficiencies – Planning and development of irrigation projects.

UNIT II IRRIGATION METHODS 9

Canal irrigation – Lift irrigation – Surface and sub-surface methods of application of water – Sprinkler and drip irrigation methods.

UNIT III CANAL IRRIGATION STRUCTURES 9

Alignment of canals – classification of canals – Design of canals based on Kennedy's and Lacey's silt theories – canal drops – hydraulic design of drops – cross drainage works – Hydraulic design of cross drainage works – canal head works – canal regulators – River training works.

UNIT IV DIVERSION AND IMPOUNDING STRUCTURES 9

Weirs – elementary profile of a weir – weirs on pervious foundations – types of impounding structures – percolation – Tanks – sluice and tank surplus weir – Factors affecting location and type of dams – Forces on dam – Gravity dam – Earth dam – Arch dam – Hydraulic design – Spillways – Types of spillways.

UNIT V IRRIGATION WATER MANAGEMENT 9

Need for canal irrigation management – methods for improving canal irrigation management – inadequacies – water delivery systems – Delivery of water to farms – operation and maintenance – performance evaluation.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Assess different irrigation needs of crops
- Select suitable methods of irrigation
- Design various types of canal irrigation structures
- Select and design suitable type of dam based on the requirement
- Learn canal irrigation water management by understanding its operation and maintenance

TEXT BOOKS:

1. Garg S K, "Irrigation Engineering and Hydraulic structures", Khanna Publishers, New Delhi, 2010.
2. Asawa G L, "Irrigation Engineering", New Age International Publishers, 2010.

REFERENCES:

1. Sharma R K, "Irrigation Engineering", S Chand and Co., Pvt. Ltd., 2007.
2. Dilipkumar Majumdar, "Irrigation Water Management (Principles and Practice)", Prentice Hall of India Pvt., Ltd., 2009.

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20CE506PE	HYDROLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand different measurement methods of rainfall
- Estimate evaporation and infiltration losses using various methods
- Determine various forms of unit hydrograph with its applications
- Acquire knowledge on flood routing, flood control and mitigation measures
- Educate various types of aquifers and methods of computing yield from well

UNIT I PRECIPITATION **9**

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, and frequency relationship – Probable maximum precipitation.

UNIT II ABSTRACTION FROM PRECIPITATION **9**

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration Process – Infiltration Capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

UNIT III HYDROGRAPHS **9**

Factors affecting hydrograph – Base flow separation – Unit Hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations – Synthetic unit hydrograph.

UNIT IV FLOODS AND FLOOD ROUTING **9**

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's channel routing – Flood control.

UNIT V GROUND WATER HYDROLOGY **9**

Types of Aquifers – Darcy's Law – Dupuit's assumptions – Confined aquifer – Unconfined aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only – Methods of computing yield from a well – Well losses – Various methods of well construction.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand different forms of precipitation
- Determine the magnitude of infiltration and evaporation and evapotranspiration by various empirical methods
- Estimate means areal precipitation and their significance in design of various hydraulic structures
- Evaluate flood frequency studies and flood routing by various methods
- Calculate yield of groundwater flow by applying different methods

TEXT BOOKS:

1. Subramanya K, "Engineering Hydrology", Tata McGraw Hill Publishing Co., Ltd., 2000.
2. Raghunath H M, "Hydrology", Wiley Eastern Ltd., 2000.

REFERENCES:

1. Chow V T and Maidment, "Hydrology for Engineers", McGraw Hill Inc., Ltd., 2000.
2. Singh V P, "Hydrology", McGraw Hill Inc., Ltd., 2000.

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20CE711PE	COASTAL AND OFFSHORE ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart fundamental knowledge of the waves and forces in marine/coastal zone/region.
- Calculate forces acting on offshore structures.
- Determine offshore soil investigation.
- Analyze offshore structures with single and multi degree freedom systems.
- Design various elements of offshore structures.

UNIT I WAVE THEORIES 9

Introduction to wave mechanics – Wave generation by wind – Small amplitude wave theory – Formulation and solution – Wave celerity, length and period – Classification of waves based on relative depth – Orbital motions and pressure.

UNIT II FORCES OF OFFSHORE STRUCTURES 9

Wave forces – Morison equation – Wave force on a circular cylinder – Wave forces on submarine pipelines, pipelines in proximity to seabed, pipelines within the zone of wave influence – Wave forces on sea walls and breakwaters – Applications of wave force regimes.

UNIT III OFFSHORE SOIL INVESTIGATION 9

General characteristics of offshore soil exploration – Sampling using free corer, gravity corer, tethered systems and manned submersibles – Deep penetration sampling using wire line techniques – In-situ determination of strength of submarine soils – Penetrometer, piezocone, vane and pressure meter techniques.

UNIT IV ANALYSIS OF OFFSHORE STRUCTURES 9

Modelling of offshore structures – single and multi degree freedom systems – Coupled motions - Frequency domain analysis – Time domain analysis – Newmark Beta method – Wilson Theta method – Response analysis of jacket structures – Response analysis of complaint structures – non-linear response and stability characteristics.

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UNIT V DESIGN OF OFFSHORE STRUCTURES 9

Design of decking, supporting legs, braces, deck legs – Design of platform derricks, masts, helipads.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand basics of wave theories, mechanics and its classification.
- Determine wave forces acting on various offshore structures and applications of wave force regimes.
- Explore offshore soil investigation by various techniques.
- Analyze response and stability characteristics of offshore structures by various methods.
- Design of offshore structures and its components with its basic standards.

TEXT BOOKS:

1. Dean R G and Darlymple R A, "Water Wave Mechanics for Engineers and Scientists", Prentice Hall Inc. 2001.
2. Sarpkaya T and Isaacson M, "Mechanics of Wave Forces on Offshore Structures", Van Nostrand, 1981.

REFERENCE BOOKS:

1. Turgut Sarpkaya, "Wave Forces on Offshore Structures", Cambridge University Press, 2010.
2. Chaney F, "Marine Geotechnology and Nearshore and Offshore Structures", ASTM, STP, 1986.
3. Chaney R C and Demars K R, "Strength Testing of Marine Sediments Laboratory and Insitu Measurements", ASTM, STP 883, 1985.
4. McClelland B and Reifel M D, "Planning & Design of fixed Offshore Platforms", Van Nostrand, 1986.

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20CE802PE WATER RESOURCES SYSTEMS ENGINEERING **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Gain knowledge on classification, and characteristics of systems.
- Understand linear programming, graphical solution, and sensitivity analysis.
- Analyze forward and backward recursion techniques in dynamic programming.
- Evaluate single and multipurpose reservoir simulation models and deterministic simulation.
- Apply advanced optimization techniques using integer and parametric linear programming.

UNIT I SYSTEM APPROACH **9**

Definition, classification, and characteristics of systems – Philosophy of modeling – Goals and Objectives – Basics of system analysis concept – Steps in systems engineering.

UNIT II LINEAR PROGRAMMING **9**

Introduction to operation research – Linear programming problem formulation – Graphical solution – Simplex method – Sensitivity analysis – Application to operation of single purpose reservoir.

UNIT III DYNAMIC PROGRAMMING **9**

Bellman's optimality criteria, problem formulation and solutions – Water allocation for three state (user), forward and backward recursion techniques in dynamic programming – Shortest pipe line route problem – Application to reservoirs capacity expansion.

UNIT IV SIMULATION **9**

Basic principles and concepts – Monte Carlo techniques – Model development – Inputs and outputs – Single and multipurpose reservoir simulation models – Deterministic simulation – Rule curve development for reservoir.

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UNIT V ADVANCED OPTIMIZATION TECHNIQUES 9

Integer and parametric linear programming – Goal programming types – Applications to reservoir release optimization – Application of evolutionary algorithms like genetic algorithm, particle swarm, simulated annealing to reservoir release optimization.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn philosophy of modeling and basics of system analysis concept.
- Develop linear programming in operation research, and operation of single purpose reservoir.
- Determine Bellman's optimality criteria, problem formulation and solutions and shortest pipe line route problem.
- Execute Monte Carlo techniques, model development, and rule curve development for reservoir.
- Demonstrate advanced optimization techniques, evolutionary algorithms like genetic algorithm, particle swarm, simulated annealing to reservoir release optimization.

TEXTBOOKS:

1. Vedula S and Majumdar P P "Water Resources Systems – Modeling Techniques and Analysis", Tata McGraw Hill, New Delhi, 5th Edition, 2010.

REFERENCE BOOKS:

1. Hall Warren A and John A Dracup, "Water Resources System Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998.
2. Chadurvedi M C, "Water Resource Systems Planning and Management", Tata McGraw Hill Inc., New Delhi, 1997.
3. Taha H A, "Operation Research", McMillan Publication Co., New York, 1995.

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24/6/24

20CE809PE INTEGRATED WATER RESOURCES MANAGEMENT **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on various system, optimization and simulation of water resources systems.
- Analyze operation research, water allocation for crops and reservoir operation for various purposes.
- Design dynamic programming water resource systems by analyzing various problems.
- Understand the components of a simulation model and plan formulation.
- Evaluate the conditions of economic analysis and reservoir operation.

UNIT I SYSTEM APPROACH **9**

Definition – Types of system – Systems approach – System analysis – Optimization using calculus – Linear programming – Dynamic programming – Simulation – Combination of simulation and optimization.

UNIT II LINEAR PROGRAMMING **9**

Introduction to operation research – Irrigation water allocation for single and multiple crops – Multi reservoir system for irrigation planning – Reliability capacity tradeoff for multi crop irrigation – Reservoir operation for irrigation – Reservoir operation for hydropower optimization.

UNIT III DYNAMIC PROGRAMMING **9**

Introduction – Solution of DP problems based on Bellman's principle of optimality – Backward recursion – Water allocation problem – Forward recursion – Characteristics of a DP problem – short route problem – Reservoir operation problem – Capacity expansion problem – Multiple state variables.

UNIT IV SIMULATION **9**

Definition – Basic principles and concepts – Components of a simulation model – Combination of simulation and optimization – Multi objective planning – Non inferior solutions – Plan formulation – Plan selection.

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UNIT V ECONOMIC ANALYSIS AND RESERVOIR SYSTEMS 9

Basics of engineering economics – Economic analysis – Conditions of project optimality – Benefit cost analysis – Reservoir sizing – Reservoir operation – Probability theory – Chance constrained linear programming – Stochastic dynamic programming for reservoir operation.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Execute effective system analysis and approach of water resources systems.
- Understand water allocation, multi reservoir system, reliability capacity and reservoir operation for irrigation.
- Analyze characteristics and solution of dynamic programming problems based on Bellman's principle of optimality.
- Familiarize with the principles, concepts and components of simulation model and Plan formulation.
- Demonstrate basics of engineering economics, economic analysis of reservoir systems.

TEXT BOOKS:

1. Vedula, S and Majumdar P P, "Water Resources Systems – Modeling Techniques and Analysis", Tata McGraw Hill, New Delhi, 5th Edition, 2010.
2. Daniel P Loucks and Eelco Van Beek, "Water Resource Systems Planning and Management", Springer Publication, 1st Edition, 2017.

REFERENCE BOOKS:

1. Hall Warren A and John A Dracup, "Water Resources System Engineering", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1998.
2. Andrew A Dzurik, "Water Resources Planning", Rowman and Littlefield Publisher, Inc. USA, 3rd Edition, 2002.
3. Taha H A, "Operation Research an Introduction", Pearson Prentice Hall, Pearson Education, New Jersey 8th Edition, 2007.

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12/8/23

20CE811PE RURAL WATER RESOURCES MANAGEMENT **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Impart the importance of water resource management and hydrological parameters.
- Acquire knowledge on groundwater hydrology.
- Gain information on rural water management issues.
- Understand the rural water resource management infrastructure.
- Illustrate the basic principles on rural hydrological water resources.

UNIT I IMPORTANCE OF WATER RESOURCE MANAGEMENT **9**

Importance of water resource management in India and Introduction to Hydrological Cycle and representations - Hydrological Parameters 1 - Hydrological Parameters 2

UNIT II GROUNDWATER HYDROLOGY **9**

Introduction to Groundwater hydrology - Groundwater components - Surface water hydrology

UNIT III RURAL WATER MANAGEMENT ISSUES **9**

Water Mass Balance Equation - Rural water management issues, data challenges and observation records.

UNIT IV RURAL WATER RESOURCE MANAGEMENT INFRASTRUCTURE **9**

Rural water resource management infrastructure (engineered) - Rural water resource management infrastructure (nature based).

UNIT V RURAL HYDROLOGICAL **9**

Rural hydrological databases for India - Remote Sensing data bases for rural water resources

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the importance of water resource management.
- Attain adequate knowledge on groundwater hydrology and its components.
- Acquire skills on rural water management issues, and data challenges.
- Explore the various engineered and nature based rural water resource management infrastructures.

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- Infer on rural hydrological and interpretation of remote sensing datas.

TEXT BOOKS:

1. Robinson Ward, "Principles of Hydrology", Tata Mcgraw Hill Education; 4th edition, Uttar Pradesh, 2011
2. R.Allan Freeze and John A Cherry, " Groundwater", Prentice-Hall International, London, 1979

REFERENCE BOOKS:

1. Dingman, S.L. and Dingman, S.L. 2015. Physical hydrology (Vol. 575). Upper Saddle River, NJ: Prentice Hall.
2. Viessman, W., Lewis, G.L. and Knapp, J.W. 2003. Introduction to hydrology (No. GB 661.2. V53 1972.). Upper Saddle River, NJ: Prentice Hall.
3. Fetter, C.W. 2018. Applied hydrogeology. Waveland Press.
4. Brady, Nyle C., and Harry Oliver Buckman. The nature and properties of soils. No. 631.4 B7295n Ej. 6 008553. Macmillan, 2013.
5. Raghunath H.M. 2006. Hydrology: principles, analysis and design.

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12(81-3

20CE507PE MICROWAVE REMOTE SENSING IN HYDROLOGY

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Introduce the satellite based positioning system, concept of geodesy and augmentation systems.
- Impart concepts about reference surfaces (Datum), coordinate transformation models and surveying methods.
- Enhance student's knowledge about optical, thermal and microwaves based Remote Sensing and Applications for solving real life problems
- Develop students to digital image processing tools and techniques.
- Gain knowledge about the basic concepts in Hydrology.

UNIT I INTRODUCTION TO MICROWAVE REMOTE SENSING 9

Fundamentals of Electromagnetic Waves, Introduction to microwave remote sensing –Overview of non-imaging and imaging microwave sensors – Principles, physical fundamentals – Installationof python using Anaconda Environment and basic commands –Scattering of Microwaves – Fundamentals of Synthetic Aperture Radar (SAR) – Basics of Image formation – Basics of SAR Image processing using python.

UNIT II OPTICAL, THERMAL AND MICROWAVE REMOTE SENSING 9

Radar equation, Image defects – Geometric distortions, Introduction to Sentinel Application Platform (SNAP) – Speckle, Doppler Shift in SAR Imagery, Multilooking, Spatial Convolution, Introduction to plotting and image statistics in python – Introduction to Texture, GLCM, Introduction to Image statistics in Python – Radar remote sensing, Speckle filtering using python.

UNIT III ADVANCES IN THERMAL AND MICROWAVE REMOTE SENSING 9

Image classification, geometrical basis, Supervised Classification, SAR Image Classificationusing SNAP – Unsupervised classification, Accuracy Assessment, Fuzzy Classification, HandlingActive microwave data in Python.

UNIT IV ACTIVE MICROWAVE REMOTE SENSING 9

Active microwave remote sensing: Principles, Application of active microwave remote sensing in hydrology, Doppler weather radar data visualization – Radar Altimetry, concepts and applications

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in hydrology, Measuring soil moisture using active microwave remote sensing, Fundamentals of Passive microwave remote sensing and data handling using python.

UNIT V RADAR IN PYTHON **9**

Applications of passive microwave remote sensing in hydrology, Handling Precipitation data in python – Radar Interferometry, using phase as a relative distance measure, Digital Elevation Models, Hydrological Models – An Introduction.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand physical principles and sensing process in remote sensing.
- Develop different type of sensors (optical, microwave, thermal and LIDAR) and theircharacteristics.
- Apply the knowledge of remote sensing in various thematic studies.
- Remember physical principles and sensing process in remote sensing.
- Explore various applications of radar in python.

TEXT BOOKS:

1. Fawwaz T Ulaby, Richard K Moore, Adrian K Fung, "Microwave Remote Sensing Activeand Passive", Addison-Wesley Publishing Company, 1981
2. Eugene A Sharkov, "Passive microwave remote sensing of the Earth", Springer, 1st Edition, 2010.

REFERENCES:

1. Costas A Varotsos and Vladimir F Krapivin, "Microwave Remote Sensing tools inEnvironmental Science", Springer Nature Switzerland AG, 1st Edition, 2020.
2. Iain H. Woodehouse, "Introduction to Microwave Remote Sensing", Speckled Press, 1st edition, 2015

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20CE601PE GROUND IMPROVEMENT TECHNIQUES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Identify the problems in soil and apply suitable remedial measures to improve their behavior.
- Acquire knowledge on various dewatering techniques.
- Execute various in situ treatment of cohesion less and cohesive soils.
- Demonstrate concept of earth reinforcement and their roles in geotextiles.
- Understand various equipments and working principles of grouting methods.

UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 9

Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

UNIT II DEWATERING 9

Dewatering Techniques – Well points – Vacuum and electro osmotic methods – Seepage analysis for two – Dimensional flow for fully and partially penetrated slots in homogeneous deposits – Simple cases – Design.

UNIT III IN SITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 9

In situ densification of cohesionless soils and consolidation of cohesive soils: Dynamic compaction vibro flotation, sand compaction piles and deep compaction – Consolidation: preloading with sand drains, and fabric drains, stone columns and lime piles – Installation techniques – Simple design – Relative merits of above methods and their limitations.

UNIT IV EARTH REINFORCEMENT 9

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – Simple design – Applications of reinforced earth – Role of geo textiles in filtration, drainage, separation, road works and containment.

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UNIT V GROUTING TECHNIQUES 9

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil –Sheet Piling Techniques.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Evaluate various problems in different types of soil and providing suitable improvement techniques to it.
- Attain knowledge on dewatering techniques and seepage analysis.
- Identify the problems in cohesion less and cohesive soils and apply suitable in situ treatment.
- Acquire knowledge on concepts of earth reinforcement, its types and applications.
- Apply different types of grouting techniques.

TEXT BOOKS:

1. Purushothama Raj P, "Ground Improvement Techniques", Firewall Media, 1st Edition, 2005.
2. Mittal S, "An Introduction to Ground Improvement Engineering", Medtech Publishers, 1st Edition, 2013.

REFERENCE BOOKS:

1. Moseley M P and Kirsch K "Ground Improvement" Spon Press, 2nd Edition, 2004.
2. Das B M, "Principles of Foundation Engineering", Cengage Learning, 7th Edition, 2010.
3. Jones J E P, "Earth Reinforcement and Soil Structure", Thomas Telford Publishing, 3rd Edition, 1996.
4. Coduto, D P, Man - Chu Ronald Yeung William A Kitch "Geotechnical Engineering Principles and Practices", Pearson Publishers, 2nd Edition, 2011.

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24/6/24

20CE605PE GEO-ENVIRONMENTAL ENGINEERING **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Gain knowledge on sources, production, classification of waste, causes of soil pollution and failures of foundation due to waste movement.
- Understand stability of landfills, current practice of waste disposal, passive containment system and application of geosynthetics.
- Learn contaminant transport in sub surface, contaminant transformation, and ground water pollution.
- Acquire knowledge on stabilization, solidification of wastes and utilization of solid waste for soil improvement.
- Assess remediation methods of contaminated soils.

UNIT I GENERATION OF WASTES AND CONSQUENCES OF SOIL POLLUTION **9**

Introduction to Geo environmental engineering – Environmental cycle – Sources, production and classification of waste – Causes of soil pollution – Factors governing soil pollution interaction clay minerals – Failures of foundation due to waste movement.

UNIT II SITE SELECTION AND SAFE DISPOSAL OF WASTE **9**

Safe disposal of waste – Site selection for landfills – Characterization of land fill sites and waste – Risk assessment – Stability of landfills – Current practice of waste disposal – Biomedical Waste- Monitoring facilities – Passive containment system – Application of geosynthetics in solid waste management – Rigid or flexible liners.

UNIT III TRANSPORT OF CONTAMINANTS **9**

Contaminant transport in sub surface – Advection, Diffusion, Dispersion – Governing equations – Contaminant transformation – Sorption – Biodegradation – Ion exchange – Precipitation – Hydrological consideration in land fill design – Ground water pollution.

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UNIT IV WASTE STABILIZATION 9

Stabilization - Solidification of wastes – Micro and macro encapsulation – Absorption, Adsorption, Precipitation – Detoxification – Mechanism of stabilization – Organic and inorganic stabilization – Utilization of solid waste for soil improvement – Case studies.

UNIT V REMEDIATION OF CONTAMINATED SOILS 9

Exsitu and Insitu remediation – Solidification, bio-remediation, incineration, soil washing, phyto remediation, soil heating, vetrification, bio-venting.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to.

- Assess the contamination in the soil.
- Understand the current practice of waste disposal.
- Prepare the suitable disposal system for particular waste.
- Stabilize the waste and utilization of solid waste for soil improvement.
- Select suitable remediation methods based on contamination.

TEXT BOOKS:

1. Hari D Sharma and Krishna R Reddy, "Geo-Environmental Engineering", John Wiley and Sons, INC, USA, 2004.
2. Daniel B E, "Geotechnical Practice for Waste Disposal", Chapman & Hall, London, 1st Edition, 1993.
3. Manoj Datta, "Waste Disposal in Engineered Landfills", Narosa Publishing House, 1997.

REFERENCE BOOKS:

1. Westlake K, "Landfill Waste Pollution and Control", Albion Publishing Ltd., England, 1st Edition, 1995.
2. Wentz C A, "Hazardous Waste Management", McGraw Hill, Singapore, 1989.
3. Proceedings of the International symposium on "Environmental Geotechnology" (Vol.I and II). Environmental Publishing Company, 1986 and 1989.
4. Ott W R, "Environmental Indices, Theory and Practice", Ann Arbor, 1978.

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20CE602PE ROCK ENGINEERING **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand concepts of formation and classification of rocks.
- Evaluate testing of rocks to understand failure mechanism.
- Analyze elastic stress distribution and displacements around circular tunnels.
- Determine strength criteria for isotropic and anisotropic rocks using different criteria.
- Gain knowledge on rock mechanics and various failures in rocks.

UNIT I ROCK FORMATION & ENGINEERING CLASSIFICATION **9**

Introduction – Minerals and rock classes – Mineral identification procedure – Rock Identification procedure – Geologically structures and discontinuities – Shear tests – Engineering classification of Intact rocks, RQD – Concept of rock mass, Factors affecting discontinuities – Classification of rock mass – Rock mass rating(RMR), Rock mass quality (Q – system) – Geological strength Index (GSI).

UNIT II TESTING OF ROCKS **9**

Spherical representation of geological data – Application of Graphical Representation of Geological Data – Laboratory testing of rocks – Sampling – Preparation & UCS – Factors influencing UCS & Modes of failure in compression – Failure mechanism and post failure behavior in compression, indirect method for UCS – Brazilian test, Schnidt rebound hardness Test – Sound velocity test – Shake durability test, swelling pressure and free swell test & void index test.

UNIT III TUNNELING **9**

Tunneling – Ground conditions – Elastic stress distribution around circular tunnels – Elastic analysis of circular tunnels – Displacements – Thick wall cylinder in Biaxial field.

UNIT IV ROCK STABILISATION **9**

Strength criteria for isotropic and anisotropic rock – Mohr failure theory – Mohrs coulomb failure criterion – Coulomb navier failure criterion – Concept of instantaneous C and I – Balmer approach – Empirical failure criteria – Basics of regression analysis – Hoek and brown criterion.

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– Parameter of failure criteria – Failure criteria for rock mass – Tunneling – Underground excavations – Rock slope stability – Circular failure – Toppling failure.

UNIT V ROCK MECHANICS IN ENGINEERING **9**

Elasto plastic stress distribution around circular tunnel – Underground excavation failure mechanisms – Structurally controlled failure – Roof failure – Sidewall failures – Rock mass support interaction analysis (1&2) – Plane failure – Wedge failure – Foundation on weak rocks – Ultimate bearing capacity using bella's approach – Bearing capacity from classification approaches and based on UCS – Bearing capacity based on plate load test – Treatment of foundations – Dam foundation problems.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze identification of rock, mineral classes and rock mass rating and quality.
- Develop skills on spherical representation of geological data and conduct various direct and indirect tests on rocks.
- Acquire knowledge on tunneling, ground conditions and elastic analysis.
- Evaluate Mohr-coulomb failure criterion, failure criteria of rock masses and underground excavations
- Execute structurally controlled failure, ultimate bearing capacity in rocks.

TEXT BOOKS:

1. Richard E Goodman, "Introduction to Rock Mechanics", John Wiley & Sons, 2nd Edition, 2010.
2. Ramamurthy T, "Engineering in Rocks for Slopes, Foundations and Tunnels", PHI Learning Pvt. Ltd, New Delhi, 2014.

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REFERENCE BOOKS:

1. Hoek, E and Bray J W, "Rock Slope Engineering", The Institution of Mining and Metallurgy, London, 3rd Edition, 1981.
2. Jaeger J G, Cook N G W and Zimmerman R W, "Fundamentals of Rock Mechanics", Blackwell Publishing, 4th Edition, 2007.
3. Bhawani Singh and Goel R K, "Engineering Rock Mass Classification", Oxford, UK, Elsevier Inc, 2011.
4. Ducan C Wyllie and Christopher W Mah, "Rock Slope Engineering, Civil and Mining", CRC Press, 4th Edition, 2004

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20CE606PE GEOSYNTHETICS AND REINFORCED SOIL STRUCTURES **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the basics of geosynthetics.
- Acquire knowledge on stability analysis of reinforced soil retaining walls.
- Analyze and design reinforced soil retaining walls.
- Gain knowledge on stability analysis of reinforced soil slopes.
- Attain skills on applications of geosynthetics.

UNIT I INTRODUCTION TO GEOSYNTHETICS **9**

Types of geosynthetics and their applications - Manufacture of geosynthetics - Strength of reinforced soils - Testing of Geosynthetics - Different Types of Soil Retaining Structures

UNIT II EXTERNAL STABILITY ANALYSIS **9**

Construction Aspects of Geosynthetic Reinforced Soil Retaining Walls - Design Codes for Reinforced Soil Retaining Walls - External Stability Analysis of Reinforced Soil Retaining Walls - Seismic Loads and Internal Stability Analysis of Reinforced Soil Walls - Testing Requirements for Reinforced Soil Retaining Walls

UNIT III DESIGN OF REINFORCED SOIL RETAINING WALLS **9**

Design of Reinforced Soil Retaining Walls – simple geometry –sloped backfill soil - Design of reinforced soil retaining walls supporting a bridge abutment - Stability analysis of soil slopes – infinite and finite slopes - Stability analysis of reinforced soil slopes resting on soft foundation soils - Stability analysis of reinforced soil slopes resting on strong foundation soil

UNIT IV BILINEAR WEDGE ANALYSIS **9**

Stability analysis of reinforced soil slopes – bilinear wedge analysis - Design of Embankments supported on Load Transfer Platforms - Reinforced soil for supporting shallow foundations - Accelerated consolidation of soft clays using geosynthetics - Geosynthetic encased stone columns for load support

UNIT V APPLICATIONS OF GEOSYNTHETICS **9**

Drainage application of geosynthetics - Filtration Applications of Geosynthetics - Erosion control-

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using geosynthetics - Natural geosynthetics and their applications - Geosynthetics for construction of municipal and hazardous waste landfills

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Evaluate strength of reinforced soils, testing of geosynthetics with its applications.
- Analyze internal and external stability analysis of reinforced soil retaining walls.
- Design reinforced stability retaining wall supporting bridge abutment, stability analysis on strong and soft foundation soil.
- Execute bilinear wedge analysis, and stability analysis of reinforced soil slopes.
- Apply geosynthetics in various applications to control drainage, erosion landfills.

TEXT BOOKS:

1. Marcio de Souza S. Almeida, Maria Esther Soares Marques, "Design and Performance of Embankments on Very Soft Soils" CRC Press, 2013.
2. Manfred R. Hausmann, "Engineering Principles of Ground Modification" McGraw-Hill Inc.,1990.

REFERENCE BOOKS:

1. Robert M Koerner, "Designing with Geosynthetics", Xlibris Publisher, 6th edition, 2012.
2. Swami Saran, "Reinforced Soil and Its Engineering Applications", I K International Publishing House Pvt. Ltd, 2006
3. Sanjay Kumar Shukla, "Handbook of Geosynthetic Engineering", Telford, Thomas Limited, 2nd Edition, 2012.

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12/8/23

20CE607PE **EARTH AND ROCKFILL DAMS** **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand fundamentals of design consideration of dams.
- Acquire design skills of slope stability and seepage analysis.
- Execute design mechanisms for hydraulic fracturing.
- Impart knowledge on embankment and foundation.
- Identify skills required for slope protection measures.

UNIT I DESIGN CONSIDERATION **9**

Design consideration, Factors influencing design, Types of earth and rock fill dams, Design details, Provisions to control pore pressure.

UNIT II SLOPE STABILITY AND SEEPAGE ANALYSIS **8**

Stability of infinite and finite slopes, Method of Slices, Bishop's method, Flow nets, Stabilit y conditions during construction, Full reservoir and drawdown - cut off walls – Trenches – Importance of drainage and filters.

UNIT III HYDRAULIC FRACTURING **9**

Introduction, Conditions and mechanisms for hydraulic fracturing, Failure criterion for hydraulic fracturing – cubic specimen with a crack – core with a transverse crack – core with a vertical crack, strike–dip of easiest crack spreading; factors affecting hydraulic fracturing, self-healing of a core crack.

UNIT IV FAILURE AND DAMAGES **9**

Failure and damages, Nature and importance of failures in embankment and foundation - Piping, Differential settlement, Foundation slides, Earthquake damage, creep and anisotropic effects, Reservoir wave action, Dispersive piping.

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UNIT V SLOPE PROTECTION MEASURES **10**

Special design problems, Slope protection, Filter design, Foundation treatment, Earth dams on pervious soil foundation, Application of Geosynthetic materials in filtration. Treatment of rock foundation, Construction Techniques, Quality control and performance measurement

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Discover the causes of failure and damage of embankments and slopes.
- Analyze the stability of slopes for various seepage conditions and apply the concept in the design of earth and rock fill dams.
- Apply the knowledge of engineering and assess the stability of dam against hydraulic fracturing and suggest suitable remedial measure.
- Understand the nature of failures and damages in earth and rock fill dams and apply the concept in field to avoid distress.
- Summarize suitable remedial measures to protect the slopes and implement quality control and monitor its performance

TEXT BOOKS:

1. Rowe, R.K., Geotechnical and Geoenvironmental Engineering Handbook, Kulwer Academic Publishers, 2001.
2. Anderson, M.G., and Richards, K.S., Slope Stability, John Wiley, 1987.
3. Sherard, J.L., Woodward, R.J., Gizienski, R.J. and Clevenger, W.A., Earth and Earth rock dam, John Wiley, 1963.

REFERENCE BOOKS:

1. Chowdhury, D.F., Slope analysis, Prentice Hall, 1988.
2. McCarthy, D.F., Essentials of Soil Mechanics and Foundations: Basic Geotechnics, Sixth Edition, Prentice Hall, 2002.
3. Bramhead, E.N., The Stability of Slopes, Blacky Academic and Professionals Publications, Glasgow, 1986.
4. Chandhar, R.J., Engineering Developments and Applications, Thomas Telford, 1991
5. Koerner, R.M. Designing with Geosynthetics, Third Edition, Prentice Hall, 1997.
6. Jun-Jie Wang, Hydraulic Fracturing in Earth-rock Fill Dams, John Wiley & Sons, 2014.

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20CE608PE	MARINE GEOTECHNICAL ENGINEERING	L T P C
		3 0 0 3

OBJECTIVES:

The Students should be made to

- Understand the engineering properties of marine soil.
- Classify the marine soil deposits based on site investigation techniques.
- Analyze the behaviour of marine soil subjected to repeated loading.
- Selection of foundation in marine soil based on soil deposits.
- Develop foundation models subjected to wave loading.

UNIT I MARINE SOIL DEPOSITS 9

Marine environment, Physical and engineering properties of marine soils - Specific problems related to marine soil deposits.

UNIT II SITE INVESTIGATION IN THE CASE OF MARINE SOIL DEPOSITS 9

Challenges of site investigation in marine environment, Different site investigation techniques, sampling techniques, Geophysical methods, Recent advancements in site investigation and sampling used for marine soil deposits.

UNIT III BEHAVIOR OF SOILS SUBJECTED TO REPEATED LOADING 9

Effect of wave loading on foundations of marine structures, Behavior of marine deposits under cyclic loading, Cyclic behavior of soils based on fundamental theory of mechanics, Approximate engineering methods.

UNIT IV FOUNDATIONS IN MARINE SOIL DEPOSITS 9

Different offshore and nearshore foundations, Gravity platforms, Jack-up rigs, pile foundations, cassions, spudcans.

UNIT V MARINE FOUNDATIONS SUBJECTED TO WAVE LOADING 9

Cyclic behavior of soils, empirical models, elastic-plastic models, FEM analysis of marine foundations subjected to wave loading.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the physical and engineering properties of marine soil deposits.
- Explain the effect of wave loading on physical and engineering properties of marine soil deposits.
- Execute investigation program for marine soil deposits.
- Design suitable marine foundation as per project requirement.
- Develop numerical model and design marine foundation subjected to wave loading.

TEXT BOOKS:

1. H. G. Poulos. "Marine Geotechnics", Unwin Hyman Ltd, London, UK, 1988

REFERENCES BOOKS:

1. D. V. Reddy and M. Arockiasamy, "Offshore Structures", Volume: 1, R.E. Kreiger Pub and Co., 1991.
2. D. Thomson and D. J. Beasley, "Handbook of Marine Geotechnical Engineering", US Navy, 2012.

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20CE609PE	TUNNELING ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand basics of tunnels and underground space application.
- Study various methods of excavations techniques and tunneling methods.
- Gain knowledge on planning and geometric design of tunnels.
- Identify the suitable method of tunneling.
- Design various types of tunnel support system and methods of ventilation.

UNIT I TUNNELS AND UNDERGROUND SPACE APPLICATION 9

History – Caves – Tunnels for Transport – Water, Power supply – Storage of LPG – Nuclear waste disposal – Defence facilities – Submerged Tunnels – Underground library, museums.

UNIT II EXCAVATION TECHNIQUES 9

Types and purpose of tunnels – Choice of Excavation Methods – Soft ground tunneling – Hardrock tunneling – Tunnel drilling – Blasting – Impact hammers – Problems encountered and Remedial measures.

UNIT III PLANNING AND GEOMETRIC DESIGN OF TUNNELS 9

Topographical – Geological survey – Rock sampling – Testing – Determination of location size shape and alignment – Subsidence problem on soft ground – Tunneling design in hard rock.

UNIT IV CONSTRUCTION OF TUNNEL 9

Advanced drilling techniques – TBM – Cuttability assessment – Shield tunneling –Advantages – Types of shield tunneling – Factors affecting selection of shield – Twin tunnel –NATM.

UNIT V DESIGN OF TUNNEL SUPPORTING SYSTEMS AND VENTILATION 9

Classification of supports – Active – Passive – Permanent – Temporary – Excavation support – Steel supports lining – Grouting – Ground freezing – Environment in underground – Various methods of ventilation.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Acquire knowledge on utilization of underground space for various applications.
- Evaluate various methods of excavations and problems encountered with its remedial measures.
- Execute geological survey, rock sampling and tunnel design in hard rocks.
- Access the suitable method of drilling techniques in construction of tunnels.
- Study various types of tunnel support system,lining,grouting and ground freezing.

TEXT BOOKS:

1. R.K.Goel, Bhavani singh, Jian Zhao, "Underground infrastructure planning design construction", Butterworth heinemunn publishers, 2012.
2. Hemphill G.B, "Practical tunnel construction", John wiley and Son, 1st Edition, 2012 .

REFERENCE BOOKS:

1. David chapran, Nicole metse and Alfred stark, "Introduction to tunnel construction",Spor press.

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20CE804PE GROUNDWATER ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the various types of aquifers and hydro geological parameters.
- Impart knowledge on steady and unsteady flow in well hydraulics.
- Evaluate the concepts of ground water management with examples.
- Analyze the sources, standard measures of groundwater quality.
- Acquire skills on various recharge methods of groundwater conservation.

UNIT I HYDRO GEOLOGICAL PARAMETERS 9

Introduction – Water bearing properties of rock – Type of aquifers – Aquifer properties – Permeability, specific yield, and storage coefficient – Determine of hydraulic conductivity – Ground water table fluctuation due to evapotranspiration -- Meteorological – Tides – Ground water utilization – Groundwater in the hydrological cycle.

UNIT II WELL HYDRAULICS 9

Objectives of ground water hydraulics – Darcy's law – Ground water equation – Steady radial flow – Well in uniform flow – Unsteady state flow in a confined aquifer – Unconfined aquifer – Well flow near aquifer boundaries – Partial penetrations of wells.

UNIT III GROUND WATER MANAGEMENT 9

Concepts of basin management – Equation of hydrologic equilibrium – Ground water basin investigations – Data collection – Alternative basin yields – Evaluation of perennial yield – Basin management by conjunctive use – Examples of ground water management.

UNIT IV GROUNDWATER QUALITY 9

Sources of salinity – Measures of water quality – Chemical analysis – Physical analysis – Biological analysis – Groundwater samples – Water quality criteria – Changes in chemical composition – Dissolved gases – Temperature – Saline ground water.

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UNIT V GROUNDWATER CONSERVATION 9

Concept of artificial recharge – Recharge methods – Occurrence of saline water intrusion – Control of saline water of intrusion – Pollution in relation to water use – Municipal sources and causes – Industrial sources and causes – Agricultural sources and causes – Attenuation of pollution – Evaluation of pollution potential – Monitoring ground water quality.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze the basic properties of various hydro geological parameters.
- Determine steady and unsteady flow in confined and unconfined aquifers in well hydraulics.
- Check stability of ground water basin and evaluate perennial yield.
- Perform different ground water quality analysis with various measures.
- Evaluate various sources, causes and control measures of saline water intrusion.

TEXT BOOKS:

1. Todd D K and Larry W Mays, "Ground Water Hydrology", John Wiley and Sons, New York, 3rd Edition, 2010.
2. Raghunath H M, "Ground Water", New Age International, Pvt. Ltd., New Delhi, 2007.

REFERENCE BOOKS:

1. Neven Kresic and Zoran Stevanovic, "Groundwater Hydrology of Springs", Butterworth Heinemann, 1st Edition, 2009.
2. Charles Fitts "Groundwater Science", Academic Press, 1st Edition, 2002.
3. Ramakrishnan S, "Ground Water" K.J. Graph arts, Chennai, 1998.
4. Jacob Bear, "Hydraulics of Groundwater", Dover Publication, 2012.
5. John H Cushman and Daniel M Tartakovsky, "The Handbook of Groundwater Engineering", CRC Press; 3rd Edition, 2016.

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20/11/24

20CE709PE IRRIGATION AND ENVIRONMENTAL ENGINEERING DESIGN AND DRAWING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand fundamentals of design of tank components.
- Acquire design skills of impounding structures and cross drainage works.
- Execute design and drawing of canal regulation structures.
- Impart knowledge on design of water supply and its treatment components.
- Design and draw various treatment and disposal units of sewage.

UNIT I TANK COMPONENTS 9

Fundamentals of design – Tank surplus weir – Tank sluice with tower head – Drawings showing foundation details, plan and elevation.

UNIT II IMPOUNDING STRUCTURES AND CROSS DRAINAGE WORKS 9

Design principles – Earth dam – Profile of gravity dam – General design principles – Aqueducts – Syphon aqueduct (type III) – Canal drop (notch type) – Drawing showing plan, elevation and foundation details.

UNIT III CANAL REGULATION STRUCTURES 9

General principles – Direct sluice – Canal regulator – Drawing showing detailed plan, elevation and foundation details.

UNIT IV WATER SUPPLY AND TREATMENT 9

Design and drawing of flash mixer – Rapid sand filter – Service reservoirs – Pumping station – House service connection for water supply.

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UNIT V SEWAGE TREATMENT AND DISPOSAL 9

Design and drawing of grit channel – Primary clarifier – Activated sludge process – Aeration tank – Trickling filter – Sludge digester – Sludge drying beds – Septic tank and disposal arrangement.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Evaluate design steps and draw tank components in detail.
- Apply design principles in dams, canal drops, aqueduct, and syphon aqueduct.
- Analyze design procedure and drawing details of direct sluice and canal regulator.
- Execute design and drawing of flash mixer, filters, service reservoir, pumping station and house service connection.
- Design and draw various sewage treatment and disposal units with its basic standards.

TEXT BOOKS:

1. Satya Narayana Murty Challa, "Water Resources Engineering Principles and Practice", New Age International Publishers, New Delhi, 2nd Edition, 2020.

REFERENCE BOOKS:

1. Garg S K, "Environmental Engineering (Vol. I) Water Supply Engineering", Khanna Publishers, New Delhi, 2011.
2. Garg S K, "Environmental Engineering (Vol. II)", Khanna Publishers, New Delhi, 2010.

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20CE502PE	AIR POLLUTION AND CONTROL ENGINEERING	L	T	P	C
	(Common to AGE, BME, ECE, EEE, CSE, IT, Mech)	3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart knowledge on ambient air quality and emission standards.
- Learn effects of meteorology on air pollution.
- Understand various types of particulate contaminants with its sources and control measures.
- Gain awareness on different types of gaseous contaminants and its preventive measures.
- Study various sources, types and control of indoor air pollutants.

UNIT I INTRODUCTION 9

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards –Ambient and stack sampling and Analysis of Particulate and Gaseous Pollutants.

UNIT II METEOROLOGY 9

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle, Design and performance equations of Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators – Operational Considerations.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 9

Factors affecting Selection of Control Equipment – Working principle, Design and performance equations of absorption, Adsorption, condensation, Incineration, Bio scrubbers, Bio filters – Process control and Monitoring - Operational Considerations.

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UNIT V INDOOR AIR QUALITY MANAGEMENT 9

Sources types and control of indoor air pollutants, sick building syndrome types – Radon Pollution and its control- Sources and Effects of Noise Pollution – Measurement – Standards – Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the nature and characteristics of air pollutants.
- Analyze the fundamentals on effects of meteorology in air pollution.
- Design stacks and particulate air pollution control devices to meet applicable standards.
- Learn control devices of gaseous contaminants with design standards.
- Maintain indoor quality management.

TEXT BOOKS:

1. Lawrence K. Wang, Norman C. Parelra, Yung Tse Hung, Air Pollution Control Engineering, Tokyo, 2004.
2. Noel de Nevers, Air Pollution Control Engineering, Mc Graw Hill, New York, 1995.

REFERENCE BOOKS:

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C Stern, "Air Pollution (Vol. I – Vol. VIII)", Academic Press, 2006.
3. Wayne T Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc., 2000.
4. Anjaneyulu. Y, "Air Pollution and Control Technologies", Allied Publishers Pvt. Ltd., India 2002.

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20CE501PE	INDUSTRIAL WASTE MANAGEMENT	L	T	P	C
	(Common to AGE, BME, ECE, EEE, CSE, IT, Mech)	3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the various characteristics of industrial waste water.
- Learn the process and mechanism of different waste water treatment process.
- Impart awareness on waste that emits from industries.
- Demonstrate biological waste water treatment process.
- Acquire knowledge on treatment of sludge and its disposal methods.

UNIT I INTRODUCTION 9

Undesirable waste water characteristics – Characteristics of industrial waste waters – Waste water characteristics – Estimating the organic content – Measuring the efficiency toxicity – In plant waste control and waste reuse – Storm water control.

UNIT II WASTE WATER TREATMENT PROCESSES 9

Pre and primary treatment of waste water – Equalization – Neutralization – Sedimentation – Oil separation-sour water strippers – Floatation – Coagulation, precipitation and metals removal– coagulation – Heavy metals removal – Aeration and mass transfer; mechanism of oxygen transfer – Aeration equipment – Air stripping of volatile organic compounds.

UNIT III POLLUTION FROM MAJOR INDUSTRIES 9

Sources, Characteristics, waste treatment flow from industries such as Textiles, pulp and paper mill wastes breweries and distilleries waste, Tanneries, Pharmaceuticals, Dairy, Sugar mill wastes, Steel plants, oil Refineries, fertilizer plant waste, petrochemical complex waste, corn starch industry waste – Odour and its removal-removal color from waste waters – Waste minimization and clean technologies.

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UNIT IV BIOLOGICAL WASTE WATER TREATMENT PROCESS 9

Lagoons and stabilization basins – Aerated lagoons-activated sludge processes – Trickling filtration – Rotating biological contactors – Anaerobic decomposition-laboratory evaluation of anaerobic treatment – Adsorption – Theory of activated carbon – Sludge quality considerations – Stripping of volatile organics – Nitrification and denitrification.

UNIT V SLUDGE TREATMENT AND DISPOSAL 9

Characteristics of sludge for disposal – Aerobic digestion – Gravity thickening – Flotation thickening – Rotatary drum screen – Gravity belt thickener – Centrifugation – Vacuum filtration – Pressure filtration – Belt filter press – Sand bed drying-factors affecting dewatering performance – Land disposal of sludges – Incineration.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, learners will be able to,

- Gain knowledge on undesirable waste water characteristics.
- Understand various methods dealt with treatment of waste water.
- Illustrate various sources, types, characteristics and disposal methods of industrial waste water.
- Acquire knowledge on different types of aerobic and anaerobic waste water treatment process.
- Aware with various sludge treatment methods and its disposal.

TEXT BOOKS:

1. Wesley Eckenfelder W, Jr Industrial Water Pollution Control 3rd Edition, Mc–GrawHill Book Company, New Delhi, 2000.
2. Stephenson R L and Blackburn J B, Industrial Wastewater Systems Hand book, Lewis Publisher, New York, 1998.

REFERENCE BOOKS:

1. M.N.Rao & A.K.Dutta, Wastewater Treatment, Oxford - IBH Publication, 1995.
2. H.M. Freeman, Industrial Pollution Prevention Hand Book, McGraw-Hill Inc., New Delhi, 1995.

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20CE803PE MUNICIPAL SOLID WASTE MANAGEMENT **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Gain knowledge on types, sources and characteristics of solid waste and estimation of solid waste quantity.
- Understand primary collection, types of collection system, need and types of transfer station.
- Analyze fuel gas characteristics, pyrolysis and treatment.
- Evaluate different phases, types of composting and types of bio-gas digesters.
- Determine site selection and types of land fill, financing in MSWM projects.

UNIT I EVOLUTION OF SOLID WASTE MANAGEMENT **9**

Introduction to solid waste – Functional elements – Types and sources of solid waste – Sampling and Characteristics – Estimation of solid waste quantity – Factors affecting solid waste generation rate – Construction and demolition waste – Management of bio medical, e – waste and inert waste – Integrated solid waste management (ISWM) – Municipal solid waste management rules.

UNIT II WASTE HANDLING, COLLECTION AND TRANSFER **9**

Handling, separation and storage at source – Processing at source – Primary collection – Types of collection system – Analysis of collection system – Need and types of transfer station – Transport means and methods – Unit operation for component separation – Material recovery facilities (MRF) – Recycling of dry waste components.

UNIT III INCINERATION **9**

Waste of fuel – Incineration /combustion – Fuel Gas characteristics and treatment – Solid residue generation, characterization and treatment – Waste to energy (WtE) plants – Pyrolysis and gasification – Case studies.

UNIT IV COMPOSTING **9**

Definition and phases of composting – Factors affecting composting process – Types of composting I – Types of composting II – Composting quality – Vermicomposting – Definition, stages and factors affecting anaerobic digestion – Pretreatment and co digestion for enhancement of biogas production – Types of biogas digesters.

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UNIT V LANDFILL & MANAGEMENT 9

Site selection and types of landfill – Leach ate collection and treatment – Landfill gas collection and treatment – Design of landfill & bio – Mining of old dumpsite – Financing in MSWM projects – Public – Private – Partnership (PPP) in MSWM projects.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn characteristics, types and management of biomedical, e-waste and inert waste.
- Develop skills to handle waste, processing and material recovery and recycling of dry waste components.
- Execute incineration, fuel gas treatment and gasification.
- Elaborate composting methods, vermi composting, biogas production and types of bio gas digesters.
- Acquire knowledge on site selection of land fill, types, treatment and design of landfill.

TEXT BOOKS:

1. Thomas H Christensen, "Solid Waste Technology & Management", Wiley Publication, Volume 1 & 2, 2010.
2. Debra R Reinhart and Timothy G Townsend, "Landfill Bioreactor Design & Operation", CRC Press, 1st Edition, 1998.

REFERENCE BOOKS:

1. George Tchobanoglous G and Frank Kreith, "Handbook of Solid Waste Management", McGraw Hill, 2nd Edition, 2002
2. George Tchobanoglous, Hilary Theisen and Samuel A Vigil "Integrated Solid Waste Management Engineering Principles and Management Issues", McGraw Hill, 2nd Edition, 1993.
3. Roger T Haug, "The Practical Handbook of Compost Engineering", Lewis Publishers, 1993
4. "Hand Book of Compost Engineering", Lewis Publishers, 1993.

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20CE812PE ENVIRONMENTAL REMEDIATION OF CONTAMINATED SITES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Aware on the concepts of regulations and remediation in contaminated sites.
- Acquire knowledge on human health risk assessment.
- Understand the concepts of remedial options for contaminated sites.
- Simplify the awareness on design consideration in soil sediments.
- Summarize knowledge on bioremediation and thermal processes.

UNIT I INTRODUCTION **9**

Introduction – Laws, Regulations and Remediation – Legal Concepts – Types of Law– Regulations– Laws/Regulations– History– Objectives– Remediation Process – Definition of hazardous waste – Waste Classification – Corrective Action.

UNIT II RISK ASSESSMENT **9**

Terminology – History – Steps in Human Health Risk Assessment – Data Collection and Evaluation – Exposure Assessment – Toxicity Assessment – Risk Characterization - Risk Management – Risk Communication – Ecological Risk Assessment – Risk-based Corrective Action – Dynamic bearing capacity – Dynamic earth pressure.

UNIT III REMEDIAL OPTIONS **9**

Introduction – Administrative Options – Groundwater – Plume Containment – Pump and Treat – Source Control – Permeable Reactive Barriers – Monitored Natural Attenuation – Case Study.

UNIT IV SOIL SEDIMENTS **9**

Excavation – Landfill – Containment – Solidification/Stabilization – Fundamentals – Leaching – Design Considerations – Chemical Treatment – Surfactant extraction – Soil Vapor Extraction.

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UNIT V BIOREMEDIATION AND THERMAL PROCESSES 9

Introduction – Fundamentals – Important processes – Phytoremediation – Thermal Processes – Introduction – Incineration – Thermal Desorption – Aqueous Oxidation –Soil Washing.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Discover the fundamental principles of remediation processes, and acquire profound knowledge, after researching, on the latest remediation technologies.
- Acquire precise information for correct decision-making skills.
- Examine basic knowledge about remedial options of contaminated sites.
- Develop the capability of selecting proper chemical treatment.
- Evaluate the phytoremediation, thermal process, aqueous oxidation.

TEXT BOOKS:

1. LaGrega, M.D., Buckingham, P.L., Evans, J.C., "Hazardous Waste Management", McGraw-Hill, 1994.

REFERENCE BOOKS:

1. Vamos, R.J., "Hazardous and Industrial Waste Treatment", Prentice Hall, Englewood Cliffs, NJ, 1995.

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12/5/23

20CE813PE ENVIRONMENTAL HEALTH AND SAFETY

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Gain knowledge on environment, health and safety systems in work places.
- Acquire awareness on occupational health and hygiene.
- Adopt different strategies in work place safety measures and systems.
- Familiarize with safety appraisal, hazards and risk management techniques.
- Attain skills on environmental health and safety management.

UNIT I INTRODUCTION 9

Need for developing Environment, Health and Safety systems in work places- International initiatives, National Policy and Legislations on EHS in India - Regulations and Codes of Practice - Role of trade union safety representatives - Ergonomics.

UNIT II OCCUPATIONAL HEALTH AND HYGIENE 9

Definition of occupational health and hygiene - Categories of health hazards – Exposure pathways and human responses–Exposure Assessment-occupational exposure limits - Hierarchy of control measures - Role of personal protective equipment and the selection criteria

UNIT III WORKPLACE SAFETY AND SAFETY SYSTEMS 9

Features of Satisfactory and Safe design of work premises – good housekeeping - lighting and color, Ventilation and Heat Control, Noise, Chemical and Radiation Safety – Electrical Safety – Fire Safety – Safety at Construction sites, ETP – Machine guarding – Process Safety, Working at different levels

UNIT IV HAZARDS AND RISK MANAGEMENT 9

Safety appraisal – Job Safety Analysis-Control techniques – plant safety inspection – Accident investigation - Analysis and Reporting – Hazard and Risk Management Techniques –Onsite and Offsite emergency Plans. Employee Participation- Education and Training- Case Studies

UNIT V ENVIRONMENTAL HEALTH AND SAFETY MANAGEMENT 9

Concept of Environmental Health and Safety Management – Elements of Environmental Health and Safety Management Policy and implementation and review – ISO 45001-Strucure and Clauses-Case Studies

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TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Aware various National Policy and Legislations on EHS in India.
- Understand different types of Health hazards, effects, assessments and control methods.
- Adopt various safety systems in working environments.
- Analyze job safety analysis, accident investigation and various onsite and offsite emergency plans.
- Review EHS Management System and its elements.

TEXT BOOKS:

1. Dr K U Mistry, "Fundamentals Of Industrial Safety And Health", Siddarth Publisher, 4th edition, 2022
2. Brain J Gallant, "The Facility Manager's Guide to Environmental Health and Safety", Government Institutes, 2007.

REFERENCE BOOKS:

1. Industrial Health and Safety Acts and Amendments, by Ministry of Labour and Employment, Government of India
2. Effective Environmental, Health, and Safety Management Using the Team Approach by Bill Taylor, Culinary and Hospitality Industry Publications Services, 2005.
3. Environmental and Health and Safety Management by Nicholas P.Cheremisinoff and Madelyn L. Graffia, William Andrew Inc. NY, 1995

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20CE805PE PREFABRICATED STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the concepts serviceability, functionality and durability of structural systems.
- Impart knowledge on various prefabricated elements.
- Evaluate proportions of mix, steel reinforcement, casting, fixing and lifting devices.
- Analyze the various types of joints in structural members.
- Acquire skills on design of earthquake resistant concept and cyclones.

UNIT I INTRODUCTION **9**

Serviceability – Functionality and durability of the building – Structural systems – Production – Transportation – Erection.

UNIT II PREFABRICATED ELEMENTS **9**

General – Concrete sandwich panels – Suspended façade panels – Beams – Columns – Walls – Foundation – Floor and roof elements.

UNIT III PROPORTIONING OF MIX **9**

Exposure, cover and strength – Mortars and grouts – Dry pads – Substitute materials – Steel reinforcement – Rebars – Mesh – Stainless steel rebars – Structural steel work – Welding – Cast – ing, fixing and lifting devices – Cast in sockets and anchorage – Non cementacious materials.

UNIT IV JOINTS IN STRUCTURAL MEMBERS **9**

Basic mechanism – Compression joints – Bearing pads – Shear joints – Shear friction – Dowel action – Tension joints – Moment resisting connection – Floor connection at load bearing walls – Flexural strength and stiffness.

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UNIT V DESIGN OF EARTHQUAKE RESISTANT CONCEPT AND CYCLONES 9

Basic concept – Geologic earthquake effects – Seismic hazard analysis – Stable foundation – Continuous load path – Adequate stiffness and strength – Seismic design categories – Design ground motion – Ductility and toughness.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Elaborate different concepts of structural systems.
- Understand the working principles of various prefabricated elements.
- Calculate proportions of mix under various exposure conditions.
- Learn basic mechanism in various types of joints and connections in structural members.
- Design stable foundation, ground motion with adequate stiffness, strength, ductility and toughness.

TEXT BOOKS:

1. Kim S and Elliott, "Precast Concrete Structures" CRC Press, 2019.
2. Alfred Steine, Hubert Bachimann and Mathias Tillmann, "Precast Concrete Structures", Wiely Ernst and Solin, 2011.
3. Guide to Good Practice Task 6.2, "Structural Connections for Precast Concrete Buildings by International Federation for Structural Concrete (FIB)" 2008.

REFERENCE BOOKS:

1. Koncz T, "Manual of Precast Concrete Construction", Vol. I, II and III, Bauverlag, GMBH, 1976.
2. "Structural Design Manual, "Precast Concrete Connection Details, Society for the Studies in the use of Precast Concrete", Netherland Betor Verlag, 2009.

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24/6/21

20CE604PE ADVANCED RC DESIGN

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart knowledge on limit state design of special structural members such as continuous beams, curved beams, deep beams and corbels.
- Design various types of slabs and grid floor as per IS code of practices.
- Calculate deflection and crack width considering limit state of serviceability.
- Acquire knowledge on design of RC wall, shear wall and ductile detailing.
- Develop skills on ultimate load analysis and inelastic behavior of RC structures.

UNIT I SPECIAL STRUCTURAL MEMBERS 9

Design of RC beams – Continuous beams, Curved beams and Deep beams – Design of Corbels.

UNIT II DESIGN OF SLABS AND YIELD LINE THEORY 9

Assumptions – Yield line patterns for various types of slabs with different boundary conditions – Yield line theory of slabs – Virtual work method – Equilibrium methods – Hillerborg method of design – Design of flat slabs – Design of grid floors as per IS: 456.

UNIT III LIMIT STATE OF SERVICEABILITY 9

Parameters considered in limit state of serviceability – Short term deflection – Long term deflection – Calculation of deflections in beams under working loads – Calculation of crack width in beams.

UNIT IV DESIGN OF RC WALL AND DUCTILE DETAILING 9

Design of RC walls – Shear walls – Concepts of ductility – Factors influencing ductility – Design principles and codal provisions.

UNIT V ULTIMATE LOAD ANALYSIS AND INELASTIC BEHAVIOUR 9

Whitney's theory – Ultimate load analysis – Moment redistribution and moment rotation characteristics of a R.C. section – Plastic hinges check for rotation capacity of sections – Concept of moment – Rotation curves.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Design continuous beams, curved beams, deep beams and corbels as per IS practices.
- Analysis of RC slabs using yield line theory and design of flat slab and grid floor.
- Execute calculation of deflection and crack width for serviceability conditions as per code practice.
- Apply concepts of ductile detailing and design RC walls and shear walls.
- Evaluate ultimate load analysis and moment redistribution, moment rotation characteristics of RC sections.

TEXT BOOKS:

1. Unnikrishna Pillai S and Devados Menon, "Reinforced Concrete Design", Tata McGraw Hill Education, 2015.
2. Varghese P C, "Advanced Reinforced Concrete Design", Prentice Hall International Edition, 2nd Edition, 2011.

REFERENCE BOOKS:

1. Krishnaraju N, "Advanced Reinforced Concrete Design", CBS Publishers and Distributors, 2017.
2. Park P and Paulay T, "Reinforced Concrete Structures", John Wiley Sons, 2008.
3. Gambhir M L, "Design of Reinforced Concrete Structures", Prentice Hall of India, 2012.
4. Sinha S N, "Handbook of Reinforced Concrete Design", Tata McGraw Hill Education, 2017.

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24/6/24

20CE701PE ADVANCED STEEL DESIGN **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on eccentric and moment connections.
- Analyze and design industrial structures as per standards.
- Design steel truss girder bridges as per IS requirements.
- Develop design skills of steel bunkers and silos.
- Evaluate basic concepts of cold formed steel structures.

UNIT I ECCENTRIC AND MOMENT CONNECTIONS **9**

Introduction – Beams – Column connections – Connections subjected to eccentric shear – Bolted framed connections – Bolted seat connections – Bolted bracket connections – Bolted moment connections – Welded framed connections – Welded bracket connections – Moment resistant connections.

UNIT II ANALYSIS AND DESIGN OF INDUSTRIAL STRUCTURES **9**

Dead loads, live loads and wind loads on roofs – Design wind speed and pressure, wind pressure on roofs, wind effect on cladding and louvers – Design of angular roof truss, tubular truss, truss for a railway platform – Design of purlins for roofs, design of built up purlins, design of knee braced trusses and stanchions – Design of bracings.

UNIT III DESIGN OF STEEL TRUSS GIRDER BRIDGES **9**

Types of truss bridges – Component parts of a truss bridge – Economic proportions of trusses and self weight of truss girders – Design of bridge compression members, tension members – Wind load on truss girder bridges – Wind effect on top lateral bracing – Bottom lateral bracing – Portal bracing and sway bracing.

UNIT IV DESIGN OF STEEL BUNKERS AND SILOS **9**

Introduction – Janseen's theory – Airy's theory – Design of Parameters – Design criteria – Analysis of bins – Hopper bottom – Design of bins.

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UNIT V COLD FORMED STEEL STRUCTURES 9

Introduction – Advantages of cold formed steel sections – Types of stiffened and unstiffened elements – Local buckling – Lateral buckling – Empirical methods – Z Purlins – Design rules PEB buildings – Steel concrete composite constructions.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand beam-column connections subjected to eccentric shear and moment
- Calculate various loads subjected to industrial structures and design its components as per standards
- Execute design of different types of steel truss girder bridges
- Analyze stability and design criteria of various components of steel bunkers and silos
- Attain knowledge on concepts, types, advantages and design rules of cold formed steel structures

TEXT BOOKS:

1. Duggal S K, "Limit State Design of Steel Structures", Tata Mcgraw Hill, New Delhi, 3rd Edition, 2019.

REFERENCE BOOKS:

1. Subramanian, "Design of Steel Structures", Oxford University Press, 2018.
2. Dr Ramachandra and Gehlot Virendra, "Design of Steel Structures – II", Scientific Publishers, 2015.
3. Rhodes J and Lawson R M "Design of Structures using Cold Formed Steel Sections", SCI Publication 089, The Steel Construction Institute, U.K. 1992.
4. Ponnuswamy S, "Bridge Engineering", Tata McGraw Hill, New Delhi, 2017.
5. IS 800 – 2007, General Construction in Steel – Code of Practice, Steel Tables.

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20CE702PE	PRESTRESSED CONCRETE STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on basic principles and methods of prestressing in structures.
- Design of pre-tensioned and post-tensioned sections for flexure and shear.
- Calculate deflections due to creep and shrinkage and design anchorage zone reinforcement.
- Analyze and design composite and continuous beams.
- Understand design concepts of prestressed water tanks, pipes, and compression, tension members.

UNIT I INTRODUCTION 9

Basic principles of prestressing – Classification and types – Advantages over ordinary reinforced concrete – Materials – High strength concrete and high tensile steel – Methods of prestressing – Freyssinet, Magnel Blaton, LeeMc Call and Killick anchorage systems – Analysis of sections for stresses by stress concept, strength concept and load balancing concept – Calculation of losses of prestress in pretension and post tension.

UNIT II DESIGN FOR FLEXURE AND SHEAR 9

Basic assumptions for calculating flexural stresses – Permissible stresses in steel and concrete as per IS1343 Code – Design of section for flexure – Design of sections of type I and type II post – tensioned and pre – Tensioned beams – Check for strength limit state based on IS 1343 Code – Location of wires in pre-tensioned beams – Design for shear based on IS1343 code.

UNIT III DEFLECTION AND DESIGN OF ANCHORAGE ZONE 9

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long term deflections due to creep and shrinkage – Check for serviceability limit state of deflection – Determination of anchorage zone stresses in post – Tensioned beams by Magnel's method, Guyon's method and IS 1343 code – Design of anchorage zone reinforcement.

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UNIT IV COMPOSITE BEAMS AND CONTINUOUS BEAMS 9

Types of RCC – PSC composite beams – Analysis and design of composite beams – Analysis for secondary moments – Concordant cable and linear transformation – Calculation of stresses – Principles of design.

UNIT V MISCELLANEOUS STRUCTURES 9

Design of tanks, pipes, and compression, tension members – Use of non-prestressed reinforcement – Definition, methods of achieving, merits and demerits of partial prestressing.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the behavior of pre stressed concrete structural elements.
- Design the pre stressed concrete members for flexure and shear as per IS code.
- Analyze deflection of prestressed concrete members and design anchorage zone.
- Determine secondary moments and stresses acting on composite and continuous beams.
- Evaluate design principles of pre stressed concrete structures such as sleepers, tanks, pipes and poles.

TEXT BOOKS:

1. Krishna Raju N, "Prestressed concrete", Tata McGraw Hill Company, New Delhi, 5th Edition, 2018.
2. Pandit G S and Gupta S P, "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd., 2016.

REFERENCE BOOKS:

1. Rajagopalan N, "Prestressed Concrete", Narosa Publishing House, 2nd Edition, 2017.
2. Dayaratnam P, "Prestressed Concrete Structures", Oxford and IBH, 6th Edition, 2018.
3. Lin T Y and Ned H Burns, "Design of Prestressed Concrete Structures", Wiley India Pvt. Ltd., New Delhi, 3rd Edition, 2013.
4. IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012.
5. IS: 3370 – 2008 (Part 4), Indian standard Code of practice for Concrete Structures for the Storage of Liquid – Design Tables, Code of Practice, Bureau of Indian Standards, New Delhi.

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24/6/21

20CE705PE BASIC STRUCTURAL DYNAMICS AND EARTHQUAKE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the concepts of equation of motion for single degree of freedom system.
- Derive equation of motion for multi degree of freedom system.
- Determine characteristics of earthquake motion with its estimation parameters.
- Analyze effects of earthquake on different types of structures.
- Evaluate concepts of earthquake resistant design for masonry and RCC structures.

UNIT I SINGLE DEGREE OF FREEDOM SYSTEM **9**

Definition of degree of freedom – Idealization of structure as SDOF system – Formulation of equation of motion for various SDOF system – 'D' Alemberts principles – Effect of damping – Free and forced vibration of damped and undamped structures – Response to harmonic forces and periodic forces.

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM **9**

Formulation of equation of motion for multi degree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods.

UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING **9**

Elements of Engineering Seismology – Definitions, introduction to seismic hazard, earthquake phenomenon – Seismotectonics – Seismic Instrumentation – Characteristics of strong earthquake motion – Estimation of earthquake parameters.

UNIT IV EARTHQUAKE EFFECTS ON STRUCTURES **9**

Effect of earthquake on different types of structures – Behavior of RCC, Steel and prestressed concrete structures under earthquake loading – Pinching effect – Bouchinger effects – Evaluation of earthquake forces – IS Code 1893: 2002 – Response spectra – Lessons learnt from past earthquakes.

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UNIT V CONCEPTS OF EARTHQUAKE RESISTANT DESIGN 9

Causes of damage – Planning considerations /Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Design and detailing (IS 13920:1993).

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze structures subjected to dynamic loading with single degree of freedom.
- Calculate response to free and forced vibration of damped and undamped MDOF system.
- Design structures for seismic loading conditions as per IS code provisions.
- Enumerate effects of earthquake on various types of structures.
- Elaborate concepts of design and detailing of earthquake resistant structures as per IS code provisions.

TEXT BOOKS:

1. Damodarasamy S R and Kavitha S, "Basics of Structural Dynamics and Aseismic Design", PHI Learning Pvt. Ltd., 2017.
2. Mario Paz, "Structural Dynamics – Theory and Computations", 2nd Edition, CBS Publishers, 2004.

REFERENCE BOOKS:

1. Pankaj Agarwa and Manish Shrikhande, "Earthquake Resistant Design of Structures", Prentice Hall of India Pvt. Ltd., 2011.
2. IS: 13920 – 1993, "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces – Code of Practice".
3. IS: 1893 – 2002 (Part I), "Indian Standard Criteria for Earthquake Resistant Design of Structures".
4. IS: 4326 – 1993, "Earthquake Resistant Design and Construction of Buildings Code of Practice", 2nd Revision.

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20/6/24

20CE708PE FIRE PROTECTION SERVICES AND MAINTENANCE MANAGEMENT OF BUILDING

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Gain knowledge on basic concepts of fire protection, effects of fire on construction materials.
- Design of fire resistance in steel and concrete, lift systems, simulation and escalators.
- Analyze flow systems, water supply, governing equations for HVAC process.
- Understand flow network, cost and various stages of maintenance management in buildings.
- Determine various effects of corrosion, non- destructive test, and periodicity and economics of condition survey.

UNIT I CONCEPTS OF FIRE PROTECTION **9**

Basic concepts of fire protection – Fire resistance – Introduction process of combustion – Ventilation and fuel process of combustion controlled fire – Process of combustion – Flashover condition – Effect of fire on construction materials – Design for fire resistance – Steel.

UNIT II DESIGN OF FIRE RESISTANCE, SAFETY AND LIFT **9**

Design of Fire resistance – Steel – Concrete – Fire safety – Urban planning – Escape and refuge – Internal planning, detection and suppression – Introduction to lift design – Design of lift systems – Expected stops and floor of reversal – Different cases – Simulation and arrangement and escalators.

UNIT III SYSTEM AND FLOW SYSTEMS AND HVAC **9**

Introduction to system and flow systems – Water supply – Constant demand – Variable demand and diversity factor – Control system – Introduction to heating, ventilation, and air conditioning (HVAC) – Governing equations for HVAC process – Numerical problem on HVAC systems – Psychometric chart – Equation based approach.

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UNIT IV FLOW NETWORK – COST - MAINTENANCE 9

Flow in pipe network and fixture units – Distribution systems – Flow in waste water pipes – Electrical systems – Design of electrical systems – Intelligent building – Life cycle and basics of building maintenance – Stages of maintenance management – Planning for building maintenance – Periodicity of maintenance management – Estimation of repair cycle – Cost profile of maintenance – Lamp replacement – Building inspection, planned and Ad – HOC maintenance.

UNIT V DIAGNOSIS, NDT AND INSPECTION 9

Conditions survey and health evaluation of building – Diagnosis of building by visual survey – case studies – Effect of corrosion and alkali aggregate reaction – Non Destructive testing – Core strength test – Carbonation and chloride measurement – Electrical methods of progress measurement – Repair – Rehabilitation of retrofit – Periodicity and economics of condition survey – Interpretation of test results.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze process of combustion, flash over condition, and effect of fire on construction materials.
- Develop skills to design fire resistance, internal planning, detection simulation and Escalators.
- Execute flow systems, governing equations for HVAC process and numerical problems on HVAC.
- Elaborate intelligent building, life cycle and basics of building maintenance, and stages of maintenance management.
- Conduct conditions survey and health evaluation of building, electrical methods of progress measurement and rehabilitation of retrofit.

TEXT BOOKS:

1. Markus T A and Morris E N, "Building Climate and Energy", Pitman publishing Limited, 1980.
2. Clements Croome and Derek J, "Air conditioning And Ventilation of Buildings Vol-1", Pergamon Press, 1981

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REFERENCE BOOKS:

1. Bureau of Indian Standards, "Hand Book of Functional Requirements of Buildings, (SP-41 & SP- 32)", Bureau Indian Standard, 1987 and 1989.
2. Denison Campbell, Allen and Harold Roper, "Concrete Structures: materials, Maintenance and Repair", Longman Publishers, 1991.
3. Faye C McQuiston, Jerald D Parker, Jeffrey D Spitler, "Heating, Ventilating, and Air Conditioning: Analysis and Design", Wiley Publishers, 6th Edition, 2020.

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20CE714PE **DESIGN OF MASONRY STRUCTURES** **L T P C**

OBJECTIVES: **3 0 0 3**

The student should be made to:

- Analyze concrete masonry wall in flexure, with or without axial compression;
- Understand masonry materials and properties.
- Evaluate strength and behavior of masonry under axial and eccentric compression conditions
- Design masonry shear walls for in-plane and out-of-plane lateral loads
- Model confined masonry and various miscellaneous steel attachments to masonry

UNIT I INTRODUCTION **9**

Introduction: Overview of masonry in ancient and modern times, Methods of design, codes and standards, Structural-functional requirements of masonry buildings, Classification of masonry construction and Loads.

UNIT II MASONRY MATERIALS AND PROPERTIES **9**

Masonry materials and properties: Properties and experimental testing of components (masonry units, mortars, grout, reinforcement).

UNIT III STRENGTH AND BEHAVIOUR OF MASONRY **9**

Strength and behaviour of masonry: Axial compression, eccentric compression, direct and flexural tension, shear and compression, biaxial state of stresses, P-M interaction and Deformation characteristics.

UNIT IV DESIGN OF MASONRY COMPONENTS AND SYSTEMS **9**

Design of reinforced masonry: Basic principles and methods of reinforcing, Working stress and limit states design, Serviceability limit states (deflection, cracking), Design for combined out-of-plane bending and axial compression, Design for in-plane flexure, Design of shear walls, Detailing requirements, International design standards and Multi-storey building design.

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UNIT V CONFINED MASONRY 9

Confined masonry: Development and application, Configuration, Response under seismic loads, Seismic resistance verification, Practical aspects and normative provisions. Infill masonry: Behaviour, Modelling and Design. Assessment and Strengthening of Existing Masonry Structure

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Enable overview of masonry in ancient and modern times, methods of design, codes and standards.
- Explore properties and experimental testing of masonry units.
- Analyse biaxial state of stresses, P-M interaction and deformation characteristics in masonry structures.
- Design masonry structures for working stress and limit state method for vertical and lateral loads, including earthquake loads.
- Review procedures for structural assessment and strengthening of existing masonry structures.

TEXT BOOKS:

1. Drysdale, R.G., Hamid, A.A., and Baker, L.R., Masonry Structures: Behaviour and Design, Prentice Hall, 1994.

REFERENCE BOOKS:

1. Taly, N., Design of Reinforced Masonry Structures, Mc-Graw Hill Companies Inc., 2010.
2. Klingner, R E, Masonry Structural Design, McGraw-Hill Companies, Inc., 2010.
3. TomaÅževic, M., Earthquake-resistant Design of Masonry Buildings, Imperial College Press, 1999.
4. Priestley, M.J.N. and Paulay, T., Seismic Design and Assessment of Reinforced Concrete and Masonry Buildings, John Wiley and Sons, 1997.
5. Handbook on Seismic Retrofit of Buildings, Central Public Works Department and Indian Buildings Congress, Edited by Chakrabarti, A., Menon D. Sengupta, A.K., Narosa Publishing House Pvt. Ltd., 2008. • IS 1905 Code of Practice for Structural use of Unreinforced Masonry, Bureau of Indian Standards.
6. SP 20: 1981 Explanatory Handbook on Masonry Code, Bureau of Indian Standards.
7. Other relevant Indian and international standards.

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20/6/21

20CE505PE	REMOTE SENSING ESSENTIALS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Analyse the basic concepts of remote sensing
- Understand types of platforms and sensors
- Determine types of data products and image analysis
- Impart knowledge on spatial resolution and satellite applications
- Illustrate images interpretation and its applications

UNIT I EMR AND ITS INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL 9

Rudiments of remote sensing and advantages – Historical Perspective of development of remote sensing technology – EM spectrum, solar reflection and thermal emission – Interaction of EM radiation with atmosphere including atmospheric scattering, absorption and emission – Interaction mechanisms of EM radiation with ground, spectral response curves – Laws of Radiation and their relevance in Remote Sensing – Basics of remote sensing image representation – Various Remote Sensing Platforms – Multi-spectral scanners and imaging devices – Significant characteristics of LANDSAT, SPOT, Sentinel sensors.

UNIT II PLATFORMS AND SENSORS 9

Prominent characteristics of IRS, Cartosat Resource Sat sensors – Unmanned Aerial Vehicle / Drone – Passive Microwave Remote Sensing – Image characteristics and different resolutions in Remote Sensing – Different techniques of Image acquisition – Importance of digital image processing – Digital Image Processing Software – Basic image enhancement techniques – Colour representations and transforms – Image Histograms and statistics.

UNIT III IMAGE ANALYSIS 9

Atmospheric errors and corrections – Geo referencing Techniques – Digital Image Processing Software – Image enhancement techniques – Digital Image Processing Software – Spatial Filtering Techniques, Band rationing and PCA – Frequency Domain Fourier Transformation, Digital Image Processing Software – Unsupervised image classification and density slicing techniques.

UNIT IV SPATIAL RESOLUTION AND SATELLITE APPLICATION 9

Supervised image classification techniques and limitations – Digital Image Processing Software – LiDAR Technique and applications – Mosaicking, subsets, sub-sampling techniques and applications – False Topographic Phenomena and correction techniques – High Spatial Resolution Satellite Images and limitations – Basic Image Compression techniques and different image file formats, Hyper spectral Remote Sensing – Digital Image Vs Digital Photograph.

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UNIT V IMAGES INTERPRETATION AND APPLICATIONS 9

NDVI and other indices – Active Microwave Remote Sensing – Radar Images interpretation and applications – SAR Interferometry (InSAR) Technique – Principles of image interpretation – Image interpretation of different geological landforms, rock types and structures – Remote Sensing of Moon and Mars – Google Earth and its Applications.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand basics of EMR and its interaction with atmosphere
- Identify the types of platforms and sensors in remote sensing
- Interpret and enhance the image for analysis
- Develop knowledge with usage of spatial Resolution and satellite application
- Analyze the image interpretation and its applications

TEXT BOOKS:

1. Anji Reddy, "Remote Sensing and Graphical Information Systems" BS Publication, 2008.
2. Dr Kumar S, " Basic of Remote Sensing and GIS", Laxmi Publication, 2017.

REFERENCES:

1. James B Campbell and Randolph H, "Introduction to Remote Sensing", The Guildford Press, New York, 5th Edition, 2012.
2. Lillesand T M, Kiefer R W and Chapman J W, "Remote Sensing and Image Interpretation", John Wiley and Sons, 5th Edition, 2007.
3. Gupta R P, "Remote Sensing Geology", Springer, 2nd Edition, 2003.
4. Drury S A, "Image Interpretation in Geology", Allen and Unwin, 2nd Edition, 1993.
5. Cracknell A P, "Introduction to Remote Sensing", Taylor and Francis, London, 2nd Edition, 1991.

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20CE508PE	ADVANCED GEOMATICS ENGINEERING	L P T C
		3 0 0 3

OBJECTIVES:

The students should be made to

- Understand the applications of geomatics engineering.
- Categorize the digital photogrammetry and types of remote sensing in remote sensing.
- Study the components, working principle, GPS, and LiDHAR concepts in remote sensing surveying.
- Investigate the functions of drone surveying and digital image transformation processing methods.
- Educate various components, data types and characteristics of GIS.

UNIT I INTRODUCTION TO GEOMTICS 9

Introduction to Geomatics engineering – Various applications of geomatics engineering – Introduction of photogrammetry – Scale of aerial photographs – Relief displacement – Stereo pairs and stereoscopes – Parallax in photographs – Height determination from stereo pairs.

UNIT II DIGITAL PHOTOGRAMMETRY 9

Photogrammetry – 3D mapping, DEM, DTM, and DSM – Digital photogrammetry – Remote sensing – Introduction, Electromagnetic spectrum, Energy Interaction with atmosphere, Earth surface, Black body and atmospheric window – Spectral signature and types of resolutions in remote sensing – Multi-concepts, Satellite Orbits in remote sensing.

UNIT III REMOTE SENSING AND GPS SURVEYING 9

Remote sensing – Various sensors, Platforms, very high-resolution remote sensing data, Thermal Microwave and hyperspectral images – Visual interpretation method – GPS surveying – Introduction and components, Working principle, Various methods, Sources of errors – GPS – applications – LiDAR – Data collection with mobile laser scanner – Airborne LiDAR systems – Unmanned aerial vehicles –

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UNIT IV DRONE SURVEYING AND DIGITAL IMAGE PROCESSING 9

Classifications of UAVs/Drones – Various components of Drone and their functions – Flying drones for data collection – Unmanned aerial vehicles and applications – Digital image processing - Preprocessing – atmospheric corrections, geometric corrections, resampling methods – Spatial Filtering in digital remote sensing - Digital Image Transformation methods – Supervised classification methods – unsupervised classification methods – accuracy assessment of classification.

UNIT V GEOGRAPHIC INFORMATION SYSTEM 9

Introduction to Geographic Information System (GIS) - Various components - Various data types and their characteristics – GIS system data input – GIS database and their uses – GIS based extraction of parameters from DEM - Buffering and overlay analysis in GIS – Spatial and network analysis in GIS – Geomatics applications – Site suitability analysis, Transportation route planning, smart city planning.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the fundamentals of Geodesy, Techniques involved in establishment of geomatic control.
- Evaluate photographic process and characteristics of tools used in photogrammetry.
- Execute the concepts, processing of LiDAR and its applications.
- Implement various digital image processing and spatial filtering techniques in digital surveying.
- Explore GIS functionalities, applications and its suitability in Civil Engineering applications.

TEXT BOOKS:

1. Burrough, P.A. and McDonnell, R.A., "Principles of Geographic Information System", Oxford University Press.
2. Chandra, A.M. and Ghosh, S.K., "Remote Sensing and Geographical Information Systems", Alpha Science.

REFERENCES:

1. Garg, P.K. Theory and Principles of Geoinformatics, Khanna Book Publishing Co. Delhi
2. Lillesand, T.L., Kieffer, R. W. and Chipman, J., "Remote Sensing and Image

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20CE509PE TOTAL STATION AND GPS SURVEYING **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the concepts of electromagnetic waves and their applications.
- Impart the knowledge on electro optical system and Total station instruments.
- Explore the working of Total Station and GPS and solve the surveying problems.
- Apply the GPS Processing techniques and methods of application.
- Enhance the surveying methods and their applications.

UNIT I FUNDAMENTALS OF TOTAL STATION AND ELECTROMAGNETIC WAVES **9**

Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying - Applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies – Refractive index (RI) – factors affecting RI -Computation of group for light and near infrared waves at standard and ambient conditions – Computation of RI for microwaves at ambient condition – Reference refractive index -Real-time application of first velocity correction. Measurement of atmospheric parameters - Mean refractive index – Second velocity correction - Total atmospheric correction - Use of temperature -pressure, transducers.

UNIT II ELECTRO-OPTICAL AND MICROWAVE **9**

Electro - optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments - Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments-COGO functions: Area, Inverse / MLM, REM, Resection, offsets and stakeout - Land survey applications.

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UNIT III SATELLITE SYSTEM 9

Basic concepts of GPS – Historical perspective and development – applications -Geoid and Ellipsoid - satellite orbital motion – Keplerian motion – Kepler's Law – Perturbing forces - Geodetic satellite – Doppler effect – Positioning concept – GNSS and IRNSS – SBAS: GAGAN and WAAS Different segments - space, control and user segments – satellite configuration – GPS signal structure – Orbit determination and representation – Anti Spoofing and Selective Availability -Task of control segment - GPS receivers.

UNIT IV GPS DATA PROCESSING 9

GPS observables – code and carrier phase observation – linear combination and derived observables, concept of parameter estimation – downloading the data – RINEX Format– Differential data processing – software modules - solutions of cycle slips, ambiguities - Multi path and other observational errors – satellite geometry and accuracy measures – Continuously Operating Reference System (CORS)– long base line processing - use of different processing software's: Open Source, Scientific and Commercial.

UNIT V SURVEYING METHODS AND APPLICATIONS 9

Total Station: Traversing and Trilateration measurement and adjustment –Planimetric map and Contour map and Topography Mapping - GNSS: Concepts of rapid, static, semi-Kinematic, pure Kinematic and RTK methods. Observation by Radiation, Lee frog and Trilateration measurement and processing -Topography mapping using PPK and RTK methods

Total Station and GNSS applications

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to

- Learn about the fundamental concept of Total station.
- Provide knowledge about electromagnetic waves and its usage in Total station and GNSS.
- Gain Knowledge on basic concepts of GNSS
- Understand the measuring and working principle of electro optical and Microwave Total station and GPS

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- Apply the knowledge in Total station and GNSS data processing and Mapping.

TEXT BOOKS:

1. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 4th Edition,1996.
2. SatheeshGopi, rasathishkumar, N.madhu, — Advanced Surveying , Total Station GPS and Remote Sensing — Pearson education , 2nd Edition,2017. isbn: 978-81317 00679
3. Gunter Seeber , Satellite Geodesy, Walter De Gruyter, Berlin, 2nd Edition, 2003

REFERENCES BOOKS:

1. R.Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983
3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin, 3rdEdition, 2016.
4. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 4th Edition, 2015

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12/2/23

20CE510PE **SATELLITE IMAGE PROCESSING** **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Know the fundamental concepts of image processing.
- Understand the types of sensors and its pre-processing techniques.
- Impart knowledge on image enhancement techniques.
- Educate various types of image classification and its applications.
- Acquire in depth knowledge on advanced classifiers.

UNIT I FUNDAMENTALS OF IMAGE PROCESSING **9**

Information Systems - Encoding and decoding - acquisition, storage and retrieval –data products - satellite data formats - Digital Image Processing Systems - Hardware and software design consideration Scanner, digitizer - photo write systems.

UNIT II SENSORS MODEL AND PRE-PROCESSING **9**

Image Fundamentals – Sensor models – spectral response – Spatial response – IFOV, GIFOV& GSI – Simplified Sensor Models – Sampling & quantization concepts – Image Representation& geometry and Radiometry – Colour concepts – Sources of Image degradation and Correction procedures- Atmospheric, Radiometric, Geometric Corrections- Image Geometry Restoration-Interpolation methods and resampling techniques.

UNIT III IMAGE ENHANCEMENT **9**

Image Characteristics - Histograms - Scattergrams – Univariate and multi variate statistics-enhancement in spatial domain – global, local & colour transformations – PC analysis, edge detections, merging - filters - convolution – LPF, HPF, HBF, directional box, cascade – Morphological and adaptive filters – Zero crossing filters – Scale space transforms – Power spectrum – Texture analysis – Frequency transformations - Fourier, wavelet and curvelet transformations.

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UNIT IV IMAGE CLASSIFICATION 9

Spectral discrimination - Pattern recognition concepts - Baye's approach - Signature and training sets – Separability test –Supervised classification – Minimum distance to mean, Parallelepiped, MLC – Unsupervised classifiers – ISODATA, K-means - Support Vector Machine – Segmentation (Spatial, Spectral) – Tree classifiers - Accuracy assessment – Error matrix – Kappa statistics – ERGAS, RMS.

UNIT V ADVANCED CLASSIFIERS 9

Fuzzy set classification – Sub-pixel classifier – Hybrid classifiers, Texture based classification - Object based classifiers - Artificial Neural nets - Hebbian leaning - Expert system, types and examples - Knowledge systems.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand about Remote sensing and Image processing systems
- Acquire knowledge about the source of error in satellite image and also to remove the error from satellite image.
- Select appropriate image Enhancement techniques based on image characteristics
- Classify the satellite image using various method and also evaluate the accuracy of classification.
- Apply the advanced image classification methods and conduct lifelong research in the field of image processing.

TEXT BOOKS:

1. John, R. Jensen, Introductory Digital Image Processing, Prentice Hall, New Jersey, 4th Edition, 2015.
2. Robert, A. Schowengergt, Techniques for Image Processing and classification in Remote Sensing, Academic Press, 2012.

REFERENCES BOOKS:

1. Robert, G. Reeves, Manual of Remote Sensing Vol. I & II - American Society of Photogrammetry, Falls, Church, USA, 1983.
2. Richards, Remote sensing digital Image Analysis - An Introduction 5th Edition, 2012, Springer -Verlag 1993.
3. Digital Image Processing by Rafael C. Gonzalez, Richard Eugene Woods- Pearson/ Prentice Hall, 2008.
4. Fundamentals of Digital Image Processing by Annadurai Pearson Education (2006).

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12/8/23

20CE511PE	CARTOGRAPHY AND GIS	L T P C
		3 0 0 3

OBJECTIVES:

The Students should be made to:

- Impart knowledge on basics of cartography elements.
- Expose the process of map making and production.
- Understand the fundamentals of GIS.
- Characterize the GIS and GPS data, data input and data presentation.
- Assess the data quality, output and compilation.

UNIT I ELEMENTS OF CARTOGRAPHY 9

Definition of Cartography – Maps – Functions – Uses and Types of Maps – Map Scales and Contents - Map Projections – Shape, Distance, Area and Direction Properties – Perspective and mathematical Projections – Indian Maps and Projections – Map Co-ordinate System – UTM and UPS References.

UNIT II MAP DESIGN AND PRODUCTION 9

Elements of a Map – Map Layout Principles – Map Design Fundamentals – Symbols and Conventional Signs – Graded and Ungraded Symbols – Color Theory – Colours and Patterns in Symbolization – Map Lettering – Map Production – Map Printing – Colours and Visualization – Map Reproduction – Map Generalization – Geometric Transformations – Bilinear and Affine Transformations.

UNIT III FUNDAMENTALS OF GIS 9

Introduction to GIS – Definitions – History of GIS – Components of a GIS – Hardware, Software, Data,People, Methods – Introduction to data quality – Types of data – Spatial, Attribute data – types of attributes – scales/levels of measurements – spatial data models – Raster Data Structures – RasterData Compression – Vector Data Structures – Raster Vs Vector Models – TIN and GRID data models.

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UNIT IV DATA INPUT AND TOPOLOGY 9

Scanner – Raster Data Input – Raster Data File Formats – Georeferencing– Vector Data Input – Digitizer– Datum Projection and Reprojection – Coordinate Transformation – Topology - Adjacency, Connectivity and containment – Topological Consistency – Non topological file formats – Attribute Data Linking – Linking External Databases – GPS Data Integration – Raster to Vector and Vector to Raster Conversion.

UNIT V DATA QUALITY AND OUTPUT 9

Assessment of Data Quality - Basic Aspects - Completeness, Logical Consistency, Positional Accuracy, Temporal Accuracy, Thematic Accuracy and Lineage – Metadata – GIS Standards – Interoperability – OGC - Spatial Data Infrastructure – Data Output – Map Compilation – Chart / Graphs.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Acquire knowledge on basic elements of map projection and coordinate systems.
- Apply suitable method for map projection co-ordinate and Datum transformations.
- Analyze the basic concepts and components of GIS, the techniques used for storage of spatial data and data compression.
- Develop skills to interpret the concepts of spatial data inputs.
- Understand the concepts of spatial data quality and data standard.

TEXTBOOKS:

1. Arthur H. Robinson et al, "Elements of Cartography", 7th Edition, Wiley, 2002.
2. Kang - Tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Publishing, Fourth Edition, 2017.
3. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction to Geographical Information Systems, Pearson Education, Fourth Edition, 2011.

REFERENCES BOOKS:

1. John Campbell, "Introductory Cartography", Wm. C. Brown Publishers, 3rd Edition, 2004.
2. Chor Pang LO, Albert K. W. Yeung, "Concepts and Techniques of Geographic Information Systems", Pearson Education, 2nd Edition, November 2016.

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12/8/23

20CE512PE **PHOTOGRAMMETRY** **L T P C**

3 0 0 3

OBJECTIVES:

The Students should be made to:

- Gain knowledge on different types and principals of photography.
- Learn various types of geometrical properties and photo interpretation techniques.
- Familiarize with different types of plotters, classification of orientations and coordinate systems.
- Impart knowledge on aero triangulation and terrain modeling.
- Drive the students to understand the basic principles of digital photogrammetry workstation.

UNIT I PRINCIPLES AND PROPERTIES OF PHOTOGRAPHY **9**

History - Definition, Applications – Types of Photographs, Classification – Photographic overlaps – Camera: metric vs. non-metric, Digital Aerial cameras – Multiple frame and Line cameras – Linear array scanner – Flight Planning – Crab & Drift– Computation of flight plan - Photogrammetry projectPlanning.

UNIT II GEOMETRIC PROPERTIES OF AERIAL PHOTOGRAPHS **9**

Photo coordinate measurement – Vertical photographs -geometry, scale, Coordinate system, Relief displacement – Stereoscopes – Stereoscopic parallax – parallax equations -Geometry, Scale, Coordinate system – Relief displacement — Photo Interpretation.

UNIT III STEREOPLOTTERS & ORIENTATION **9**

Projection system, Viewing, Measuring and Tracing system Stereo plotters–Classification: Analog, semi analytical, Analytical and Digital systems – Interior orientation - Relative orientation – Absolute orientation - Collinearity condition and Coplanarity condition - Orientation: Two-dimensional coordinate transformations –Three-dimensional conformal coordinate transformation.

UNIT IV AEROTRIANGULATION, TERRAIN MODELING, ORTHOPHOT **9**

Model – Strip and blocks of photographs – Aero triangulation: strip adjustment, independent

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model triangulation, Bundle block Adjustment and GPS Aero triangulation (INS and GNSS integration) - feature collection – DTM generation and Contour mapping – ortho rectification - mono plotting – stereo plotting.

UNIT V DIGITAL PHOTOGRAMMETRY **9**

Photogrammetric Scanner – Digital Photogrammetry WorkStation – Work Station Basic system function – Storage System – Stereoscopic Viewing and Measuring System – Image properties - Image matching: template matching, feature based matching - DEM and DSM - Satellite photogrammetry principles.

TOTAL:45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand and appreciate the importance of photography as means of mapping, functional and physical elements of photography.
- Execute the need of the photogrammetric mapping and the relevance of accuracy standards
- Evaluate the standards of map based on the state-of-the-art tool and techniques and assess the production standards for photogrammetric map making.
- Acquire knowledge on the current development, issues methods and solutions in map making and evaluate methods of production.
- Analyze critically and evaluate methods by applying the knowledge gained in integration of mapping technology

TEXTBOOKS:

1. Paul. R Wolf., Bon A. De Witt, Elements of Photogrammetry with Application in GIS McGraw Hill International Book Co., 4thEdition, 2014.
2. E. M. Mikhail, J. S. Bethel, J. C. McGlone, Introduction to Modern Photogrammetry, Wiley Publisher, 2001.

REFERENCES BOOKS:

1. Gollfried Konecny, Geoinformation: Remote Sensing, Photogrammetry and Geographical Information Systems, CRC Press, 2nd Edition, 2014.

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2. Karl Kraus, Photogrammetry: Geometry from Images and Laser Scans, Walter de Gruyter Gmb H & Co. 2nd Edition, 2007.
3. Manual of Photogrammetry – American society of Photogrammetry & amp; R. S by Albert. D, 1980.
4. Digital Photogrammetry – A practical course by Wilfried Linder, 3rd edition, Springer, 2009.
5. Digital Photogrammetry by – Y. Egels& amp; Michel Kasser, Taylor & amp; Francis group, 2003.

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20CE513PE **HYDROGRAPHIC SURVEYING** **L T P C**

3 0 0 3

OBJECTIVES:

The Students should be made to:

- Understand the basic principles of hydrographic survey, tides, and tide analysis.
- Characterize the types of data, signals, and transducers of soundings.
- Learn the GPS and internal navigation and positioning systems.
- Gain skills in data processing and analysis, data interpolation, chat production and use of specialized hydrographic software.
- Enhance practical knowledge and understanding of hydrographic survey with case studies.

UNIT I INTRODUCTION, TIDES AND DATUMS **9**

Overview of hydrographic surveying concepts- bathymetric and nautical charts- Basic tidal theory- tidal observations and predictions - common types of recording tide gauges - different vertical datums - Indian tides.

UNIT II SOUNDINGS **9**

Overview of depth data types- Working principle of echo sounders - characteristics and nature of underwater acoustic signals – transducers - error sources and calibrations- Advanced instrumentation.

UNIT III NAVIGATION AND POSITION FIXING **9**

Horizontal positioning methods and requirements - concept of line and surface of position - positioning and navigation using satellite positioning systems - differential GPS and Real-time kinematic (RTK).

UNIT IV PLANNING AND DATA PROCESSING **9**

General considerations for planning of an inshore hydrographic survey - ground and track control - practical soundings in inshore and coastal surveys - data processing and chart compilation - hydrographic software packages for data collection - processing and plotting.

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UNIT V MARINE ENVIRONMENTAL MEASUREMENTS 9

Methods of measuring and recording of currents - composition of the sea bed - and solids in suspension - Case Studies (The role of the hydrographic surveyor on different marine projects).

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn the fundamentals of hydrographic surveying.
- Identify the appropriate techniques for different types of survey.
- Understand the various options available during the Navigation.
- Analyze the data collected from a survey and assess its quality against the project requirements.
- Discuss the different roles for a hydrographic surveyor on marine projects.

TEXT BOOK:

1. U.S. Army Corps of Engineers, "Hydrographic Surveying, Document No. EM 1110-2-1003", 2002.

REFERENCES BOOKS:

1. De Jong, C. D., Lachapelle, G., Skone, S. & Elema, I. A., "Hydrography", Delft University Press, The Netherlands, 2002.
2. Ingham, A. E, "Hydrography for the Surveyor and Engineer", revised by Abbott, V. J., Blackwell Science, 3rd Edition, 1992.
3. International Hydrographic Organisation, "IHO Standards for Hydrographic Surveying (S-44)", IHB Monaco, 1998.
4. Loweth, R. P., "Manual of Offshore Surveying for Geoscientists and Engineers", Chapman & Hall, 1997.
5. Pugh, D., "Changing Sea Levels – Effects of Tides, Weather and Climate", Cambridge University Press, 2004.
6. Sonnenberg, G. J., "Radar and Electronic Navigation", Butterworths, 1988.

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20/6/24

20CE703PE	PRECAST TECHNOLOGY IN BUILDING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the concepts of various types of precast concrete structures.
- Impart knowledge on various precast structural systems.
- Calculate various loads acting on shear walls and to check stability of precast concrete structures.
- Analyze concepts and principles of various precast concrete elements.
- Acquire skills to learn production methods for various special concrete.

UNIT I INTRODUCTION 9

Definition – Precast concrete – Materials used in precast structures – Concrete – Steel reinforcement – Structural steel and bolts – Non-cementitious materials – Types of precast concrete structures – Connections for precast concrete construction – Purlin supports – Roof beam supports – Floor slab supports – Down stand beam supports – Wall element supports – Column/foundation.

UNIT II PRECAST STRUCTURAL SYSTEMS 9

Precast concrete floors options – Floor arrangements – Precast concrete beams – Non-composite reinforced concrete beams – Composite reinforced beams – Non-composite pre stressed beams – Composite pre stressed – Propping – Horizontal interface shear – Production, transport and Erection – Sustainability.

UNIT III STABILITY OF PRECAST CONCRETE STRUCTURES 9

Introduction – Loads on stability components – Wind load case – Out of plumb load case – Seismic load case – Restraint load case (shrinkage and temperature) – Load bearing members for stability – Typical stability elements – Shear wall – Segmented shear walls – Shear walls with large openings – Frames and girders – Three dimensional systems – Plates made from precast concrete elements – Arrangement of stability elements – Distribution of horizontal loads – Construction details – Floor diaphragms – Shear walls.

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UNIT IV PRECAST CONCRETE ELEMENTS 9

Floor and roof elements – Solid slabs – Hollow core slabs – Prestressed hollow core slabs – Conventionally reinforced hollow – Core slabs – Precast floor plates with in situ concrete topping – Prestressed precast floor plates with in situ concrete topping – Ribbed elements – Other floor systems – Beams – Purlins, frame beams, down stand beams – Roof beams – Columns – Walls – Precast concrete wall elements – Foundations – Monolithic foundations – Pocket and pad foundations – Punching shear – Other types of foundation .

UNIT V PRODUCTION 9

Production methods – Production using fixed moulds – Concretes for precast concrete elements – Fresh concretes – Hardened concretes – Ultra high performance concretes – Self compacting concretes – Fiber reinforced concretes – Heat treatment and curing – Reinforcement – Bending and assembling reinforcement – Pre tensioning in prestressing beds – Quality assurance.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on various types of precast structures with its support conditions.
- Analyze composite and non-composite reinforced and pre stressed beams.
- Check stability of precast concrete structures with its different load conditions.
- Determine working principles of various precast concrete elements.
- Evaluate production methods, strength properties and applications of ultra high performance and high strength concrete.

TEXT BOOKS:

1. Alfred Steinle, Hubert Bachmann and Mathias Tillmann, "Precast Concrete Structures", 2nd Edition, 2019.

REFERENCE BOOKS:

1. Elliot and Kim S "Precast Concrete Construction" Butterworth Heinemann Publications, 2002.

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20CE503PE NON DESTRUCTIVE TESTING FOR STRUCTURAL ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The Students should be made to:

- Analyze various surface examination non destructive methods.
- Impart knowledge on volumetric methods.
- Demonstrate radiography, tomography and laminography.
- Acquire knowledge about principles of condition monitoring methods.
- Illustrate procedure to be followed in special NDT methods.

UNIT I SURFACE EXAMINATION METHOD 9

Visual Inspection - Liquid penetrant - Magnetic particle - Eddy current - Physical principles, methodology, limitations and applications.

UNIT II VOLUMETRIC EXAMINATION METHOD - PART 1 9

Ultrasonic testing - Ultrasonic NDT principles, different types of wave modes, physics of wave generation, reception, interactions and propagation - Calibration, data collection, quantification, and interpretation, new methods using guided waves, resonance and other low frequency methods.

UNIT III VOLUMETRIC EXAMINATION METHOD - PART 2 9

Radiography testing - Principles of X-ray NDT, equipment, calibration, image collection, quantification and interpretation - High power sources and high-quality films - Digital radiography, introduction to tomography and laminography.

UNIT IV CONDITION MONITORING METHOD 9

Thermography - Principles of thermography and approaches in NDT, sources and detectors, capabilities and limitations, measurement of diffusivity and wall thickness - Infrared testing - Vibration analysis.

UNIT V SPECIAL NDT METHODS 9

Introduction to special NDT methods - Magnetic resonance imaging, vibration monitoring, laser ultrasonic, holography, computed tomography.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the problem in structures by visual inspection without any special instruments.
- Examine the quality of structures / materials by ultrasonic test and its principles with help of data from equipment's and methods.
- Understand the quality of structures/materials by radiography with principals of X ray and its principles with help of digital radiography, image collections.
- Develop the quality of structures/materials by thermography approach with help sources and detectors and more techniques.
- Exposed to latest techniques/methods in adopted in NDT methods.

TEXT BOOKS:

1. P.J. Shull, "Nondestructive Evaluation - Theory, Techniques, and Applications", Marcell Decker Inc., NY 2016.
2. D.E. Bray and R. K. Stanley, "Non - Destructive Evaluation - A tool in Design, Manufacturing and Service", Revised Edition CRC Press, 1997.

REFERENCE BOOKS:

1. Breysse.D, "Non - Destructive Assessment of Concrete Structures: Reliability and Limits of Single and Combined Techniques", Springer Publishers, 2012.
2. NDT Handbooks Vol 1-17, ASNT Press, OH, USA.

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20CE806PE MAINTENANCE AND REPAIR OF CONCRETE STRUCTURES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Learn concepts of embedded metal corrosion, its significance, types, assessment quality on TMT and corrosion in prestressed concrete.
- Determine deterioration in cementitious systems under various exposure conditions using different onsite tests.
- Evaluate assessment and protective treatment of rebars.
- Execute coating and strengthening on concrete structures, structural strength in joints and connections.
- Develop skills on service life estimation studies with various case studies.

UNIT I EMBEDDED METAL CORROSION **9**

Prologue – Corrosion of embedded metal – Significance and fundamentals of corrosion – carbonation induced and chloride – Induced corrosion – Corrosion of embedded metal – Types of reinforcement – Bare steels – TM ring test for assessing the quality of TMT / QST steel rebars – Metallic and non metallic coated rebars – Corrosion in prestressed concrete

UNIT II DETERIORATION IN CEMENTITIOUS SYSTEMS AND TESTING **9**

Deterioration of cementitious systems – Introduction – Sulphate attack, biofouling and acid attack – Frost attack freeze – Thaw and alkali – Silica reaction – Shrinkage and creep – Fire attack – Abrasion and erosion – Condition assessment of concrete structure – Exposure conditions – Visual inspection – Onsite concrete testing – Testing of concrete in laboratory.

UNIT III ASSESSMENT AND PROTECTIVE TREATMENT **9**

Assessment of concrete structure – Mechanical and corrosion testing of rebars – Strategies and materials for surface repair – Surface preparation and protective treatment.

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UNIT IV COATING AND STRENGTHENING 9

Coatings on concrete infrastructure – Water proofing of concrete structures – Structural strengthening & stabilization – Load effects and introduction to S&S – Beams and slabs – Column & walls – Structural strengthening (joints and connections) – Injection grouts for concrete repair – Structural repair for prestressed concrete systems.

UNIT V SERVICE ESTIMATION AND CASE STUDIES 9

Case studies on structural repair (right methodologies and systematic approach / case studies) – cathodic protection in concrete structures – Laboratory and field studies – Service life estimation.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze significance and fundamentals of corrosion, metallic and non-metallic coated rebars.
- Determine deterioration in cementitious systems and condition assessment of concrete structure
- Elaborate assessment and protective treatment on concrete structures.
- Determine strengthening techniques on structural elements, joints and connections.
- Acquire knowledge on service estimation of concrete structures by various field studies and case studies.

TEXT BOOKS:

1. Varghese P C, "Maintenance Repair and Rehabilitation & Minor Works of Buildings", PHI Learning Pvt. Ltd., New Delhi, 2014.
2. Michael Raupach and Till Buttner, "Concrete Repair to EN1504 – Diagnosis, Design, Principles and Practice", CRC Press, 2019.

REFERENCE BOOKS:

1. Dodge Woodson R, "Concrete Structures – Protection, Repair and Rehabilitation", Butterworth Heinemann, 1st Edition, 2009.

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24/6/25

20CE704PE MODERN CONSTRUCTION MATERIALS

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Learn engineering and technology of materials.
- Understand atomic bonding, structure of solids and movement of atoms in solids.
- Gain knowledge on fracture mechanics.
- Analyze concepts of wood and wood products and fiber reinforced polymer.
- Execute water proofing, floor finish techniques.

UNIT I BASICS AND CLOSURE **9**

Prologue – Introduction to the course – Science, engineering and technology of materials – Environmental concerns – Social perception of construction materials – Closure.

UNIT II MICROSTRUCTURE **9**

Atomic bonding – Structure of solids – Movement of atoms – Development of microstructure.

UNIT III MATERIAL BEHAVIOUR **9**

Surface properties – Response to stress – Failure theories – Fracture mechanics – Rheology - Thermal properties.

UNIT IV STRUCTURAL MATERIALS **9**

Review of construction materials and criteria for selection – Wood and wood products – Polymers – Fiber reinforced polymers – Metals – Bituminous materials – Concrete – Glass.

UNIT NON-STRUCTURAL MATERIALS, ACCESSORIES AND FINISHES **9**

Review of non-structural materials and criteria for selection - Waterproofing materials - Polymer Floor finishes – Paints – Tiles – Acoustic treatment – Dry walls – Anchors.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze different modern materials used in construction.
- Develop skills to learn development of microstructure and movement of atoms in solids.
- Elaborate fracture theories and mechanics.
- Acquire knowledge about wood products, bituminous material and fiber reinforced polymer.
- Execute water proof techniques, floor finishes and anchors.

TEXT BOOKS:

1. Varghese P C, "Building Materials", Prentice Hall India Learning Private Limited, 2nd Edition, 2015.

REFERENCE BOOKS:

1. Raghavan V, "Materials Science and Engineering", Prentice Hall India Learning Private Limited, 6th Edition, 2015.
2. Higgins R A, "The Properties of Engineering Materials", Industrial Press Inc, U.S, 2nd Edition, 1994.
3. Neville A M, "Properties of Concrete", Pearson Education India, 5th Edition, 2012.
4. Illston J M and Demone P L J, "Construction Material, Their Nature and Behaviour", CRC Press, 2001.

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20CE610PE	FORMWORK ENGINEERING	L T P C
		3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the basic principles adopted in form work.
- Acquire skills on various formwork materials accessories & pressures.
- Design formwork, tall structures, foundation wall.
- Evaluate formwork for special structures such as Bridge Structures, Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Nuclear Reactor.
- Analyse the detailed planning of formwork, design of forms and erection of form work.

UNIT I INTRODUCTION TO FORM WORK 9

Introduction to Formwork and false work, Temporary work systems, Requirements, Construction planning and site constraints, Selection, and Classification (Types) of Formwork, General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples - Overall Planning - Detailed planning - Overall programme – Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant Formwork beams - Scaffold frames - Framed panel formwork.

UNIT II FORMWORK MATERIALS ASSESORIES & PRESSURES 9

Formwork Materials, Accessories and consumables – Application of tools, Reconstituted wood – Steel – Aluminum Plywood - Types and grades Standard units - Corner units – Pass units, Calculation of labour constants - Formwork hours - Labour Requirement. Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Finish – Sheathing boards working stresses - Repetitive member stress Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.

UNIT III FORMWORK DESIGN 9

Concepts, Formwork Systems – components, assembly, De-shuttering, safety of work and Design for Tall Structures, Foundation Wall, Column, Slab and Beam formworks. Design of Decks and False works. Effects of various loads. Loading and moment of formwork, IS Code provisions.

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UNIT IV FORMWORK FOR SPECIAL STRUCTURES 9

Formwork for Bridge Structures, Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower, Nuclear Reactor, Tunnel, Lift Shaft, stairs and Formwork for Precast Concrete. Various climbing system, Table lifting system.

UNIT V CASE STUDIES 9

Formwork failures: Causes of failures – Inadequate shoring inadequate bracing of members – improper vibration – Premature stripping Errors in design – Case studies – Finish of exposed concrete design deficiencies – Safety factors – Prevention of rotation – Stripping sequence – failure formwork issues in multi - story building construction – vertical and horizontal elements used in the industry.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Estimate the overall and detailed planning of formwork.
- Impart knowledge on formwork materials, accessories, pressures and labour requirement.
- Gain the conceptual understanding of design, construction and erection of formwork.
- Access the knowledge about different types of form work used for special structures.
- Calculate the errors in design and judge the formwork failures through case studies.

TEXT BOOKS:

1. Peurify R.L and Oberlender G.D , Formwork for Concrete Structures, , McGraw Hill Education India ,2015
2. Jha K N, Formwork for Concrete Structures, Tata McGraw Hill Education, 2012.

REFERENCE BOOKS:

1. Austin, C.K., Formwork for Concrete, Cleaver -Hume Press Ltd., London, 1996.
2. Hurd, M.K., Formwork for Concrete, Special Publication No.4, American Concrete Institute, Detroit, 1996
3. Michael P. Hurst, Construction Press, London and New York, 2003.
4. Christopher Souder , (2014), Temporary Structure Design, Wiley Publications, London.
5. IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS.

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12/8/23

20CE611PE	ENERGY EFFICIENT BUILDINGS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the concepts of energy consumption in buildings and design an energy efficient building.
- Acquire skills on various passive solar heating and cooling design and air filtration.
- Design building strategies, day lighting and light distribution.
- Evaluate heat control and ventilation of solar radiation.
- Analyse and design energy efficient buildings for different climatic zones.

UNIT I INTRODUCTION 9

Climate adapted and climate rejecting buildings – Heat Transfer – Measuring Conduction – Thermal Storage – Measurement of Radiation – The Greenhouse Effect – Convection – Measuring latent and sensible heat – Psychrometry Chart – Thermal Comfort – Microclimate, Site Planning and Development – Temperature – Humidity – Wind – Optimum Site Locations – Sun Path Diagrams – Sun Protection – Types of Shading Devices – Design responses to energy conservation strategies.

UNIT II PASSIVE SOLAR HEATING AND COOLING 9

General Principles of passive Solar Heating – Key Design Elements – Sunspace – Direct gain – Trombe Walls, Water Walls – Convective Air loops – Concepts – Case Studies – General Principles of Passive Cooling – Ventilation – Principles – Case studies – Courtyards – Roof Ponds– Cool Pools – Predicting ventilation in buildings – Window Ventilation Calculations – Room Organization Strategies for Cross and Stack Ventilation – Radiation – Evaporation and dehumidification – Wind Catchers – Mass Effect – Zoning – Load Control – Air Filtration and odor removal.

UNIT III DAYLIGHTING AND ELECTRICAL LIGHTING 9

Materials, components and details – Insulation – Optical materials – Radiant Barriers – Glazing materials – Glazing Spectral Response – Day lighting – Sources and concepts – Building Design Strategies – Case Studies – Daylight apertures – Light Shelves – Codal requirements – Day lighting design – Electric Lighting – Light Distribution – Electric Lighting control for day lighted

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buildings – Switching controls – Coefficient of utilization – Electric Task Lighting – Electric Light Zones – Power Adjustment Factors.

UNIT IV HEAT CONTROL AND VENTILATION 9

Hourly Solar radiation – Heat insulation – Terminology – Requirements – Heat transmission through building sections – Thermal performance of Building sections – Orientation of buildings – Building characteristics for various climates – Thermal Design of buildings – Influence of Design Parameters – Mechanical controls – Examples. Ventilation – Requirements – Minimum standards for ventilation – Ventilation Design – Energy Conservation in Ventilating systems – Design for Natural Ventilation – Calculation of probable indoor wind speed.

UNIT V DESIGN FOR CLIMATIC ZONES 9

Energy efficiency – An Overview of Design Concepts and Architectural Interventions – Embodied Energy – Low Embodied Energy Materials – Passive Downdraft Evaporative Cooling – Design of Energy Efficient Buildings for Various Zones – Cold and cloudy – Cold and sunny – Composite – Hot and dry – Moderate – Warm and humid – Case studies of residences, office buildings and other buildings in each zones – Commonly used software packages in energy efficient building analysis and design - Energy Audit – Certification..

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain environmental energy supplies on buildings
- Analyse the passive solar heating, cooling system
- Discuss the various aspects of day-lighting and electrical lighting in abuilding
- Predict and design building ventilation and heat control for indoor comfort
- Design a building for climatic zone and apply simulation programs of buildings to perform energy calculations

TEXT BOOKS:

1. Brown, G.Z. and DeKay, M., "Sun, Wind and Light - Architectural Design Strategies", John Wiley and Sons Inc,3rd Edition, 2014

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REFERENCE BOOKS:

1. Energy Conservation Building Code, cau of Energy Efficiency, New Delhi, 2018.
2. Handbook on Functional Requirements of Buildings Part 1 to 4 SP : 41 (S and T) 1995
3. John Krigger and Chris Dorsi, "Residential Energy: Cost Savings and Comfort for Existing Buildings", Saturn Resource Management, 2013.
4. Majumdar, M (Ed), "Energy - Efficient Buildings in India", Tata Energy Research Institute, Ministry of Non-Conventional Energy Sources, 2009.

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12/8/23

20CE612PE SUSTAINABLE CONSTRUCTION AND LEAN CONSTRUCTION

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the sustainable construction and to understand the concepts of sustainable materials, energy calculations, green buildings and environmental effects.
- Acquire skills on energy calculations and its components.
- Design of green buildings on National Building Code (NBC), ECBC code, codes in neighboring tropical countries.
- Evaluate core concepts in lean construction.
- Acquire knowledge on lean construction tools and techniques of sampling, survey stream.

UNIT I INTRODUCTION & MATERIALS USED IN SUSTAINABLE CONSTRUCTION **9**

Introduction and definition of Sustainability - Carbon cycle - role of construction material: concrete and steel, etc. - CO_2 contribution from cement and other construction materials - Recycled and manufactured aggregate - Role of QC and durability - Life cycle and sustainability.

UNIT II ENERGY CALCULATIONS **9**

Components of embodied energy - calculation of embodied energy for construction materials - Energy concept and primary energy - Embodied energy via-a-vis operational energy in conditioned building - Life Cycle energy use.

UNIT III GREEN BUILDINGS **9**

Control of energy use in building – National Building Code (NBC), ECBC code, codes in neighboring tropical countries - OTTV concepts and calculations – Features of LEED and TERI – Griha ratings - Role of insulation and thermal properties of construction materials - influence of moisture content and modeling -Performance ratings of green buildings - Zero energy building'.

UNIT IV CORE CONCEPTS IN LEAN **9**

Introduction to the Course; Lean Overview; Need for Productivity Measurement and improvement; Productivity Measurement System (PMS).

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UNIT V LEAN CONSTRUCTION TOOLS AND TECHNIQUES 9

Sampling/ Work Sampling; Survey/ Foreman delay survey; Value Stream/ Process Mapping– 5S, Collaborative Planning System (CPS)/ Last Planner™ System (LPS) – Big Room Approach, IT/BIM and Lean, How to Start Practicing Lean Tools in Project Site.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Assess the various sustainable materials used in construction.
- Analyse the method of estimating the amount of energy required for building.
- Describe the features of LEED, TERI and GRIHA ratings of buildings.
- Explore the core concepts of lean construction tools and techniques and their importance in achieving better productivity.
- Apply lean tools & techniques to achieve sustainability in construction projects.

TEXT BOOKS:

1. Charles J Kibert, "Sustainable Construction: Green Building Design & Delivery", Wiley Publishers, 4th Edition, 2016.

REFERENCE BOOKS:

2. Steve Goodhew, "Sustainable Construction Process", Wiley Blackwell,UK, 2016.
3. Craig A. Langston & Grace K.C. Ding, "Sustainable Practices in the Built Environment", Butterworth Heinemann Publishers, 2011.
4. Ballard, G., Tommelein, I., Koskela, L. and Howell, G., "Lean construction tools and techniques", 2002.
5. Salem, O., Solomon, J., Genaidy, A. and Luegring, M., "Site implementation and Assessment of Lean Construction Techniques", Lean Construction Journal, 2005.

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BoS(CIVIL)

civil

20MG802PE	ENGINEERING ECONOMICS (COMMON TO CIVIL AND MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Understand the fundamentals of engineering economics and cost analysis
- Impart knowledge on value engineering and time value of money
- Know about the methods of cash flow
- Familiarize with the concepts of replacement and maintenance analysis
- Learn the various methods of depreciation and inflation factors

(Use of Interest Tables is permitted)

UNIT I INTRODUCTION TO ECONOMICS 9

Introduction to economics – flow in an economy, law of supply and demand – concept of engineering economics – engineering efficiency – economic efficiency – scope of engineering economics – elements of cost – marginal cost, marginal revenue, sunk cost and opportunity cost – breakeven analysis – PV ratio – elementary economic analysis – material selection for product – design selection for product – process planning.

UNIT II VALUE ENGINEERING 9

Make or buy decision – value engineering – aim, function and procedure – interest formulae and their applications – time value of money – single payment compound amount factor – single payment present worth amount factor – equal payment series compound amount factor – equal payment series sinking fund factor – equal payment series payment present worth amount factor – equal payment series capital recovery amount factor – uniform gradient series annual equivalent amount factor – effective interest rate – examples in all the methods.

UNIT III CASH FLOW 9

Methods of comparison of alternatives – present worth method - revenue dominated and cost dominated cash flow – future worth method - revenue dominated and cost dominated cash flow – annual equivalent method - revenue dominated and cost dominated cash flow – rate of return method – examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

Introduction – types of maintenance – types of replacement problem – determination of economic life of an asset – replacement of an asset with a new asset – capital recovery with return – concept of challenger and defender – simple probabilistic model for items which fails completely.

UNIT V DEPRECIATION 9

Introduction – straight line method of depreciation – declining balance method of depreciation – sum of the years digits method of depreciation – sinking fund method of depreciation – service output method of depreciation – evaluation of public alternatives – inflation adjusted decisions - procedures – examples on comparison of alternatives and determination of economic life of asset.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (MECH)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply the basics of economics and cost analysis to take economically sound decisions
- Analyze the make or buy decision and applications of time value of money
- Evaluate the investment decision by using cash flow methods
- Describe the replacement and maintenance analysis for improvement
- Gain the knowledge on depreciation, inflation and cost benefit ratio

TEXT BOOKS:

1. Panneer Selvam R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2nd Edition, 2013.
2. Chan S Park, "Contemporary Engineering Economics", Pearson Education, 6th Edition, 2015.

REFERENCES:

1. Degarmo E P, Sullivan W G and Canada J R, "Engineering Economy", Macmillan, New York, 7th Edition, 2011.
2. Donald G Newman, Jerome P Lavelle, "Engineering Economics and analysis", Oxford University Press, 8th Edition, 2017.
3. Zahid A khan, Arshad Noor Siddiquee and Brajesh Kumar, "Engineering Economy", Pearson Education, New Delhi, 1st Edition, 2012.

CHAIRMAN
BoS (MECH)

CIVIL

20ME807PE	PROJECT MANAGEMENT (COMMON TO CIVIL AND MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Know the fundamentals of project management
- Understand the principles of project estimation
- Learn about human resource management
- Recognize the organizing systems in project implementations
- Study the concepts of project control and performance measures

UNIT I CONCEPTS OF PROJECT MANAGEMENT 9

Concept of a project – categories – project life cycle phases – project management - tools and techniques – project manager – roles and responsibilities of project manager – project manager as a profession.

UNIT II PROJECT ESTIMATION 9

Feasibility report – financing arrangements – preparation of cost estimates – finalisation of project implementation schedule – evaluation of the project profitability – appointing a project manager – fixing the zero date.

UNIT III HUMAN RESOURCES AND CONTRACTING 9

Delegation – project manager's authority – project organization – accountability in project execution – contracts – trending and selection of contractors – team building.

UNIT IV PROJECT IMPLEMENTATION 9

Systems – design of systems – project work system design – Work Breakdown Structure (WBS) – Project Execution Plan (PEP) – project procedure manual – project control system – planning, scheduling and monitoring – monitoring contracts – project diary.

UNIT V PROJECT CONTROL AND PERFORMANCE 9

Project direction – communications in a project – project coordination – project control – progress control – performance control – schedule control – cost control – performance indicators – performance improvement – Construction Management (CM) and Design Management (DM) companies – project management environment.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the concepts of project management
- Carry out costing and budgeting during project estimation
- Apply the human resource management techniques
- Facilitate the organizing system in project implementations
- Execute the concepts of project control and performance measures

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TEXT BOOKS:

1. Harold kerzner, "Project Management - A Systems Approach to Planning, Scheduling, and Controlling", Wiley India Pvt. Ltd, 10th Edition, 2013.
2. Choudhury S, "Project Management", Tata McGraw-Hill Education Pvt. Ltd, 2013.

REFERENCES:

1. Chitkara K K, "Construction Project Management - Planning, Scheduling and Controlling," Tata McGraw Hill Education, 3rd Edition, 2019.
2. Khanna R B, "Project Management", PHI Learning Private Limited, New Delhi, 2011.
3. Mike Field & Laurie Keller, "Project Management", Thompson Business Press, Washington, 3rd Edition, 2012.

CHAIRMAN
BoS (MECH)

CIVIL

20GE601	PROFESSIONAL ETHICS IN ENGINEERING (COMMON TO CIVIL, EEE, IT AND MECH)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Understand the ethical behaviour and human values
- Expose the basic knowledge about engineering ethics and ethical theories
- Familiarize with the codes of ethics
- Know about the safety, responsibilities and rights of an engineer
- Gain the knowledge about MNCs, Environmental and Computer ethics

UNIT I HUMAN VALUES 9

Morals, values and ethics – integrity – work ethic – service learning – civic virtue – respect for others – living peacefully – caring – sharing – honesty – courage – valuing time – cooperation – commitment – empathy – self confidence – character – spirituality.

UNIT II ENGINEERING ETHICS 9

Senses of 'engineering ethics' – variety of moral issues –.types of inquiry – moral dilemmas – moral autonomy - Kohlberg's theory and Gilligan's theory – consensus and controversy – models of professional roles – theories about right action – self interest – customs and religion – uses of ethical theories.

UNIT III ENGINEER AS SOCIAL EXPERIMENTATION 9

Engineering as experimentation – engineers as responsible experimenters – codes of ethics – balanced outlook on law – the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and risk – assessment of safety and risk – risk benefit analysis and reducing risk – the three mile island and Chernobyl case studies. Respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee rights – Intellectual Property Rights (IPR) – discrimination.

UNIT V GLOBAL ISSUES 9

Multinational Corporation (MNC) – environmental ethics – computer ethics – weapons development – engineers as managers – consulting engineers – engineers as expert witnesses and advisors – moral leadership – code of conduct – corporate social responsibility.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Develop an awareness on human values
- Recognize the basic view of various moral and ethical issues
- Clarify the various social issues, code of ethics and role of professional ethics
- Assess the safety and risk benefit analysis
- Acquire knowledge on global issues and corporate social responsibility

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BoS (MECH)

TEXT BOOKS:

1. Mike W Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 4th Edition, 2017.
2. Naagarazan R S, "Professional Ethics and Human Values", New Age International Publishers, 1st Edition, 2017.

REFERENCES:

1. Govindarajan M, Natarajan S and Senthil Kumar V S, "Engineering Ethics", Prentice Hall of India, New Delhi, 12th Edition, 2011.
2. Charles B Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 4th Edition, 2014.
3. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 6th Edition, 2019.
4. John R Boatright, Jeffery D Smith and Bibhu Prasan Patra "Ethics and the Conduct of Business", Pearson Education, New Delhi, 8th Edition, 2017.

CHAIRMAN
BoS (MECH)

10/10/23

20MG701	TOTAL QUALITY MANAGEMENT	L	T	P	C
	(COMMON TO AGE, CIVIL, CSE, ECE, EEE, IT AND MECH)	3	0	0	3

OBJECTIVES:

The Students should be made to:

- Provide an overview of basic approaches of TQM
- Familiarize with the concepts and principles of TQM
- Impart knowledge on basic and new quality tools
- Learn the applications of TQM techniques in various industries
- Understand the various quality systems, standards and procedures

UNIT I INTRODUCTION 9

Definition of quality and TQM – basic needs of quality – contributions of Deming, Juran and Crosby – TQM framework – historical review of quality management – dimensions of quality – barriers to TQM – benefits of TQM – quality council – quality statements.

UNIT II TQM PRINCIPLES 9

Customer satisfaction – customer perception of quality, customer complaints, service quality and customer retention – employee involvement – motivation, empowerment, team and teamwork, recognition and reward, performance appraisal – continuous process improvement – PDSA cycle, 5s and Kaizen – supplier partnership – supplier selection and supplier rating.

UNIT III TQM TOOLS 9

Basic seven tools of quality – new seven management tools – six sigma – concepts and process – quality costs – reengineering process – improvement strategies – Taguchi principles – quality loss function – role of IT in TQM.

UNIT IV TQM TECHNIQUES 9

Benchmarking - reasons, types and process – Failure Mode of Effect Analysis (FMEA) - procedures and types – Quality Function Deployment (QFD) - benefits and process – Total Productive Maintenance (TPM) - process.

UNIT V QUALITY SYSTEMS 9

Benefits of ISO registration – ISO 9000 series of standards – ISO 9000 requirements and implementation – other sectors specific standards – documentation – audit – ISO 14000 series of standards - concepts, requirements and benefits – quality awards.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Implement the concept of quality, TQM to bring quality management
- Improve the customer supplier relationship management and enrich the employee involvement
- Apply the basic and new quality tools for enhancing quality
- Explore the usage of TQM techniques for measuring, controlling and improving the quality
- Execute the various quality systems, its standards and procedures to increase the quality assurance

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TEXT BOOKS:

1. Dale H Besterfiled, "Total Quality Management", Pearson Education Asia, 3rd Edition, 2013.
2. Poonia M P and Sharma S C, "Total Quality Management", Khanna Publication, 1st Edition, 2018.

REFERENCES:

1. James R Evans and William M Lindsay, "The Management and Control of Quality", South-Western Cengage Learning, 6th Edition, 2010.
2. Vijayan V and Ramakrishnan H "Total Quality Management", S Chand Publication, Pune, 1st Edition, 2014.
3. Suganthi L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd, 7th Edition, 2011.
4. Poornima M Charantimath, "Total Quality Management", Pearson Education, 3rd Edition, 2017.

CHAIRMAN
BoS(MECH)

24/6/24

20CE810PE CONSTRUCTION PLANNING AND SCHEDULING L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the basic concepts in the development of construction plans, work tasks and estimation of activity durations and requirements.
- Impart knowledge on scheduling procedures and techniques in construction.
- Analyze cost control monitoring and accounting.
- Execute safety standards and quality control by statistical methods in construction.
- Acquire knowledge on computerized organization and use of project information.

UNIT I CONSTRUCTION PLANNING 6

Basic concepts in the development of construction plans – Choice of technology and construction method – Defining work tasks – Definition – Precedence relationships among activities – Estimating activity durations – Estimating resource requirements for work activities – Coding systems.

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 12

Relevance of construction schedules – Bar charts – The critical path method – Calculations for critical path scheduling – Activity float and schedules – Presenting project schedules – Critical path scheduling for activity on – Node and with leads, lags and windows – Calculations for scheduling with leads, lags and windows – Resource oriented scheduling – Scheduling with resource constraints and precedences – Use of advanced scheduling techniques – Scheduling with uncertain durations crashing and time cost tradeoffs – Improving the scheduling process.

UNIT III COST CONTROL MONITORING AND ACCOUNTING 9

The cost control problem – The project budget – Forecasting for activity cost control – Financial accounting systems and cost accounts – Control of project cash flows – Schedule control – Schedule and budget updates – Relating cost and schedule information.

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 9

Quality and safety concerns in construction – Organizing for quality and safety – Work and material specifications – Total quality control – Quality control by statistical methods –Statistical quality control with sampling by attributes – Statistical quality control by sampling and variables – Safety – Applications of construction planning and scheduling.

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UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 9

Types of project information – Accuracy and use of information – Computerized organization and use of information – Organizing information in databases – Relational model of data bases – Other conceptual models of databases – Centralized database management systems – Databases and application programs – Information transfer and flow – MS primavera – MS office.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on the basic concepts in construction planning, choice of technology and construction method.
- Calculate bar charts, critical path schedule and advanced scheduling procedures and techniques in construction.
- Evaluate project budget, financial accounting systems, cost accounts and schedule control.
- Apply statistical quality control with sampling by attributes and safety concerns in construction.
- Execute organizing information in databases and other conceptual models of databases and application programs.

TEXT BOOKS:

1. Chitkara K K, "Construction Project Management Planning, Scheduling and Controlling", Tata McGraw Hill Publishing Co., New Delhi, 1998.
2. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 1988.

REFERENCE BOOKS:

1. Moder J, Phillips C and Davis E, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1983.
2. Willis E M, "Scheduling Construction projects", John Wiley and Sons, 1986.
3. Halpin D W, "Financial and Cost Concepts for Construction Management", John Wiley and Sons, New York, 1985.

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20CE814PE **SAFETY AND RISK ANALYTICS** **L T P C**

3 0 0 3

OBJECTIVES:

The students should be made to

- Educate overview of safety and risk management in industry.
- Impart knowledge on date quality and data transformation analysis.
- Study the control charts for safety performance evaluation and analysis.
- Categorize and classify the regression analysis for the prediction of safety risk using case studies.
- Understand the statistical measures based on risk management and safety data collection.

UNIT I INTRODUCTION TO SAFETY AND RISK MANAGEMENT 9

Hazard Triangle – Safety ontology – Quality risk assessment – Hazard and risk data- I & II – Incident Investigation data – Inspection and audit data – Behavioral and organizational safety data.

UNIT II DATA QUALITY AND DISCRIPTIVE ANALYTICS 9

Data dimensions and information quality – Missing data handling – Data transformation – Data reduction – Probability distribution – sample and statistics – Safety data visualization tools – safety data exploration.

UNIT III SAFETY PERFORMANCE AND ANALYSIS 9

Leading and lagging indicators for measuring safety performance – control charts for safety performance evaluation and monitoring – safety capability analysis – Safety reports and use of text analytics – Processing of text data – Document classification using KNN – Topic modeling – Latent Dirichlet allocation.

UNIT IV PREDICTIVE ANALYTICS 9

Bow – Tie construction – Bow-tie quantification – accident scenarios, paths – Probabilistic approach using Monte Carlo Simulation - Consequence Modeling and Risk distribution – Introduction to predictive safety and risk analytics – Logistic regression – Application of logistic

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regression – Classification and regression tree, case study – Support vector machine – Applications – Association rule mining – applications.

UNIT V STATISTICAL MEASURES **9**

Statistical measures of safety program effectiveness – Intervention design – Risk based decision making – Risk based maintenance – Behavioral safety data collection and preliminary analysis – Causal modelling and application path – Injury epidemiology – Occupational safety, Health and working conditions code & analytics.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Develop safety measures policy in industries based on Indian regulations.
- Explore the date quality and data transformation system.
- Apply safety performance measures and control measures in working environments.
- Predict analysis for preparation of Emergency Plans and Accident investigation.
- Analyse safety management system and measures.

TEXT BOOKS:

1. H Kumamoto and E J Henley, "Probabilistic Risk Assessment and Management for Engineers and Scientists", IEEE Press, 2nd Edition, 2000.

REFERENCES BOOKS:

1. Daniela witten. Trevor Hastie, Robert Tibshirani, Gareth James "An Introduction to Statistical Learning", Springer Book, 2013.
2. Christopher M Bishop, "Pattern Recognition and Machine Learning", Springer Book, 2006.
3. Tan, P. N., Steinbach, M., & Kumar. V, "Introduction to Data Mining" , Pearson Education India, 2016.
4. Weiss S M, Indurkhya N, Zhang T and Damerau F J, "Text mining: predictive methods for analysing unstructured information", Springer Book, 2005.

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20CE816PE LEADERSHIP AND TEAM EFFECTIVENESS L T P C

3 0 0 3

OBJECTIVES:

The student should be made to:

- Provide a framework for the students to understand the importance of Leadership and team effectiveness in organizations.
- Develop an understanding of the interpersonal processes and group dynamics.
- Understand a theoretical understanding of leadership practices in organizations.
- Evaluate an understanding of factors influencing teamwork and team leadership.
- Gain the role of leadership in the development of an institution.

UNIT I Introduction to Leadership & Team Management **9**

Introduction to Leadership & Team Management; Leadership Myths; Interactional Framework for analyzing leadership; Leadership Development: The First 90 Days as a Leader; Leader Development- The Action-Observation-Reflection Model. Leadership Attributes; Personality Traits and Leadership; Personality Types and Leadership; Intelligence and Leadership; Emotional Intelligence and Leadership.

UNIT II Leadership Myths & Facts-I **9**

Power and Leadership; The art of influence in leadership; Leadership and "Doing the Right Things; Character-Based Approach to Leadership; Role of Ethics and Values in Organizational Leadership Leadership Behaviour; Leadership Pipeline; Assessing Leadership Behaviors: Multi-rater Feedback Instruments; The Dark Side of; Leadership- Destructive Leadership; Managerial Incompetence and Derailment Conflict Management Negotiation and Leadership; Leadership under a crisis situation; The Situation and the Environment; Culture and Leadership; Global Leadership Motivation and Leadership; Introduction to Groups and Teams; Characteristics of Leader, Follower and Situation; Group Dynamics; Team Formation

UNIT III Leadership Myths & Facts-II **9**

Negotiation and Leadership; Leadership under a crisis situation; The Situation and the Environment; Culture and Leadership; Global Leadership. Motivation and Leadership; Introduction to Groups and Teams; Characteristics of Leader, Follower and Situation; Group

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Dynamics; Team Formation. Delegation and Empowerment; Leading teams: Enhancing teamwork within a group; The leader's role in team-based organizations; Leader actions that foster Teamwork Effectiveness; Offsite training and team development.

UNIT IV INTERACTIONAL FRAMEWORK FOR ANALYZING LEADERSHIP **9**

Understanding Team processes and Team Coaching; Team decision making and conflict management; Virtual teams; Managing Multicultural teams; Building great teams. Experiential Learning; Action Learning; Development Planning: GAP Analysis; Coaching and Mentoring; Women in Leadership Roles.

UNIT V LEADERSHIP DEVELOPMENT: THE FIRST 90 DAYS AS A LEADER **9**

Building Effective Relationship with subordinates and peers; Fostering Followers satisfaction; The Art of Communication; Setting Goals and Providing Constructive Feedback; Enhancing Creativity problem solving skills. Building High-Performance Teams: The Rocket Model; Building Credibility and Trust; Skills for Developing. Others; Team Building at the Top; Community Leadership.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Access global leadership skills contribute to leadership effectiveness.
- Study the leader's role in team-based organizations.
- Illustrate the potential contribution of outdoor training to the development of team leadership.
- Obtain the basics of leadership during a crisis.
- Analyze how evidenced based leadership can contribute to contingency and situational leadership.

TEXT BOOKS:

1. Leadership: Enhancing the lessons of experience by Hughes, R.L., Ginnett, R.C., & Curphy, G.J. (2019), 9th Edition, McGraw Hill Education, Chennai, India.

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20CE807PE	COASTAL ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart fundamental knowledge of the waves and forces in marine/coastal zone/region.
- Calculate forces acting on offshore structures.
- Determine offshore soil investigation.
- Analyze offshore structures with single and multi degree freedom systems.
- Design various elements of offshore structures.

UNIT I WAVE THEORIES 9

Introduction to wave mechanics – Wave generation by wind – Small amplitude wave theory – Formulation and solution – Wave celerity, length and period – Classification of waves based on relative depth – Orbital motions and pressure.

UNIT II FORCES OF OFFSHORE STRUCTURES 9

Wave forces – Morison equation – Wave force on a circular cylinder – Wave forces on submarine pipelines, pipelines in proximity to seabed, pipelines within the zone of wave influence – Wave forces on sea walls and breakwaters – Applications of wave force regimes.

UNIT III OFFSHORE SOIL INVESTIGATION 9

General characteristics of offshore soil exploration – Sampling using free corer, gravity corer, tethered systems and manned submersibles – Deep penetration sampling using wire line techniques – In-situ determination of strength of submarine soils – Penetrometer, piezocone, vane and pressure meter techniques.

UNIT IV ANALYSIS OF OFFSHORE STRUCTURES 9

Modelling of offshore structures – single and multi-degree freedom systems – Coupled motions - Frequency domain analysis – Time domain analysis – Newmark Beta method – Wilson Theta method – Response analysis of jacket structures – Response analysis of complaint structures – non-linear response and stability characteristics.

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UNIT V DESIGN OF OFFSHORE STRUCTURES 9

Design of decking, supporting legs, braces, deck legs – Design of platform derricks, masts, helipads.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand basics of wave theories, mechanics and its classification.
- Determine wave forces acting on various offshore structures and applications of wave force regimes.
- Explore offshore soil investigation by various techniques.
- Analyze response and stability characteristics of offshore structures by various methods.
- Design of offshore structures and its components with its basic standards.

TEXT BOOKS:

1. Dean R G and Darlymple R A, "Water Wave Mechanics for Engineers and Scientists", Prentice Hall Inc., 2001.
2. Sarpkaya T and Isaacson M, "Mechanics of Wave Forces on Offshore Structures", Van Nostrand, 1981.

REFERENCE BOOKS:

1. Turgut Sarpkaya, "Wave Forces on Offshore Structures", Cambridge University Press, 2010.
2. Chaney F, "Marine Geotechnology and Nearshore and Offshore Structures", ASTM, STP, 1986.
3. Chaney R C and Demars K R, "Strength Testing of Marine Sediments Laboratory and Insitu Measurements", ASTM, STP 883, 1985.
4. McClelland B and Reifel M D, "Planning & Design of Fixed Offshore Platforms", Van Nostrand, 1986.

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20CE710PE FUNDAMENTALS OF NANOSCIENCE

L	T	P	C
3	0	0	3

OBJECTIVE:

The student should be made to:

- Learn fundamentals, mechanical, electronic, optical, magnetic and thermal properties of nano particles.
- Acquire knowledge on various methods of preparation of nanomaterials.
- Develop skills on synthesis, structure-property relationships of nanometal oxides.
- Impart knowledge on X-ray diffraction techniques, Scanning Electron Microscopy, Environmental techniques.
- Analyze various applications of Nanocomputer, molecular switch, super chip, Nanobiotechlogy, Nanoprobes in medical diagnostics and biotechnology, Nanosensors.

UNIT I INTRODUCTION 8

Nanoscale Science and technology – Implications for physics, chemistry, biology and engineering – Classifications of nano structured materials – Nano particles – Quantum dots, nano wires – ultra thin films – multilayered materials – Length scales involved and effect on properties – Mechanical, electronic, optical, magnetic and thermal properties – Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION 9

Bottom-up synthesis – Top-down approach – Co-Precipitation, ultrasonication, mechanical milling, colloidal routes, self-assembly, vapour phase deposition, MOCVD, sputtering, evaporation, molecular beam epitaxy, atomic layer epitaxy, MOMBE.

UNIT III NANOMATERIALS 12

Nanoforms of Carbon – Buckminster fullerene – Graphene and carbon nanotube, single wall carbon nanotubes (SWCNT) and multi wall carbon nanotubes (MWCNT) – Methods of synthesis (arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property relationships applications – Nanometal oxides ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, ferrites, Nanoclays – Functionalization and applications – Quantum wires, quantum dots – Preparation, properties and applications.

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UNIT IV CHARACTERIZATION TECHNIQUES 9

X-ray diffraction technique, scanning Electron Microscopy – Environmental techniques, transmission electron microscopy including high resolution imaging – Surface analysis techniques – AFM, SPM, STM, SNOM, ESCA, SIMS – Nanoindentation.

UNIT V APPLICATIONS 7

NanoInfoTech – Information storage – Nanocomputer, molecular switch, super chip, nanocrystal – Nanobiotechlogy – Nanoprobes in medical diagnostics and biotechnology, nano medicines, Targetted drug delivery, bioimaging – Micro electro mechanical systems (MEMS), Nano electro mechanical systems (NEMS) – Nanosensors, nano crystalline silver for bacterial inhibition, nanoparticles for sunbarrier products - In photostat, printing, solar cell, battery.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Evaluate nanoscale Science and technology, classifications of nano structured materials, ultra thin films, multilayered materials.
- Execute Co-Precipitation, ultrasonication, mechanical milling, colloidal routes, self-assembly, vapour phase deposition, MOCVD, sputtering, evaporation, molecular beam epitaxy, atomic layer epitaxy, MOMBE.
- Analyze nanoforms of carbon, methods of synthesis, structure-property relationships applications, nanometal oxides, nanoclays, Quantum wires, quantum dots.
- Determine transmission electron microscopy including high resolution imaging surface analysis techniques, AFM, SPM, STM, SNOM, ESCA, SIMS, nano indentation.
- Develop applications of nano infotech, Information storage, nano medicines, targetted drug delivery, bio imaging, Micro Electro Mechanical Systems (MEMS), nano electro mechanical systems (NEMS).

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TEXT BOOKS:

1. Edelstein A S and Cammearata R C, "Nanomaterials Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. John Dinardo N, "Nanoscale Charecterisation of Surfaces & Interfaces", Weinheim Cambridge, Wiley-VCH, 2nd Edition, 2000.

REFERENCE BOOKS:

1. Timp G, "Nanotechnology", AIP Press/Springer, 1999.
2. Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations", Prentice-Hall of India (P) Ltd., New Delhi, 2007.

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CIVIL

20MA601PE **QUANTITATIVE AND REASONING APTITUDE**

(Common to all branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Sense the problems and develop strategies to find the solutions.
- Derive conclusions and make decision by analyzing mathematical functions.
- Build the right decision quantitatively based on the situations that depends upon the factors.
- Evaluate the validity and possible biases in the arguments presented in authentic contexts based on multiple sources of quantitative information.
- Do aptitude actively such as analyzing data, constructing hypotheses, solving problems, reflecting on their work and making connections.

UNIT I QUANTITATIVE ANALYSIS ON NUMBERS AND PERCENTAGE **9**

Numbers - Simplification – H.C.F and L.C.M of Numbers – Square Root and Cube Root – Surds and Indices – finding Unit and Last two digits of given expression – Remainder Theorem - Average -Logarithm - Percentage – Profit, Loss and Discount.

UNIT II ANALYSIS ON EFFICIENCY, TIME AND SPEED **9**

Simple Interest – Compound Interest - Time and Work – Pipes and Cistern – Chain rule - Time, Speed, Distance – Trains - Boats and streams- Races and games – Calendar -Clocks - Crypt arithmetic Problems.

UNIT III ANALYTICAL THINKING ABILITY OF RATIO & PROPORTION AND PROBABILITY **9**

Ratio and Proportion -Problems on Ages – Partnership – Alligation or Mixture - Permutation and Combination – Probability - Height and Distance – Trigonometry–Mensuration (Two dimensional and Three dimensional figures) - Data Interpretation.

UNIT IV REASONING ABILITY – I **9**

Series Completion – Coding and Decoding - Odd man out - Blood Relations - Sequential output Tracing – Analogy – Direction Sense Test - Classification - Ranking - Seating Arrangements - Dice – Cubes and Cuboids.

UNIT V REASONING ABILITY – II **9**

Syllogism – Statement and Conclusion -Statement and Assumption – Cause and effect - Transformation of Matrices - Matrix Reasoning - Mirror and Water Image – Paper folding – Completion of incomplete pattern- Embedded Images.

TOTAL: 45 PERIODS

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OUTCOMES:

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

- Solve a real-time problem which requires interpretation and comparison of complex numeric summaries.
- Get reason, models, and draw the conclusions or make decisions with mathematical, statistical and quantitative information.
- Justify and communicate effectively with conclusions in the appropriate ways to the audience.
- Apply probabilistic reason to draw conclusions, to make decisions, and to evaluate outcomes of decisions.
- Perceive success in future courses, gain skills for the workplace, and participate as a productive citizens in society.

TEXT BOOKS:

1. Aggarwal R S, "Quantitative Aptitude for Competitive Examinations", S Chand Publishing; New Delhi, Revised edition, 2017.
2. Aggarwal R S, "A Modern Approach to Verbal and Non – Verbal Reasoning", S Chand Publishing; New Delhi, Revised edition, 2018.

REFERENCES:

1. Abhijit Guha, "Quantitative Aptitude for All Competitive Examinations", McGraw Hill Education; 6th edition, 2016.
2. Arun Sharma, "How to Prepare for Quantitative Aptitude for the CAT", McGraw Hill Education; 8th edition, 2018.
3. Kailash Chandra and Sunil Kumar, "General Intelligence and Reasoning (Verbal and Non – Verbal)", Arihant Publications, 13th edition, 2019.
4. Anand P A and Lalith Singh, "Wiley's Verbal Ability and Reasoning for Competitive Examinations", 2016.

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20CE715PE	ADMIXTURES AND SPECIAL CONCRETES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Evaluate various requirements of cement, aggregates and water for making concrete.
- Understand various effects of Chemical admixtures on properties of concrete.
- Recognize the effects of Mineral admixtures on properties of concrete.
- Determine properties of concrete at fresh and hardened state.
- Execute the importance and application of special concretes.

UNIT I CEMENT COMPOSITION 9

Cement chemistry and concrete performance - An overview

UNIT II CHEMICAL ADMIXTURES 9

Introduction & Water reducers- Set controllers, Standards on chemical admixtures & Air entraining agents- Understanding concrete rheology, Viscosity modifying agents, Shrinkage reducing admixtures, & Other specialty admixtures

UNIT III MINERAL ADMIXTURES 9

Introduction, classification and pozzolanic activity- Fly ash and Silica fume- GGBFS, Metakaolin and LC3- Agricultural ashes, characterization techniques Life Cycle Assessment

UNIT IV FRESH AND HARDENED PROPERTIES OF CONCRETE 9

Workability-Tests for workability of concrete-Slump Test and Compacting factor Test-Segregation and Bleeding-Determination of Compressive and Flexural strength as per BIS - Properties of Hardened concrete- Stress-strain curve for concrete-Determination of Modulus of elasticity

UNIT V SPECIAL CONCRETES 9

High strength concrete and ultra high performance concrete- Self compacting concrete and mass concreting-Mass concreting and lightweight concrete- High density concrete and concrete for 3D printing

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply knowledge on various requirements of concrete making materials.
- Analyze the effect of chemical admixtures on properties of concrete.
- Interpret the effect of mineral admixtures on properties of concrete.
- Recognize the various fresh and hardened properties of concrete.
- Enumerate properties and applications of special concrete.

TEXTBOOKS:

1. Mehta, P. K., and Monteiro, P. J. M., Concrete: Microstructure, Properties, and Materials, Fourth Edition (Indian Edition), McGraw Hill, 2014.

REFERENCE BOOKS:

1. Neville, A. M., Properties of Concrete, Pitman Publishing, Inc., MA, 1981

2. Thomas M.D.A., Supplementary Cementing Materials in Concrete, CRC Press, Francis & Taylor Group, Florida, USA, 2013.

3. Bentur, A., Diamond, S., and Berke, N.S., Steel Corrosion in Concrete, E&FN Spon, UK, 1997.

4. Taylor, H. W. F., Cement Chemistry, Academic Press, Inc., San Diego, CA, 1990.

5. Lea, F. M., The Chemistry of Cement and Concrete, Chemical Publishing Company, Inc., New York, 1971.

6. Mindess, S., and Young, J. F., Concrete, Prentice Hall, Inc., NJ, 1981.

7. J. Newman and B. S. Choo, Eds., Advanced Concrete Technology, Four Volume Set, Elsevier, 2003

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12/8/23

20CE514PE INTEGRATED WASTE MANAGEMENT FOR A SMART CITY **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Illustrate the introduction to solid waste management.
- Acquire knowledge on municipal solid waste collection.
- Understand the concepts of energy recovery from municipal solid waste.
- Familiarize with construction and demolition (C&D) waste management.
- Impart knowledge on electronic waste (e-waste) management.

UNIT I INTRODUCTION **9**

Introduction to Solid Waste Management - Municipal Solid Waste Characteristics and Quantities - MSW Rules 2016, Swachh Bharat Mission and Smart Cities Program

UNIT II MUNICIPAL SOLID WASTE **9**

Municipal Solid Waste Collection, Transportation, and Segregation and Processing - Disposal of Municipal Solid Waste: Landfill - Biochemical Processes and Composting.

UNIT III ENERGY RECOVERY **9**

Energy Recovery from Municipal Solid Waste - Current Issues in Solid Waste Management and Review of MSW Management Status in First List of 20 Smart Cities in the Country.

UNIT IV CONSTRUCTION AND DEMOLITION (C&D) WASTE **9**

Construction and Demolition (C&D) Waste Management - Overview - C&D Waste – Regulation, Beneficial Reuse of C&D Waste Materials.

UNIT V ELECTRONIC WASTE (E-WASTE) MANAGEMENT **9**

Electronic Waste (E-Waste) Management – Issues and Status in India and Globally - E-Waste Management Rules 2016 and Management Challenges.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the basic concepts and characteristics of solid waste management.
- Infer about the knowledge on municipal solid waste collection, transportation, segregation and processing.
- Interpret on energy recovery from municipal solid waste.
- Explore the utilization of construction and demolition (C&D) waste.
- Analyze the impact on electronic waste (e-waste) management.

TEXT BOOKS:

1. William A Worrell and P Aarne Vesilind, "Solid waste Engineering", Cengage Learning, Inc, 2nd edition, 2011.
2. George Tchobanoglous, "Integrated Solid Waste Management: Engineering Principles and Management Issues (CIVIL ENGINEERING)", Tata McGraw Hill, 2nd, Uttar Pradesh 1993

REFERENCE BOOKS:

1. Manual on Solid Waste Management, prepared by The Central Public Health and Environmental Engineering Organization (CPHEEO), India.
2. MSW Management Rules 2016, Govt. of India, available online at CPCB website.
3. Electronic Waste Management Rules 2016, Govt. of India, available online at CPCB website

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20CE716PE	OCEAN WAVE DYNAMICS	L T P C
		3 0 0 3

OBJECTIVES:

The Students should be made to

- Understand the fundamental concepts of mass, moment, energy and fluid flow equations.
- Analyze the wave generation mechanism and their effects on wave properties.
- Describe the wave properties including waveforms and various wave parameters.
- Classify the wave transformation concepts.
- Develop practical skills for analyzing interpreting wave phenomena.

UNIT I CONSERVATION EQUATIONS OF FLUID FLOW 9

Basic equations – Conservation of mass, moment and Energy - Continuity Equation, Euler's Equation, Newtonian Fluids, Navier-Stokes Equation.

UNIT II WAVE THEORIES 9

Linear wave theory: Governing Equation, Boundary Conditions and solutions, Dispersion relation, Constancy of wave period. Introduction to non-linear wave theories - Stokes, Cnoidal and Solitary wave theory.

UNIT III WAVE KINEMATICS 9

Wave celerity, water particle velocities, accelerations, displacements and pressures. Integral properties of waves: Mass flux, Energy and energy flux, Group speed, Momentum and momentum flux.

UNIT IV WAVE TRANSFORMATIONS 9

Shoaling, bottom friction and damping, refraction, reflection and diffraction. Wave Breaking: Type ofbreaking, Surf similarity parameter. Keulegan-Carpenter number, Ursell Parameter, Scattering-parameter, Reynolds Number.

UNIT V WAVE ANALYSIS 9

Short term wave analysis- Short term wave Height Distribution – Wave period Distribution - Time and Frequency domain Analysis of Wave Records - Long term wave

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analysis – Gumbel Distribution Weibull Distribution - Statistics analysis of grouped wave data

TOTAL:45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the concept of mass, momentum and wave energy transformations
- Classify the linear and nonlinear wave theories including the Stokes theory, solitary and cnoidal wave theories.
- Explain the wave kinematics and its properties.
- Apply wave transformation concepts to analyze and solve wave related problems.
- Analyze of the long term and short-term waves.

TEXT BOOKS:

1. Ian Young, and Alexander Babanin., Ocean Wave Dynamics, World scientific 2020, ISBN:9811208689.
2. Vallam Sundar., Ocean Wave Dynamics for coastal and Marine structure, World Scientific Publishing Co Pvt., Ltd., 2021, ISBN:9811236666.

REFERENCES BOOKS:

1. Sarpkaya, T. and Isaacson, M., Mechanics of Wave Forces on Offshore Structures, Van Nostrand Reinhold Co., New York, 1981.
2. Dean, R.G. and Dalrymple, R.A., Water wave mechanics for Engineers and Scientists, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1994.
3. Ippen, A.T., Estuary and Coastline Hydrodynamics, McGraw-Hill Book Company, inc., New York, 1978.
4. Coastal Engineering Manual Volume I and II, Coastal Engineering Research Centre, Dept, of the Army, US Army Corps of Engineers, Washington DC, 2006.
5. Sorenson, R.M., Basic Coastal Engineering, A Wiley-Interscience Publication, New York, 1978.

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12/8/23

20CE815PE COASTAL ZONE MANAGEMENT AND REMOTE SENSING **L T P C**

3 0 0 3

OBJECTIVES:

The students should be made to

- Study the features and components of the coastal zone.
- Assess the various living and non-living resources.
- Analyze the human impacts on marine ecosystem.
- Understand the need for coastal zone management and to develop an ICM plan.
- Apply the coastal and oceanographic applications of satellite remote sensing.

UNIT I COASTAL ZONE **9**

Coastal Zone – Beach Profile – Surf Zone – Off Shore – Coastal Waters – Coastal sediments -Estuaries– Wetlands and Lagoons – Coastal dunes – Coastal Geomorphology.

UNIT II COASTAL RESOURCES **9**

Types and functions of coastal and marine resources – Renewable and Non-Renewable resources - Living marine resources and Nonliving marine resources – Marine minerals-Placer deposits – Hydrocarbon deposits – Polymetallic nodules.

UNIT III COASTAL ECOSYSTEM **9**

Marine ecosystem: Mangroves – Seagrass – Seaweeds - Coral reef – Large marine ecosystem - Climate effects on living marine resources- Biological monitoring of marine ecosystem- Human impacts on marine ecosystem.

UNIT IV COASTAL REGULATIONS **9**

Introduction- What is ICM- Developing an ICM framework- Principles-Goals-defining boundaries – Coastal Regulation Zones (CRZ) for main land and Islands –Environmental Law and policy.

UNIT V REMOTE SENSING IN COASTAL ZONE MANAGEMENT **9**

Sensors and Platforms used for coastal application –Mapping of Coral Reefs, Macroalgae,

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Mangrove and Wetlands – Coastal Landuse / Land Cover Mapping – Coastal Regulation Zone Mapping – Case studies.

TOTAL:45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the science and basic of Coastal zone.
- Assess the living marine resources and non-living marine resources.
- Learn about importance of different ecosystem available in coastal and marine environment.
- Apply the coastal regulations for mainland and islands.
- Acquire knowledge about various satellites and sensors used for marine and coastal environment.

TEXTBOOKS:

1. Richard Sylvester, "Coastal Engineering, Volume I And II", Elseiner Scientific Publishing Co., 1999.

REFERENCES BOOKS:

2. NCSCM straigies and guide line for National implementation of Integrated Coastal zone management, 2013.
3. Ramesh R and Purvaja R , E-learning module on ICZM for UNESCO-HE, The Netheralands, 2006.
4. Dwivedi, S.N., Natarajan, R and Ramachandran, S., "Coastal Zone Management in Tamilnadu", Madras, 1991.
5. David R. Green, Stephen D. King; Coastal and Marine Geo-Information Systems: Applying the Technology to the Environment, Springer, 2003.
6. Ramamohana Rao P, Suneetha P, "Coastal Zone Management Using Remote Sensing and GIS", Paperback – Import, 2014

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20ME601OE	PRODUCTION TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Identify and select suitable materials for various engineering applications
- Understand the concept of metal casting process
- Know about the various types of welding processes
- Understand the working principles of machine tools such as Lathe, Shaping, Milling, Drilling and Grinding
- Learn about the basic concepts of Computer Numerical Control (CNC) machine tool

UNIT I ENGINEERING MATERIALS **9**

Engineering Materials – Classification – Mechanical properties of materials – strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, toughness, hardness, resilience, machinability, formability and weldability – Steels and Cast irons : Carbon steels – classifications based on percentage of carbon – properties and applications – Alloy steels: Stainless steel and tool steel.- Cast iron and its types.

UNIT II METAL CASTING PROCESSES **9**

Sand Casting : Sand mould – Type of patterns – Pattern materials – Pattern allowances – Moulding sand properties – Core – Moulding machines – Types and applications; Melting furnaces : Blast and Cupola furnaces; Principle of special casting processes: Shell – investment – Ceramic mould – Pressure die casting – Centrifugal casting - Stir casting; Defects in sand casting.

UNIT III WELDING **9**

Introduction, classification of welding processes – Gas welding, types of flames and applications. Electric arc welding, Resistance welding, Soldering and Brazing processes and their uses.

UNIT IV MACHINING **9**

Centre lathe – Constructional features – Specifications – Operations performed – Special machines: Shaper, Drilling, Milling and Grinding machines – Constructional details and its operations.

UNIT V CNC MACHINE **9**

Numerical Control (NC) machine tools – CNC: types, constructional details, special features – design considerations of CNC machines for improving machining accuracy – Structural members – Slide ways – Linear bearings – Ball screws – Spindle drives and feed drives.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (MECH)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on engineering materials
- Know about the casting process and its defects
- Understand the construction and working principles of gas, arc welding and resistance welding process
- Identify the suitable machining process for the given component
- Describe the constructional and operational features of CNC machines

TEXT BOOKS:

1. Kalpakjian and Schmid, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2014.
2. Hajra Choudry S K, "Elements of Workshop Technology-Vol. II", Media Promoters and Publishers Pvt. Ltd, 2010.

REFERENCES :

1. Nagendra Parashar B S and Mittal R K, "Elements of Manufacturing Processes", Prentice Hall of India, 2011.
2. Rao P N, "Manufacturing Technology, Metal Cutting and Machine Tools", Tata McGraw Hill, New Delhi, 2013.
3. Chapman W A J, "Workshop Technology", Part I, II, III, E.L.B.S. and Edward Arnold Publishers Ltd, London, 2004.

CHAIRMAN
BoS (MECH)

20ME602OE	BASICS OF AUTOMOTIVE COMPONENTS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the various engine components of automobiles
- Illustrate the different types of transmission system used in automobiles
- Study the construction of various engine auxiliary systems
- Learn about working principles of steering, suspension and braking systems
- Describe about the fundamentals of alternative energy sources and Ignition

UNIT I ENGINE COMPONENTS **9**

Overview – Engine Components – Engine block, Crank shaft, Connecting rod, Cylinder Liners, Piston, Piston rings, Cylinder head – Camshaft, Valve, Rocker Arm, Spark Plug, Injector, Carburetor, Fuel pump.

UNIT II TRANSMISSION COMPONENTS **9**

Flywheel – Clutch – Friction plate, Clutch housing, Pressure plate. Gearbox – Propeller shaft – Differential – Conventional Differential, Rear axle.

UNIT III BODY COMPONENTS **9**

Types of automobiles – Vehicle construction and different layouts, Chassis, Frame and body – Vehicle aerodynamics.

UNIT IV STEERING, SUSPENSION SYSTEMS AND BRAKES **9**

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System (ABS).

UNIT V ALTERNATIVE FUELS AND IGNITION SYSTEMS **9**

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles. Ignition System – Battery and Magneto Ignition System – Principles of Combustion and detonation CI Engines. Lubrication and Cooling systems.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Recognize the various parts of the automobile and their functions
- Distinguish the working of different types of power transmission systems like clutch, gears
- Demonstrate the Vehicle construction and Vehicle aerodynamics
- Explain about the Steering, Brakes and Suspension systems
- Predict possible alternate sources of energy and ignition system for automotive Engines

CHAIRMAN
BoS (MECH)

TEXT BOOKS:

1. Kirpal Singh, "Automobile Engineering", Vol. 1 and 2, Seventh Edition, Standard Publishers, New Delhi, 14th Edition 2017.
2. Ganesan V, "Internal Combustion Engines", Tata McGraw-Hill, 4th Edition, 2018.

REFERENCES:

1. Joseph Heitner, "Automotive Mechanics," East-West Press, Second Edition, 1999.
2. Jain K K and Asthana R B, "Automobile Engineering", Tata McGraw Hill Publishers, New Delhi, 2002.
3. Martin W, Stockel and Martin T Stockle, "Automotive Mechanics Fundamentals", The Good Heart-Will Cox Company Inc, USA , 1978.

CHAIRMAN
BoS (MECH)

20EC503PE	INTERNET OF THINGS (COMMON TO BME, CIVIL, ECE, EEE AND MECH)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the fundamentals of Internet of Things
- Study about domain specific IoTs & M2M
- Design the IoT using Python
- Build a small low cost embedded system using Raspberry Pi
- Apply the concept of internet of things in the real world scenario

UNIT I INTRODUCTION TO IoT **9**

Internet of Things – characteristics- Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - IoT Platforms Design Methodology.

UNIT II DOMAIN SPECIFIC IoTs & M2M **9**

Domain Specific IoTs- M2M- Difference between IoT & M2M- Software Defined Networking-Network Function Virtualization.

UNIT III IoT LOGICAL DESIGN USING PYTHON **9**

Introduction –Python Data types & Data structures-Control Flow-Functions-Modules-Packages-File Handling-Classes-Python Packages of Interest for IoT.

UNIT IV IoT PHYSICAL DEVICES & ENDPOINTS **9**

IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python - Other IoT Devices – Arduino.

UNIT V CASE STUDIES **9**

Home Automation – Cities – Environment – Agriculture - Structural Health monitoring - Weather monitoring.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the concepts of Internet of Things
- Analyze the domain specific applications of IoT
- Apply the knowledge of Python for IoT
- Design a portable IoT using Rasperry Pi
- Implement basic IoT applications on embedded platform

TEXT BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.

Chairman
Bos/ECE

REFERENCES:

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011
2. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.
3. Jan Holler, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014
4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Chairman
Bos/ECE

20EC501OE	SENSORS AND TRANSDUCERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Student should be made to:

- Understand the concepts of measurement and characteristics of transducers
- Learn the various sensors used to measure various physical parameters
- Apply the concept of sensors for force, magnetic and heading sensor
- Explain the concept of optical, pressure and temperature sensors
- Distinguish the DAQ systems with different sensors for real time applications

UNIT I INTRODUCTION 9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types- First order and Second order Transducer systems.

UNIT II MOTION AND RANGING SENSORS 9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer – GPS, Bluetooth, Range Sensors – Light Detection and Ranging (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS 9

Strain Gauge, Load Cell and Magnetic Sensors – types and principle –Magnetoresistive – Hall Effect – Eddy Current sensor- Heading Sensors: Compass, Gyroscope, Inclinometers.

UNIT IV OPTICAL, PRESSURE TEMPERATUREAND SMART SENSORS 9

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure: Diaphragm, Bellows, Piezoelectric – Temperature – Thermistor, RTD, Thermocouple. Acoustic Sensors: Flow and level measurement, Radiation Sensors – Smart Sensors – MEMS and Nano Sensors, LASER sensors.

UNIT V SIGNAL CONDITIONING and DAQ SYSTEMS 9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging – applications – Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL : 45 PERIODS

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BoS (ECE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Expertise in various calibration techniques and signal types for transducers
- Understand the basic principles of various motion and ranging sensors
- Analyze the various sensor in force, heading and temperature applications
- Apply the various sensor applications in optical, pressure, temperature and smart sensor
- Implement the DAQ systems with different sensors for real time applications

TEXT BOOKS:

1. Ernest O Doebelin, "Measurement Systems-Applications and Design", Tata McGraw Hill, 2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", Dhanpat Rai and Co, New Delhi, 12th Edition, 2013

REFERENCES:

1. Patranabis D, "Sensors and Transducers", PHI, New Delhi, 2nd Edition ,2010.
2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 1999.
3. Richard Zurawski, "Industrial Communication Technology Handbook", CRC Press, 2nd Edition ,2015.
4. Dr Sengolrajan T and Sampath A, "Sensors and Transducers", Sri Krishna Hitech Publishing Company Pvt. Ltd, 1st Edition, 2019.
5. Dr Vijayachitra S, "Transducer Engineering", PHI Learning Pvt. Ltd, 1st Edition, 2016.

CHAIRMAN
BoS (ECE)

20EE501OE NON-CONVENTIONAL ENERGY RESOURCES

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on various sources of non-conventional energy
- Learn the fundamental concepts about solar energy systems and devices
- Design wind turbine system and know about facts of wind energy in electricity generation
- Understand the geothermal and biomass energy system
- Discuss other energy sources

UNIT I INTRODUCTION **9**

Electric energy from conventional sources – Energy reserves – Power scenario in India – Types of renewable energy sources – New technologies of energy resources – Impact on renewable generation on environment – Biochemical cycles – Global warming potential – Forest resources and water management in India – Biodiversity.

UNIT II SOLAR ENERGY **9**

Solar radiation – Geometry, Estimation and Measurements – Solar thermal energy storage – Solar thermal electric power plant – Solar ponds – Solar air heaters – Solar cookers – Solar air conditioning and refrigerators – Solar greenhouse – Solar photovoltaic system and its standards – Application of PV system – PV hybrid system.

UNIT III WIND ENERGY **9**

Classification of wind turbines and rotors – Terms used in wind energy – Wind energy characteristics – Land for wind energy – Design of wind turbine rotor – Modes of wind power generation – Estimation of wind energy potential – Wind resource assessment in India – Grid system and properties.

UNIT IV GEOTHERMAL AND BIOMASS ENERGY **9**

Structure of Earth's interior – Geothermal resources and its power generation – Biomass resources – Biomass conversion technology – Biochemical conversion – Biomass gasification – Biogas and its plant – Power generation from liquid waste – Biomass cogeneration – Biodiesel – Biofuel petrol.

UNIT V OTHER ENERGY SOURCES **9**

Tidal energy: Tidal characteristics – Tidal energy and its potential estimation – Development of tidal power scheme – important component of tidal power plant – Tidal power development in India. Wave Energy: Factors affecting the wave energy – Mathematical analysis of wave energy – Principle of wave energy plant – Wave energy conversion machines. Ocean Thermal Energy Conversion (OTEC): Working Principle – Closed cycle OTEC system – Thermoelectric OTEC – Application and global development.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (EEE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Demonstrate the various causes of renewable energy sources with environmental aspect
- Illustrate the concept of solar energy technology
- Analyze the techniques used in wind energy sources
- Know the classification and operation of geothermal and biomass sources
- Enumerate the details of other energy sources

TEXT BOOK:

1. Kothari P, Singal K C and Rakesh Ranjan, "Renewable Energy Sources and Emerging Technologies", 2nd Edition, PHI Pvt. Ltd., New Delhi, 2011.

REFERENCES:

1. Godfrey Boyle, "Renewable Energy - Power for a Sustainable Future", Oxford University Press, U.K, 1996.
2. Twidell J W and Weir A, "Renewable Energy Sources", EFN Spon Ltd., UK, 1986.
3. Tiwari G.N, "Solar Energy – Fundamentals Design", Modelling and Applications, Narosa Publishing House, New Delhi, 2002.
4. Shobh Nath Singh, "Non-Conventional Energy Resources", Pearson Education, 2015.
5. Scott Grinnell, "Renewable Energy and Sustainable Design", Cengage Learning, USA, 2016.

CHAIRMAN
BoS (EEE)

20EE502OE	INDUSTRIAL AUTOMATION	L T P C 3 0 0 3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on industrial automation systems
- Illustrate the field level equipment's in industrial automation
- Develop basic programming with PLC
- Understand the theory and operation of SCADA system
- Design a industrial application based problems

UNIT I INTRODUCTION 9

Industrial control system – Automation and process control – Purpose of industrial automation – Industrial automation circuits – Computer based industrial control and automation – Architecture of the basic three level integrated industrial automation systems – Distributed control system.

UNIT II FIELD LEVEL EQUIPMENTS 9

Sensors: Thermal overload relay – Proximity and photoelectric switch – Limit, level and flow switches – Temperature and pressure switch. Actuators: Electric motors – Pneumatic actuators – Micro Electro Mechanical System – Solenoid linear actuators – Different types of relays – Timers, Drum switches and special components – Pneumatic devices.

UNIT III PROGRAMMABLE LOGIC CONTROLLERS 9

Introduction to PLCs – Modular construction of PLC – PLC I/O components – I/O modules – Special purpose of I/O modules – Central processing unit – PLC expansion and I/O configuration – Introduction to programming of PLCs – Basic programming instructions – PID control in the industry.

UNIT IV HMI AND SCADA 9

HMI controls for data acquisition – Developer and runtime packages – Available tools – Definition of tags – Display of real time parameters in graphical form – Generation of various reports – Logging of alarms, trend curves and historical reports.

UNIT V COMMUNICATION PROTOCOLS 9

Serial and Parallel communication – Communication topology – Field bus and similar standards – RTU/MTU communications.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on the basics of industrial automation system
- Understand the working of different field level equipments
- Analyze the theory and operation of PLC programming instructions
- Impart the knowledge of SCADA system
- Develop various industrial automation applications

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BoS (EEE)

TEXT BOOKS:

1. Stamatios Manesis and George Nikolakopoulos, "Introduction to Industrial Automation", CRC Press, 2018.
2. Stuart A Boyer, "SCADA: Supervisory Control and Data Acquisition", 4th Edition, ISA Press, USA, 2009.

REFERENCES:

1. John W Webb and Ronald A Reis, "Programmable Logic Controllers: Principles and Applications", Prentice Hall India, 2003.
2. William Bolton, "Programmable Logic Controllers", Elsevier, Sixth Edition, 2015.
3. Gupta A K, "Industrial Automation and Robotics: An Introduction", Mercury Learning & Information, 2016.
4. Krishna Kant, "Computer Based Industrial Control", Second Edition, Prentice Hall of India, 2010.
5. Popovic D and Bhatkar V P, "Distributed Computer Control for Industrial Automation", Marcel Dekkar Inc., Newyork, 1990.

CHAIRMAN
BoS (EEE)

20IT501OE	FUNDAMENTALS OF OPERATING SYSTEMS	L T P C
		3 0 0 3

OBJECTIVES:

The Student should be made to:

- Acquire basic knowledge of operating system structures and its functioning
- Study the concept of process management
- Learn the basics of memory management
- Understand the structure of file systems
- Familiarize with different operating systems

UNIT I OPERATING SYSTEMS OVERVIEW **9**

Introduction to operating systems – Computer system organization – architecture – Operating system structure – operations – Process, memory, storage management – Open source operating systems – OS services – User interface – System calls – System programs – Process concept – scheduling – Operations on processes – Cooperating processes – Inter-process communication – Threads.

UNIT II PROCESS MANAGEMENT **9**

Basic concepts – Scheduling algorithms – Algorithm evaluation – The critical section problem – Synchronization hardware – Semaphores – Classic problems of synchronization – Deadlocks – Deadlock characterization – Methods for handling deadlocks – Deadlock prevention – Deadlock avoidance – Deadlock detection – Recovery from deadlock.

UNIT III MEMORY MANAGEMENT **9**

Memory management – Swapping – Contiguous memory allocation – Paging – Segmentation – Virtual memory: Background – Demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing.

UNIT IV FILE MANAGEMENT **9**

File concept – Access methods – Directory structure – File-system mounting – Protection – Directory implementation – Allocation methods – Free space management – Disk scheduling – Disk management.

UNIT V LINUX AND WINDOWS **9**

The Linux system – History – Process management – Scheduling – Memory management – File systems – Inter Process Communication – Windows OS – History – Design principles.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (IT)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the components of operating system and their functionalities
- Analyze the various process management algorithms
- Evaluate the performance of various memory management techniques
- Design a simple file system and analyze the performance
- Work with some popular operating systems like Linux, Windows

TEXTBOOK:

1. Abraham Silberschatz, Peter B Galvin and Greg Gagne, "Operating System Concepts Essentials", John Wiley and Sons Inc., 8th Edition, 2011

REFERENCE BOOKS:

1. Andrew S Tanenbaum, "Modern Operating Systems", Addison Wesley, 2nd Edition, 2001.
2. Charles Crowley, "Operating Systems: A Design-Oriented Approach", Tata McGraw Hill Education, 1996.
3. Dhamdhere D M, "Operating Systems: A Concept-based Approach", Tata McGraw Hill Education, 2nd Edition, 2007.
4. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall, 7th Edition, 2011.

CHAIRMAN
BoS (IT)

20IT502OE	INTRODUCTION TO DATABASE	L T P C
		3 0 0 3

OBJECTIVES:

The Student should be made to:

- Correlate the role of database management systems in information technology applications
- Structure data using relational model
- Explore the features of structured query language
- Reduce the anomalies using Normalization
- Manage transaction and concurrency control techniques

UNIT I DATABASE FUNDAMENTALS **9**

Purpose of Database Systems – View of Data - Database System Architecture – Database Users and Administrators – Data Models – Structure of Network Model – Structure of Hierarchical Model – Entity Relationship Model – Constraints – Removing Redundant Attributes in Entity Sets – E-R Diagrams – Design Issues – Extended E-R Features – Introduction of Relational Model – E-R Reduction to Relational Schemas

UNIT II RELATIONAL DATABASE MODEL **9**

Structure of Relational Databases – Database Schema – Schema Diagrams – Relational Query Languages – Relational Algebra – Tuple Relational Calculus – Domain Relational Calculus

UNIT III STRUCTURED QUERY LANGUAGE **9**

Overview of SQL query language – SQL Data definition – Basic Structure of SQL Queries – Additional Basic Operations – Set Operations – Null values – Aggregate Operations – Nested Subqueries – Joins – Views – Integrity Constraints – Authorization. Introduction to Advanced SQL: Functions and Procedures – Triggers

UNIT IV NORMALIZATION **9**

Functional Dependencies – Non-loss Decomposition – Dependency Preservation – First, Second, Third Normal Forms – Boyce Codd Normal Form

UNIT V TRANSACTION AND CONCURRENCY CONTROL **9**

Transaction Model – ACID properties – Transaction States – Serializability – Conflict serializability – View Serializability – Testing Serializability. Concurrency Control – Lock Based Protocols – Deadlocks – Multiple Granularity – Time Stamp Based Protocols – Validation Based Protocols.

TOTAL: 45 PERIODS

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B.S (IT)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Draw the ER Diagram for enterprise applications
- Design databases using relational model
- Query the database using SQL
- Apply normalization techniques on the databases
- Perform transaction and concurrency control techniques

TEXTBOOKS:

1. Henry F Korth, Abraham Silberschatz, Sudharshan S, "Database System Concepts", McGraw Hill, 6th Edition, 2011.
2. Date C J, Kannan A and Swamynathan S, "An Introduction to Database Systems", Pearson Education, 8th Edition, 2006.

REFERENCE BOOKS:

1. Elmasri R and Navathe S B, "Fundamentals of Database Systems", Pearson Education/Addison Wesley, 6th Edition, 2010.
2. Thomas Cannolly and Carolyn Begg, "Database Systems, A Practical Approach to Design, Implementation and Management", Pearson Education, 5th Edition, 2009.
3. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw Hill, 3rd Edition 2004.

CHAIRMAN
BoS (IT)

20CS506OE FUNDAMENTALS OF SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Explore the fundamental concepts of software engineering
- Learn the requirements engineering process and planning for software development
- Understand the software design principles
- Know coding standards and different testing strategies
- Learn the project management principles and quality assurance standards

UNIT I SOFTWARE AND SOFTWARE ENGINEERING 8

The Nature of Software - Software Engineering - Software Myths – Process Models: Prescriptive Process Models, Specialized Process Models, Personal and Team Process Models – Overview of Agile Process -Overview of CMMi

UNIT II REQUIREMENTS ENGINEERING AND PLANNING 10

Requirements Engineering: Establishing the Groundwork - Eliciting Requirements - Negotiating Requirements - Validating Requirements - Requirements Analysis using scenario based modeling. Process and Project Metrics: Software Measurement - Metrics for Software Quality. Estimation: The Project Planning Process – Resources - Software Project Estimation - Decomposition Techniques - Empirical Estimation Models - Project Scheduling

UNIT III MODELLING AND DESIGN 9

Modelling: Data Modeling Concepts - Class-Based Modeling - Flow-Oriented Modeling - Creating a Behavioral Model Design Concepts - Architectural Design: Software Architecture, Architectural Styles, Architectural Design, Architectural Mapping Using Data Flow - User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis

UNIT IV CODING AND SOFTWARE TESTING 9

Coding standards and guidelines - Testing: Strategic approach to Software Testing - Test Strategies for Conventional Software - Validation Testing - System Testing – Debugging – White-box Testing - Basis Path Testing - Control Structure Testing - Black-box Testing

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BoS (CSE)

UNIT V PROJECT MANAGEMENT AND SOFTWARE QUALITY 9

Project Management Concepts: The Management Spectrum, People, Product and Process – Software Configuration Management – Risk Management - Quality Management: Software Quality, Achieving Software Quality - Elements of Software Quality Assurance - The ISO 9000 Quality Standard

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply software engineering principles for software development.
- Formulate software requirement specification and plan for software development
- Design software according to the specification
- Code the software using guidelines / standards and conduct testing
- Manage and maintain the software process by assuring the quality

TEXT BOOKS:

1. Roger S. Pressman and Bruce R. Maxim, "Software Engineering – A practitioner's approach", McGraw Hill Publications, Eighth Edition, 2014

REFERENCES:

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", Springer, Third Edition, 2005
2. Ian Sommerville, "Software engineering", Pearson Education Asia, Seventh Edition, 2007.
3. Watts S.Humphrey, "A Discipline for Software Engineering", Pearson Education, 2007.
4. James F.Peters and WitoldPedrycz, "Software Engineering, Engineering Approach", Wiley-India, 2007.
5. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill, 2007.
6. S.A.Kelkar, "Software Engineering", Prentice Hall of India Pvt, 2007

CHAIRMAN
BoS (CSE)

18/8

20CS507OE INTRODUCTION TO DATA STRUCTURES AND ALGORITHMS **L T P C 3 0 0 3**

(Common to AGE, BME, CIVIL, EEE and MECH)

OBJECTIVES:

The Student should be made to:

- Introduce the basics of problem solving techniques and analysis of algorithms
- Learn the various searching and sorting techniques
- Impart knowledge on ADTs such as List, Stack, Queue
- Explore the binary trees and priority queues
- Get exposure on hashing techniques and graphs

UNIT I ANALYSIS OF ALGORITHMS **9**

Introduction to Algorithms and algorithmic problem solving – Problem types. Analysis of Algorithms: Analysis Framework - Asymptotic Notations – Best case, worst case and average cases - Mathematical analysis of non-recursive algorithms - Recurrence equations – Solving recurrence equations - Mathematical analysis of recursive algorithms.

UNIT II SEARCHING AND SORTING ALGORITHMS **9**

Search Algorithms: Linear search - binary search - Analysis of Search algorithms. Sorting Algorithms: Bubble sort - Exchange sort - Insertion sort – Merge sort – Quick sort – Heap sort - Analysis of Sorting Algorithms.

UNIT III LISTS, STACKS AND QUEUES **9**

Abstract Data Types – The List ADT – Singly Linked List – Doubly Linked List – Circular Linked List – Applications and analysis of List. The Stack ADT – Applications and Analysis of Stack. The Queue ADT – Applications and Analysis of Queues.

UNIT IV TREES AND HEAPS **9**

Preliminaries – Binary Trees – Expression Trees- Traversals. The Search Tree ADT – Binary Search Trees – Applications of BST. Priority Queues – Binary heap – Heap operations - Applications of heaps.

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UNIT V HASHING AND GRAPHS 9

Hashing – Closed hashing: Separate Chaining – Open Addressing - Linear probing. Graph ADT – Representation of graph – Graph Traversals: DFS and BFS. Applications of Graph - Finding Shortest Path - Connected components.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Analyze recursive and non recursive algorithms for complexity
- Apply various searching / sorting algorithms for solving real-world problems
- Implement List, Stack and Queue with appropriate data structures
- Work with binary trees and heap based priority queue
- Exploit the hashing technique and graph algorithms

TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education Asia, Second Edition, 1997.

REFERENCES:

1. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, "Data Structures and Algorithms", Pearson Education, New Delhi, 2006
2. Ellis Horowitz, Sartaj Sahni and Dinesh Mehta, "Fundamentals of Data Structures in C", Orient Longman, Second Edition, 2008.
3. Jean-Paul Tremblay and Paul G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw-Hill, New Delhi, Second Edition, 1991.

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BoS (CSE)

20BM501OE BASICS OF BIOMEDICAL INSTRUMENTATION

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Gain knowledge about various physiological parameters of both electrical and non-electrical
- Know the importance of pH, pO_2, pCO_2 levels in human
- Add insights on the various methods of recording and also the methods for transmitting these parameters
- Study about the various assist devices used in hospitals
- Gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING **9**

Sources of biomedical signals, Bio-potentials, Bio-potential electrodes, Biological amplifiers, ECG, EEG, EMG, PCG, Typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMENTER MEASUREMENT **9**

pH, pO_2, pCO_2, Colorimeter, Blood flow meter, Cardiac output, Respiratory, Blood pressure, Temperature and Pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES AND IMAGING SYSTEMS **9**

Cardiac Pacemakers, DC Defibrillator, Dialyzer, Ventilators, Computed Tomography, Magnetic Resonance Imaging systems, Ultrasonic Imaging systems (Block diagrammatic approach would suffice).

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY **9**

Diathermies – Shortwave, Ultrasonic and Microwave type and their applications, Surgical Diathermy, Biotelemetry.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION **9**

Telemedicine, Insulin Pumps, Radio Pill, Endoscopy, Brain Machine Interface, Lab on a Chip.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Know the human body electro-physiological parameters and recording of bio-potentials
- Comprehend the non-electrical physiological parameters and their measurement-body temperature, blood pressure, pulse, blood cell count, blood flow meter…
- Interpret the various assist devices used in the hospitals viz pacemakers, defibrillators, dialyzers and ventilators
- Comprehend physical medicine methods. E.g) Ultrasonic, Shortwave, Microwave surgical diathermies and bio-telemetry principles and methods
- Know about recent trends in medical instrumentation

CHAIRMAN
BoS (BME)

TEXT BOOK:

1. Leslie Cromwell. "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.

REFERENCES:

1. Khandpur R S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003.
2. John G Webster, "Medical Instrumentation Application and Design", 3rd Edition, Wiley India Edition, 2007.
3. Joseph J Carr and John M Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2004.

CHAIRMAN
BoS (BME)

20BM502OE INTRODUCTION TO CELL BIOLOGY

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Provide knowledge on cell structure and junctions
- Know the membranes and cell wall
- Be acquainted with cell division and its cycles
- Become aware of the significance of DNA and RNA, Proteins
- Identify various enzymes and its use in industries

UNIT I CELL STRUCTURE 9

Cell organization, structure of organelles, extra cellular matrix and cell junctions.

UNIT II CELL ORGANELLE AND FUNCTION 9

Nucleus, Mitochondria, Lysosomes, Endoplasmic reticulum, Golgi apparatus, vesicles, centrosomes, cell membranes, ribosomes, cytosol, chloroplasts, flagella, cell wall.

UNIT III DIVISION 9

Cell cycle – mitosis, meiosis, cell cycle regulation and apoptosis.

UNIT IV MACROMOLECULES 9

DNA, RNA and Proteins – basic units, architectural hierarchy and organization, functions.

UNIT V ENZYMES 9

Enzymes – Structure, Mechanism of action, Factors that affect enzyme activity, Common enzymes used in industrial setup of plant and animal origin.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify the structure of the cell and its functions
- Recognize the functions of cell wall and membrane
- Familiar with the cell cycle and its characteristics
- Apply the knowledge of DNA and RNA to study different characteristics
- Comment of various enzymes and its role by doing thorough analysis

TEXT BOOKS:

1. Lodish, Harvey etal., "Molecular Cell Biology", 5th Edition, W H Freeman, 2005.
2. Cooper G M and Hansman R E, "The Cell: A Molecular Approach", 4th Edition, ASM Press, 2007.
3. Alberts, Bruce etal., "Molecular Biology of The Cell", 4th Edition, Garland Science (Taylors Francis), 2002.

REFERENCES:

1. McDonald, F etal., "Molecular Biology of Cancer", 2nd Edition, Taylor & Francis, 2004.
2. King and Roger J B, "Cancer Biology" Addison Wesley Longman, 1996.

CHAIRMAN
BoS (BME)

20ME701OE	BASICS OF HYDRAULIC AND PNEUMATIC SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Study the fundamentals of fluid power systems
- Understand the working of hydraulic pumps and actuators
- Know about control valves and accumulators in hydraulic systems
- Learn the various components of pneumatic and electro-pneumatic systems
- Identify the various trouble shoots in hydraulic and pneumatic systems

UNIT I FUNDAMENTALS OF FLUID POWER SYSTEMS 9

Introduction – fluid power systems – types – components – properties of fluids – types of fluids – applications of Pascal's law – principle of hydraulic flow - laminar and turbulent flow – Reynolds's number – Darcy's equation – losses in valves and fittings – advantages and applications of fluid power – fluid power ANSI symbols.

UNIT II HYDRAULIC PUMP AND ACTUATORS 9

Principles of hydraulic system – pumping theory – pump classification - gear pump, vane pump, piston pump – fluid power actuators – linear hydraulic actuators - single acting, double acting and special type – rotary actuators - gear, vane and piston motors – hydraulic cushioning.

UNIT III CONTROL COMPONENTS IN HYDRAULIC SYSTEMS AND ACCUMULATORS 9

Directional Control Valve (DCV) - check valve, 3/2 DCV and 4/3 DCV – pressure control valve - pressure relief valve and pressure reducing valve – flow control valve - pressure compensated and non pressure compensated – mechanical servo valves – proportional valves – comparison of servo and proportional valve – accumulators – types - weight loaded, spring loaded and gas loaded accumulators – intensifier – intensifier press circuit.

UNIT IV PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS 9

Principles of pneumatic system – properties of air – compressors – Filter, Regulator and Lubricator (FRL) unit – muffler – air control valves – pneumatic actuators – components of electrical control - switches, solenoids, relays and timers – electro pneumatic system - electro pneumatic circuits - reciprocation, sequencing and regenerative – introduction to fluidics.

UNIT V TROUBLE SHOOTING AND APPLICATIONS 9

Hydraulic and pneumatic systems: Installation, selection, maintenance, troubleshooting and remedies – low cost automation – Case studies: Conveyor feed system, car parking barriers, pick and place robot.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the basic concepts of fluid power systems
- Describe the functions of various hydraulic pump and actuators
- Familiarize with different types of control valves and accumulators
- Understand the functions of pneumatic and electro pneumatic systems

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- Analyse the various trouble shooting methods of hydraulic and pneumatic systems

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education India, 7th Edition, 2013.
2. Srinivasan R, "Hydraulic and Pneumatic Controls", Vijay Nicole, 3rd Edition, 2019.

REFERENCES:

1. Majumdar S R, "Oil Hydraulics Systems-Principles and Maintenance", Tata McGraw Hill, 2017.
2. Majumdar S R, "Pneumatic Systems-Principles and Maintenance", Tata McGraw Hill, 1st Edition, 2011.
3. Shanmugasundaram K, "Hydraulic and Pneumatic Controls", S.Chand & Co, 1st Edition, 2006.

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BoS (MECH)

20ME702OE	ALTERNATIVE ENERGY FUELS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Familiarize with various sources of energies available in universe
- Study the methods of liquid fuel extraction
- Know the concepts of fuel cells and types
- Learn the properties and preparation techniques of biodiesel
- Understand the production techniques of nuclear energy

UNIT I INTRODUCTION TO ENERGY 9

World energy consumption – petroleum – natural gas – coal – nuclear energy – geo thermal energy – renewable energy - solar, wind, tidal, biomass and hydropower.

UNIT II LIQUID FUELS 9

Introduction to coal pyrolysis – char oil energy development process – TOSCOAL process – Lurgi-Ruhr gas process – occidental flash pyrolysis process – clean coke process – coalcon process.

UNIT III FUEL CELLS 9

Introduction – basic concepts – design characteristics – operation – thermal efficiency – cell voltage – fuel cell system – general description – fuel cell classifications – low temperature fuel cells - proton exchange membrane fuel cells and alkaline fuel cells – high temperature fuel cells - molten carbonate fuel cells and solid oxide fuel cells.

UNIT IV BIODIESEL 9

Introduction – transesterification process for biodiesel manufacture – pretreatment of oil – transesterification reaction in a biodiesel reactor – product and by-product separation – purification – properties of biodiesel – cetane number – calorific value – general physical properties of biodiesel – cold flow properties – material compatibility.

UNIT V NUCLEAR ENERGY 9

Nuclear fission and nuclear reactor physics – electricity generation from nuclear reactors – nuclear fuel cycle – types of reactors – advanced reactors and concepts – hydrogen production – nuclear waste disposal – nuclear fusion.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the various sources of energy
- Demonstrate liquid fuel extraction through pyrolysis processes
- Understand the importance and design considerations of fuel cells
- Describe the process involved in the extraction of biodiesel
- Analyse the utilization and waste disposal of nuclear energy

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TEXT BOOKS:

1. Sunggyu Lee, James G Speight, "Handbook of Alternative Fuel Technologies", CRC Press, Taylor & Francis Group, 2014.
2. Arumugam S Ramadhas, "Alternative Fuels for Transportation", Taylor & Francis, 2016.

REFERENCES :

1. Donald L Klass, "Biomass for Renewable Energy, Fuels and Chemicals", Elsevier-Academic Press, 1st Edition.
2. Sunggyu Lee, "Alternative Fuels", CRC Press, Taylor & Francis, 1st Edition.
3. Suresh M, Rajkumar S, Lakshminarayanan A K, "Alternative Energy Sources, Materials and Technologies", Trans Tech Publications Limited, 2015.

CHAIRMAN
BoS (MECH)

20EC701OE CONSUMER ELECTRONICS **L T P C**
3 0 0 3

OBJECTIVES:

The students should be made to

- Understand the audio basics and devices
- Know the performance of different audio systems
- Understand the various television systems
- Learn the operation of TV receivers and video systems
- Gain the knowledge on basics of home/office appliances

UNIT I AUDIO FUNDAMENTALS AND DEVICES **9**

Basic characteristics of sound signal: level and loudness - pitch - frequency response - fidelity and linearity - Reverberation - Audio level metering - decibel level in acoustic measurement - Microphone: working principle - sensitivity - nature of response - directional characteristics - Types: carbon - condenser - crystal - electrets - tie-clip - wireless - Loud speaker: working principle - characteristic impedance - watt capacity - Types: electrostatic - dynamic - permanent magnet etc - woofers and tweeters - Sound recording: Optical recording - stereophony and multichannel sound - MP3 standard.

UNIT II AUDIO SYSTEMS **9**

Audio system: CD player, home theatre sound system, surround ,sound- Digital console: block diagram, working principle, applications - FM tuner: concepts of digital tuning, ICs used in FM tuner TDA 7021T - PA address system: planning, speaker impedance matching, Characteristics, power amplifier, Specification

UNIT III TELEVISION SYSTEMS **9**

Monochrome TV standards - scanning process - aspect ratio - persistence of vision and flicker - interlace scanning - picture resolution - Composite video signal: horizontal and vertical sync details - scanning sequence - Colour TV standards - colour theory - hue-brightness - saturation - luminance and chrominance - Different types of TV camera - Transmission standards:PAL system - channel bandwidth.

UNIT IV TELEVISION RECEIVERS AND VIDEO SYSTEMS **9**

PAL-D colour TV receiver - block diagram - Precision IN Line color picture tube - Digital TVs: LCD - LED - PLASMA - HDTV - 3D TV - projection TV - DTH receiver - Video interface: Composite - Component - Separate Video - Digital Video - SDI - HDMI Multimedia Interface - Digital Video Interface - CD and DVD player: working principles - interfaces.

UNIT V HOME / OFFICE APPLIANCES **9**

FAX and Photocopier - Microwave Oven: types - single chip controllers - wiring and safety instructions - technical specifications - Washing Machine: wiring diagram - electronic controller for washing machine – technical specifications - types of washing machine - fuzzy logic - Air conditioner and Refrigerators: Components features - applications - and technical specification - Digital camera and cam coder: pick up devices - picture processing - picture storage, lithium battery.

Total: 45 Periods

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OUTCOME:

On successful completion of this course, the students will be able to,

- Develop audio circuits
- Design the audio systems
- Familiarize with TV systems
- Analysis the fault identification in TV
- Familiarize in home/office appliances

TEXT BOOKS:

1. Bali S.P, "Connsumer Electronics", Pearson Education India, 2010 , Latest Edition.
2. Bali R and Bali S.P, "Audio Video Systems: Principle Practices & Troubleshooting", Khanna Book Publishing Co.(P) Ltd., Delhi, India, Latest Edition, 2010.

REFERENCES:

1. Gulati R.R, "Modern Television Practices", New Age International Publication (P) Ltd. New Delhi Year 2011, Latest Edition
2. Gupta R.G, "Audio Video Systems", Tata McGraw Hill, New Delhi, India 2010, Latest Edition
3. Whitaker Jerry & Benson Blair, "Mastering Digital Television", McGraw-Hill Professional, Latest Edition, 2010.
4. Whitaker Jerry & Benson Blair, "Standard Handbook of Audio Engineering", McGraw-Hill Professional, Latest Edition, 2010.

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20EC702OE **RFID AND FLEXIBLE SENSORS** **L T P C**
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the basic principle of RFID system.
- Get knowledge on information processing through RFID system
- Learn the basics of readers, printers and protocols.
- Design for various applications testing software.
- Understand the principle and applications of flexible sensors

UNIT I INTRODUCTION AND RFID ARCHITECTURE **9**

Case for RFID - Eras of RFID - applications - RFID Architecture - confluence of technologies - key functionalities- system components - systemic quality considerations - architecture guidelines - System Management.

UNIT II TAGS AND PROTOCALS **9**

Basic tag capabilities - physical characteristics - power source - air interface - information storage and processing capacity - standards - protocol terms and concepts - how tags store data - singulation and anti-collision procedurestag features for security and privacy - learn to troubleshoot tag communications

UNIT III READERS, PRINTERS AND READER PROTOCOLS **9**

Physical and logical components of RFID reader - parts of RFID printer and applicator - types of readers - layout for readers and antennas - configuring readers - parts of a reader protocol - vendor protocols - EPC global protocol overview - simple lightweight RFID reader protocol - future protocols.

UNIT IV MIDDLEWARE AND INFORMATION SERVICE **9**

Motivations - logical architecture - application level events specification - commercial RFID middleware - RFID Data - EPC global network - object naming service - EPC information services.

UNIT V FLEXIBLE SENSORS **9**

World of wearables - Attributes of wearables - Textiles and clothing: The meta wearable - Challenges and opportunities - Future of wearables - Need for wearable haptic devices - Categories of wearable haptic.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the principle of operation of various components of RFID system.
- Familiar with usage of tags and protocols

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- Explain about the working principle of readers, printers and reader protocols
- Apply the methodology in engineering applications like inventory management, material handling etc
- Know about the recent trends in flexible sensors

TEXT BOOK:

1. Himanshu Bhatt, Bill Glover, "RFID Essentials", O'Reilly Media publications, 2006 Approved by third Academic council.
2. Amin Rida and Manos M. Tentzeris, RFID-Enabled Sensor Design and Applications (Artech House Integrated Microsystems), 2011, 1st edition, Artech House Publishers, UK

REFERENCES:

1. Klaus Finkenzeller, "RFID Handbook", John Wiley & Sons, Ltd, 2010
2. Stephen B. Miles, Sanjay E. Sarma, John R. Williams, "RFID Technology and Applications", Cambridge University Press, 2008
3. Patrick J Sweeney, "RFID for DUMMIES", Wiley India Publications, 2005
4. Elaine Cooney, "RFID + The Complete review of Radio Frequency Identification", 1st ed., Delmar Cengage Learning 2007.

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BoS /ECE

20EE701OE	ENERGY STORAGE SYSTEMS	L T P C
	(COMMON TO ALL BRANCHES)	3 0 0 3

OBJECTIVES:

The students should be made to:

- Understand the basic concepts of energy storage devices
- Learn the performance of various types of batteries
- Explain the operation of fuel cells and ultracapacitors
- Analyse the application of energy storage devices
- Know the thermal and mechanical energy storage systems

UNIT I ENERGY STORAGE TECHNOLOGIES 9

Introduction – Need of energy storage – Battery – Components of cells and batteries – Classification – Operation of a cell – Theoretical cell voltage, capacity and energy – Electrochemical principles and reactions: Cell polarization – Electrical double–layer capacity and ionic adsorption – Mass transport to the electrode surface – Factors affecting battery performance – Standards.

UNIT II PRIMARY AND SECONDARY BATTERIES 9

Battery parameters and specification – Performance, charging and discharging – Storage density, energy density, classical and modern batteries: Zinc–chloride, Nickel cadmium, Leadacid, Nickel hydride and Lithium battery – Principle and working.

UNIT III ADVANCED BATTERIES FOR EV APPLICATIONS 9

Ultracapacitors: Features – Basic principles of ultracapacitors – Performance of ultracapacitors – Mathematical model. Fuel cells: Operating principles – Characteristics – Polarization loss – Fuel cells technologies – Comparison of fuel cells, hybridization of energy storage systems.

UNIT IV APPLICATIONS OF BATTERIES 9

Storage of solar – Greenhouse heating – Power plant application – Batteries in space – Storage in electric supply networks – Automotive application in hybrid and electric vehicles – Role of ultracapacitors in EVs.

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BoS (EEE)

UNIT V THERMAL AND MECHANICAL ENERGY STORAGE 9

Thermal energy storage – Energy storage in hydrogen – Energy storage in flywheels – Pumped hydro storage – Elastic energy storage – Applications.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the working of energy storage devices
- Differentiate the characteristics of various primary and secondary batteries
- Compare the operation of ultracapacitors and fuel cells
- Summarize the applications of batteries
- Explain the different energy storage techniques

TEXT BOOK:

1. Robert A Huggins, "Energy Storage–Fundamentals, Materials and Applications", 2nd Edition, Springer, 2016.

REFERENCES:

1. Ibrahim Dincer and Marc A Rosen, "Thermal Energy Storage: Systems and Applications", 2nd Edition, John Wiley and Sons, 2011.
2. Ru-shiLiuLei Zhang, Xueliang Sun, Hansan Liu andJiujun Zhang, "Electrochemical Technologies for Energy Storage and Conversion", Wiley publications, 2012.
3. Ali Emadi, Mehrdad Ehsani and John M Miller, "Vehicular Electric Power Systems", Special Indian Edition, Marcel dekker, Inc 2010.
4. Tetsuya Osaka and MadhavDatta, "Energy Storage Systems in Electronics", Gordon and Breach Science Publishers, 2000.
5. Iqbal Hussain, "Electric and Hybrid Vehicles: Design Fundamentals", 2nd Edition, CRC Press, Taylor and Francis Group, 2011.

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BoS (EEE)

20EE702OE	ELECTRICAL SAFETY ENGINEERING (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Know the concepts of safety engineering
- Learn the various electrical hazards and safety equipment
- Analyze the grounding and bonding techniques
- Compare the safety methods for various electrical equipment
- Understand the various standards for proper maintenance of electrical equipment

UNIT I CONCEPTS IN SAFETY 9

Introduction – Electrostatics, electro magnetism, stored energy, energy radiation and electromagnetic interference – Working principles of electrical equipment – Indian electricity act and rules – Statutory requirements from electrical inspectorate – International standards on electrical safety – First aid – Cardio Pulmonary Resuscitation(CPR).

UNIT II ELECTRICAL HAZARDS AND SAFETY EQUIPMENTS 9

Primary and Secondary hazards – Arc, blast and shocks – Causes and effects – Safety equipment – Person Protection Equipment(PPE), Head and eye protection, flash and thermal protection. Rubber insulating equipment, hot sticks, insulated tools, barriers and signs, safety tags and locking devices – Voltage measuring instruments – Proximity and contact testers – Safety electrical one line diagram – Electrician's safety kit.

UNIT III GROUNDING AND BONDING TECHNIQUES 9

General requirements for grounding and bonding – Definitions – Grounding of electrical equipment – Bonding of electrically conducting materials and other equipment – Connection of grounding and bonding equipment – System grounding – Purpose of system grounding – Grounding electrode system – Grounding conductor connection to electrodes – Use of grounded circuit conductor for grounding equipment – Grounding of low voltage and high voltage systems.

UNIT IV SAFETY METHODS OF EQUIPMENT 9

The six step safety methods – Pre job briefings – Hot–Work decision tree – Safe switching of

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power system – Lockout – Tag out – Flash hazard calculation and approach distances – Calculating the required level of arc protection – Safety equipment – Procedure for low, medium and high voltage systems – The one minute safety audit.

UNIT V SAFETY SCHEDULE AND MAINTENANCE **9**

Safety related case for electrical maintenance – Reliability Centered Maintenance (RCM) – Eight step maintenance programme – Frequency of maintenance – Maintenance requirement for specific equipment and location – Regulatory bodies – National electrical safety code – Standard for electrical safety in work place – Occupational safety and health administration standards.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain the basic concepts related to safety
- Describe electrical hazards and safety equipment
- Identify various grounding and bonding techniques
- Select appropriate safety method for low, medium and high voltage equipment
- Conduct proper maintenance of electrical equipment according to standards

TEXT BOOK:

1. John Cadick, Mary Capelli–Schellpfeffer, Dennis K Neitzel and Al Winfield, "Electrical Safety Handbook", 4th Edition, McGraw–Hill Education, 2012.

REFERENCES:

1. Mohamed El Sharkawi, "Electric Safety–Practice and Standards", CRC Press, 2014.
2. Maxwell Adams J, "Electrical Safety–A guide to the Causes and Prevention of Electric Hazards", 1st Edition, The Institution of Engineering and Technology, 1994.
3. Ray A Jones, Ray Jones and Jane G Jones, "Electrical Safety in the Workplace", 1st Edition, Jones and Bartlett Learning, 2000.
4. Fortham Cooper W, "Electrical Safety Engineering", 1st Edition, Butterworth and Company, London, 1998
5. Kimberly Keller, "Electrical Safety Code Manual", Elsevier, 2010.

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BoS (EEE)

C5

20IT701OE	PROGRAMMING IN JAVA	L T P C 3 0 0 3

OBJECTIVES:

The students should be made to:

- Learn the fundamentals of object oriented programming in Java.
- Be familiar with the Object Oriented concepts in Java
- Be exposed to the usage of Arrays in Java programming
- Understand the mechanism in handling exceptions, Multithreading and I/O.
- Demonstrate the concepts of AWT, event handling used in GUI.

UNIT I INTRODUCTION **9**

Introduction to Java – History of Java – FOP versus OOP – OOOPs Concepts - Java Programming Paradigm – Features of Java Programming – Java Programming Environment – C vs Java - Tools available for Java Programming – Java Architecture - Data types and Character set – Variables - Identifiers – Keywords – Operators - A Simple Java Program – Analysis of the program – Command line input in Java – Input using Scanner class

UNIT II CLASS, OBJECT and INHERITANCE **9**

Class – Class Structure – Object declaration – Object Initialization - Declaring Multiple Classes - Adding methods to Class – Constructor – this Keyword – Multiple Constructors – Constructor Overloading - Control Statements – Inheritance – Method Overriding – Super Keyword – Abstract Class– final Keyword – Access Modifiers - Packages in Java – Interface – Iterator – Cloneable – Serializable – Comparable

UNIT III ARRAYS **9**

Array in Java: Creation of Array – Storing elements in Array – Processing elements in Array – 2D Array and 3D Array – Java Scope – Static Keyword – Static Variable – Static Method – Nested Class – Recursion

UNIT IV EXCEPTION HANDLING, MUTITHREADING AND I/O STREAMS **9**

Exception Handling - Multithreading –Thread – Life Cycle of Thread – Thread Control Methods – Thread Types – Thread Scheduling – Thread Synchronization - I/O Stream – Character Stream Class - Data Input Stream – Data Output Stream – File Handling - Java networking - JDBC - Connectivity

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UNIT V APPLET, AWT and SWING 9

Java Applet Programming : Applet – Building an applet – Hosting an applet – Running an Applet – Basic Structure of an applet – Basic Methods in applet – Input passing to an Applet – Application Versus Applet – Applet Events – Basics of HTML – Applet Tag Properties - AWT Programming – Classes of AWT – Components – Methods – Containers – Event Handling – Classes – Interfaces - SWING: Introduction – Swing Components – Containers – Events - Hierarchy of Swing class

OUTCOMES:

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

- Explain the fundamentals of Java programming
- Use the concept of object oriented programming in Java
- Implement the mechanism of array and recursion.
- Develop applications for concurrent processing and I/O with exception handling.
- Build interactive GUI applications in Java programming

TEXT BOOK:

1. Hebert Schildt, "Java: The Complete Reference, Eleventh Edition", 7th Edition, McGraw-Hill, 2010.

REFERENCE(S):

1. Kathy Sierra, Bert Bates, "Head First Java", 2nd Edition, O'Reilly Media, Inc., 2005.
2. Y.Daniel Liang, "Introduction to Java Programming", 11th Edition, Pearson Education, 2017.
3. https://onlinecourses.nptel.ac.in/noc21_cs56/preview

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BoS (IT)

20IT702OE	WEB DESIGN	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Enhance the knowledge of how to develop a Web page using HTML
- Classify the various style and dimensions of CSS
- Design the web page using JavaScript
- Design the web page using DOM
- Implement the various approach of database connectivity

UNIT I INTRODUCTION **9**

Introduction to HTML – Benefits of HTML – Structure of an HTML Document, HTML Tags: Attributes – meta Elements – Linking – Lists- Tables- Forms- Form Elements- Form Attributes – Web services.

UNIT II CASCADING STYLE SHEETS **9**

Introduction to CSS - Inline Styles – Conflicting Styles- Style Sheets- Positioning Elements – Backgrounds –Dimensions- Text Flow- Media Types – Drop-Down Menu.

UNIT III SCRIPTING LANGUAGE **9**

Introduction to Scripting Language – Data Types - Variables – Expressions – Operators and Control Statements – Arrays – User Defined Functions – Events.

UNIT IV JAVASCRIPT OBJECTS **9**

JavaScript Objects: String – Math – Date – Boolean and Number – Window – Document – Document Object Model(DOM) – DOM Collections – Dynamic Styles.

UNIT V IMPLEMENTATION STRATEGIES **9**

Introduction to PHP: Basics – String Processing and Regular Expressions – Form Processing and Business Logic – Connecting to a Database – Using Cookies – Dynamic Content – Operator Precedence Chart – Database Connectivity: SQL: DDL – DML- MySQL: Creating Database in MySQL – Mini Project.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Identify different types of HTML tags, their functionality and attributes and learn the basics of web services
- Classify CSS to control the appearance of web pages and denote the background elements and media types
- Incorporate JavaScript variables, operators and functions in web pages and manipulate HTML forms to validate user inputs
- Demonstrate various JavaScript object models and create a web pages with dynamic style using JavaScript and DOM
- Demonstrate the database connectivity and simple PHP application program using web Server

TEXT BOOKS:

1. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web: How to Program", 5th Edition, Pearson, 2011
2. KoGent Learning Solutions Inc., "Web Technologies: HTML, JavaScript, PHP, Java, JSP, ASP.NET, XML and AJAX", Kindle Edition, Dreamtech Press, 2012.

REFERENCES :

1. Robert. W. Sebesta, "Programming the World Wide Web", 8th Edition, Pearson Education, 2015.
2. Jeffrey C.Jackson, "Web Technologies: A Computer Science Perspective", Pearson Education, 2007.
3. http://www.w3schools.com/

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20CS706OE **E-COMMERCE**

L T P C
3 0 0 3

OBJECTIVES:

The Student should be made to:

- Study the basics of E-Commerce.
- Learn the activities involved in the E- commerce process.
- Focus the applications related to the EDI.
- Analyze the security issues in the E –commerce.
- Apply the E-commerce at various applications.

UNIT I INTRODUCTION **9**

E-Commerce framework – E-Business models – Network infrastructure for E-commerce – Internet as a Network Infrastructure – E-commerce and World Wide Web.

UNIT II E-COMMERCE **9**

Consumer oriented E-Commerce – Applications – Mercantile process models – Electronic Payment Systems – Digital Token based EPS – Smart cards – Credit cards – Risks – designing EPS – Study of e-commerce companies

UNIT III INTERORGANIZATIONAL COMMERCE AND EDI **9**

Electronic Data Interchange: EDI applications in Business – EDI and E-Commerce – EDI standardization and implementation – Internet based EDI.

UNIT IV SECURITY ISSUES IN E-COMMERCE **9**

Network Security – Client-Server Network Security – CS Security Threats – Firewalls – Data & Message Security – Encrypted Documents – Security on the Web.

UNIT V INTRAORGANIZATIONAL E-COMMERCE AND MARKETING **9**

Internal Information System-Work-flow Automation and Coordination-Supply Chain Management-Document Library-Types of Digital Documents-Corporate Data Warehouses – Advertising and Marketing on the Internet .

TOTAL: 45 PERIODS

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BoS (CSE)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the basics of E-Commerce.
- Explain the activities involved in the E- commerce process.
- Develop the applications related to the EDI.
- Analyze the security issues in the E –commerce.
- Apply the E-commerce at various applications.

TEXT BOOKS:

1. Ravi Kalakota and Andrew B Whinston, "Frontiers of Electronic Commerce", Pearson Education Asia, 2009.

REFERENCES:

1. Marilyn Greenstein and Todd M Feinman , "Electronic commerce: Security, Risk Management and Control", Tata McGraw-Hill , 2000.
2. Judy Strauss and Raymond Frost, "E Marketing", PHI, 2002.
3. Brenda Kienan, "Managing E Commerce Business", PHI, 2001.
4. Vivek Sharma and Rajiv Sharma, "Developing E Commerce Sites – an integrated approach", Pearson Education Asia, 2000.
5. Kamalesh K. Bajaj, "E-Commerce: The Cutting Edge & Business", Tata McGraw-Hill, 2003.

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BoS (CSE)

20CS708OE INTRODUCTION TO COMPUTER ORGANIZATION

L	T	P	C
3	0	0	3

OBJECTIVES:

The Student should be made to:

- Have a knowledge on basic digital principles.
- Understand the basic structure and operation of a digital computer.
- Explore the basic processing unit
- Study the hierarchical memory system.
- Learn the pipelining architecture concepts.

UNIT I INTRODUCTION TO DIGITAL PRINCIPLES 9

Boolean functions – Simplifications of Boolean functions using Karnaugh map-Implementation of Boolean functions using logic gates - Decoders and encoders - Multiplexers and demultiplexers

UNIT II BASIC STRUCTURE OF COMPUTERS 9

Functional units – Basic operational concepts – Performance – Instructions and instruction sequencing – Addressing modes – RISC and CISC Styles – Arithmetic: Design of fast adders – Multiplication of unsigned and signed numbers – Fast Multiplication – Floating point numbers and operations.

UNIT III BASIC PROCESSING UNIT 9

Fundamental concepts – Instruction Execution – Hardware Components - Instruction Fetch and Execution Steps – Control Signals – Hardwired control

UNIT IV MEMORY SYSTEM 9

Basic concepts – Memory hierarchy - Semiconductor RAM – Read-only Memories – Direct Memory Access – Cache memories – Performance considerations – Virtual memory

UNIT V PIPELINING 9

Basic concepts – Pipeline organization and issues – Data dependencies – Memory and branch delays – Performance evaluation

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Apply digital principle concepts to design logical circuits
- Design the arithmetic circuits for faster operations
- Analyze the main processing units of a computer.
- Analyze memory hierarchy and its impact on computer cost/performance.
- Design a pipeline for consistent execution of instructions with minimum hazards

TEXT BOOKS:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, and Naraig Manjikian, "Computer Organization and Embedded Systems", McGraw Hill Higher Education, Sixth Edition, 2011.
2. M.Morris Mano, "Digital Design", Pearson Education, 3rd Edition, 2007.

REFERENCES:

1. David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/Software interface", Elsevier, Third Edition, 2005.
2. "Computer Organization", ISRD Group, Tata McGraw Hill, 2006.
3. William Stallings, "Computer Organization and Architecture – Designing for Performance", Pearson Education, Sixth Edition, 2003.
4. Charles H.Roth, Jr. "Fundamentals of Logic Design", Jaico Publishing House, Cengage Earning, 4th Edition, 2005.
5. Donald D.Givone, "Digital Principles and Design", Tata McGraw-Hill, 2007.

CHAIRMAN
BoS (CSE)

20BM701OE BIOINFORMATICS

L T P C
3 0 0 3

OBJECTIVES:

The student should be made to:

- Understand the how to acquire the DNA and protein structure and sequence
- Study the database indexing, search and sequence formats
- Learn the different data processing tools and methods
- Know the various analysis methods and software tools
- Get an awareness about the applications of Bioinformatics

UNIT I BIOLOGICAL DATA ACQUISITION 9

The form of biological information. Retrieval methods of DNA sequence, protein sequence and protein structure information

UNIT II DATABASES 9

Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases – primary sequence databases, protein sequence and structure databases, Organism specific databases

UNIT III DATA PROCESSING 9

Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local versus Global. Distance metrics. Similarity and homology. Scoring matrices.

UNIT IV METHODS OF ANALYSIS 9

Dynamic programming algorithms, Needleman-wunsch and Smith-waterman.Heuristic Methods of sequence alignment, FASTA, and PSI BLAST.Multiple Sequence Alignment and software tools for pairwise and multiple sequence alignment.

UNIT V APPLICATIONS 9

Genome Annotation and Gene Prediction, ORF finding, Phylogenetic Analysis: Comparative genomics, orthologs, paralogs. Genome analysis – Genome annotation

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Appreciate the DNA and protein sequence data acquisition
- Realize the database indexing, searching and various file formats
- Do Access, search and retrieval processing on data
- Analyze different methods, algorithms and software tools
- Apply the skills in different findings and do the analysis on various applications

TEXT BOOKS:

1. Arthur M Lesk, "Introduction to Bioinformatics", Fourth Edition, Oxford University Press
2. Dan Gusfield, "Algorithms on Strings, Trees and Sequences", Cambridge University Press

Chairman
BoS/BME

REFERENCE BOOKS:

1. Pierre Baldi, Soren Brunak, "Bioinformatics The Machine Learning Approach", MIT Press
2. Durbin R, Eddy S, Krogh A, Mitchison G, "Biological Sequence Analysis Probabilistic models of proteins and nucleic acids", Cambridge University Press, 1998
3. David Mount, "Bioinformatics: Sequence and Genome Analysis", Cold Spring Harbor Laboratory Press, Second Edition
4. James D Tisdall, "Beginning Perl for Bioinformatics", O'Reilly Publisher

Chairman
BoS/BME

20BM702OE FUNDAMENTALS OF NUTRITION **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Develop knowledge in the basic area of Food Chemistry
- Know how digestion takes place in Human and the insights of Mechanical and Chemical digestion
- Learn the Glycemic and Non Glycemic indexes of Carbohydrates
- Understand food processing and technology subjects effectively
- Appreciate the similarities and complexities of the chemical components in food

UNIT I OVERVIEW OF NUTRITION **9**

Definition, Six classes of nutrients, calculating energy values from food using the RDA, Nutritional status, Nutritional requirement, malnutrition, nutritional assessment of individuals and populations, dietary recommendations, Balanced diet planning: Diet planning principles, dietary guidelines; food groups, exchange lists, personal diet analysis

UNIT II DIGESTION **9**

Digestion, Absorption and Transport: Anatomy and Physiology: Anatomy and Physiology of the digestive tract, Mechanical and Chemical digestion, Absorption of Nutrients

UNIT III CARBOHYDRATES **9**

Glycemic and Non Glycemic carbohydrates, Blood glucose regulation, Recommendations of sugar intake for health, Health effects of fiber and starch intake, Artificial sweeteners; Importance of blood sugar regulation, Dietary recommendations for NIDDM and IDDM

UNIT IV PROTEINS AND LIPIDS **9**

Proteins; Food enzymes; Texturized proteins; Food sources, functional role and uses in foods. Review of structure, composition and nomenclature of Fats. Non-glyceride components in fats and oils; Fat replacements; Food sources, functional role and uses in foods. Health effects and recommended intakes of lipids.Recommended intakes of proteins, Deficiency – short term and long term effects.

UNIT V METABOLISM, ENERGY BALANCE AND BODY COMPOSITION **9**

Energy Balance, Body weight and Body composition, Health implications, Obesity, BMR and BMI Calculations, Weight control: Fat cell development, Hunger, Satiety and Satiation, Dangers of unsafe weight lost schemes, Treatment of obesity, Attitudes and behaviours toward weight control. Food and pharmaceutical grades, Toxicities, Deficiencies, Factors affecting bio availability, Stability under food processing conditions

TOTAL: 45 PERIODS

Chairman
BoS/BME

OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the different classes nutrients
- Illustrate the digestion and absorption of Food substances
- Demonstrate the role of carbohydrates in producing the required energy
- Exhibit the energy balance and the body composition in detail
- Explain the significance of proteins and Lipids with its role

TEXT BOOKS:

1. Mann, Jim, Stewart Truswell, "Essentials of Human Nutrition", Third Edition, Oxford University Press, 2007.
2. Gibney, Michael J., et al, "Introduction to Human Nutrition", Second Edition, Blackwell, 2009.

REFERENCES:

1. Damodaran S, Parkin K L and Fennema O R, " Fennema's Food Chemistry Fourth Edition, CRC Press, 2008.
2. Belitz H D, Grosch W andSchieberle P, "Food Chemistry", Third Revised Edition, Springer, Verlag, 2004.

Chairman
BoS/BME

20M101 **FINANCIAL MANAGEMENT**

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Acquire the knowledge of the decision areas in finance.
- Learn the various sources of Finance.
- Study about capital budgeting and cost of capital.
- Learn on how to construct a robust capital structure and dividend policy.
- Study about the tools on Working Capital Management.

UNIT I INTRODUCTION TO FINANCIAL MANGEMENT **9**

Definition and Scope of Finance Functions - Objectives of Financial Management – Profit Maximization and Wealth Maximization- Time Value of money- Risk and return concepts.

UNIT II SOURCES OF FINANCE **9**

Long term sources of Finance -Equity Shares – Debentures - Preferred Stock – Features – Merits and Demerits. Short term sources - Bank Sources, Trade Credit, Overdrafts, Commercial Papers, Certificate of Deposits, Money market mutual funds etc

UNIT III INVESTMENT DECISIONS: **9**

Investment Decisions: capital budgeting – Need and Importance – Techniques of Capital Budgeting – Payback -ARR – NPV – IRR –Profitability Index.

Cost of Capital - Cost of Specific Sources of Capital - Equity -Preferred Stock- Debt - Reserves - Concept and measurement of cost of capital - Weighted Average Cost of Capital.

UNIT IV FINANCING AND DIVIDEND DECISION **9**

Operating Leverage and Financial Leverage- EBIT-EPS analysis. Capital Structure – determinants of Capital structure- Designing an Optimum capital structure.

Dividend policy - Aspects of dividend policy - practical consideration - forms of dividend policy - Determinants of Dividend Policy.

UNIT V WORKING CAPITAL DECISION **9**

Working Capital Management: Working Capital Management - concepts - importance –Determinants of Working capital. Cash Management: Motives for holding cash – Objectives and Strategies of Cash Management. Receivables Management: Objectives - Credit policies.

45 PERIODS

CHAIRMAN
BoS (IT)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain about the decision areas in finance.
- Discuss about the various sources of Finance.
- Work on capital budgeting and cost of capital.
- Construct a robust capital structure and dividend policy.
- Handle the tools on Working Capital Management.

TEXT BOOKS

1. M.Y. Khan and P.K.Jain Financial management, Text, Tata McGraw Hill, Ltd.
2. M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd.

REFERENCES:

1. James C. Vanhorne, Fundamentals of Financial Management, PHI Learning.
2. Srivatsava, Mishra, Financial Management, Oxford University Press, 2011

CHAIRMAN
BoS (IT)

20M102 FUNDAMENTALS OF INVESTMENT

(Common to all Branches)

L T P C

3 0 0 3

OBJECTIVES:

The student should be made to:

- Study about the investment environment in which investment decisions are taken.
- Acquire knowledge on how to Value bonds and equities.
- Learn the various approaches to value securities.
- Study on how to create efficient portfolios through diversification.
- Learn the mechanism of investor protection in India.

UNIT I THE INVESTMENT ENVIRONMENT 9

The investment decision process, Types of Investments – Commodities, Real Estate and Financial Assets, the Indian securities market, the market participants and trading of securities, security market indices, sources of financial information, Concept of return and risk, Impact of Taxes and Inflation on return.

UNIT II FIXED INCOME SECURITIES 9

Bond features, types of bonds, estimating bond yields, Bond Valuation types of bond risks, default risk and credit rating.

UNIT III APPROACHES TO EQUITY ANALYSIS 9

Introduction to Fundamental Analysis, Technical Analysis and Efficient Market Hypothesis, dividend capitalisation models, and price-earnings multiple approach to equity valuation.

UNIT IV PORTFOLIO ANALYSIS AND FINANCIAL DERIVATIVES 9

Portfolio and Diversification, Portfolio Risk and Return; Mutual Funds; Introduction to Financial Derivatives; Financial Derivatives Markets in India

UNIT V INVESTOR PROTECTION 9

Investor grievances and their redressal system, insider trading, investors' awareness and activism.

45 PERIODS

CHAIRMAN
BoS (IT)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Describe the investment environment in which investment decisions are taken.
- Explain how to Value bonds and equities.
- Explain the various approaches to value securities.
- Create efficient portfolios through diversification.
- Discuss the mechanism of investor protection in India.

TEXT BOOKS

1. Charles P. Jones, Gerald R. Jensen. Investments: analysis and management. Wiley, 14th Edition, 2019.

REFERENCES:

1. Chandra, Prasanna. Investment analysis and portfolio management. McGraw-hill education, 5th, Edition, 2017.
2. Rustagi, R. P. Investment Management Theory and Practice. Sultan Chand & Sons, 2021.
3. ZviBodie, Alex Kane, Alan J Marcus, PitabusMohanty, Investments, McGraw Hill Education (India), 11 Edition(SIE), 2019

CHAIRMAN
BoS (IT)

20M103 BANKING, FINANCIAL SERVICES AND INSURANCE

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Study about the Banking system in India.
- Acquire knowledge on how banks raise their sources and how they deploy it.
- Learn the development in banking technology.
- Study about the financial services in India.
- Acquire knowledge about the insurance Industry in India.

UNIT I INTRODUCTION TO INDIAN BANKING SYSTEM 9

Overview of Banking system – Structure – Functions –Banking system in India - Key Regulations in Indian Banking sector –RBI. Relationship between Banker and Customer - Retail & Wholesale Banking – types of Accounts - Opening and operation of Accounts.

UNIT II MANAGING BANK FUNDS/ PRODUCTS 9

Liquid Assets - Investment in securities - Advances - Loans.Negotiable Instruments – Cheques, Bills of Exchange & Promissory Notes.Designing deposit schemes– Asset and Liability Management – NPA's – Current issues on NPA's – M&A's of banks into securities market.

UNIT III DEVELOPMENT IN BANKING TECHNOLOGY 9

Payment system in India – paper based – e payment –electronic banking –plastic money – e-money – forecasting of cash demand at ATM's –The Information Technology Act, 2000 in India – RBI's Financial Sector Technology vision document – security threats in e-banking & RBI's Initiative.

UNIT IV FINANCIAL SERVICES 9

Introduction – Need for Financial Services – Financial Services Market in India – NBFC — Leasing and Hire Purchase — mutual funds. Venture Capital Financing –Bill discounting –factoring – Merchant Banking.

UNIT V INSURANCE 9

Insurance –Concept - Need - History of Insurance industry in India. Insurance Act, 1938 –IRDA – Regulations – Life Insurance - Annuities and Unit Linked Policies - Lapse of the Policy – revival – settlement of claim.

45 PERIODS

CHAIRMAN
BoS (IT)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the Banking system in India.
- Discuss how banks raise their sources and how they deploy it.
- Explain the development in banking technology.
- Discuss about the financial services in India.
- Explain the insurance Industry in India.

TEXT BOOKS

1. Padmalatha Suresh and Justin Paul, "Management of Banking and Financial Services, Pearson, Delhi, 2017.

REFERENCES:

1. Meera Sharma, "Management of Financial Institutions – with emphasis on Bank and Risk Management", PHI Learning Pvt. Ltd., New Delhi, 2010.
2. Peter S. Rose and Sylvia C. and Hudgins, "Bank Management and Financial Services", Tata McGraw Hill, New Delhi, 2017.

CHAIRMAN
BoS (IT)

20M104 INTRODUCTION TO BLOCKCHAIN AND ITS APPLICATIONS

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Study about the introduction of blockchain technology.
- Acquire knowledge on the usage of Cryptocurrency.
- Learn about the concept of Ethereum technology.
- Study about the Web3 and Hyperledger concepts .
- Acquire knowledge about the emerging trends related to blockchain technology.

UNIT I INTRODUCTION TO BLOCKCHAIN **9**

Blockchain: The growth of blockchain technology - Distributed systems - The history of blockchain and Bitcoin - Features of a blockchain - Types of blockchain, Consensus: Consensus mechanism - Types of consensus mechanisms - Consensus in blockchain. Decentralization: Decentralization using blockchain - Methods of decentralization - Routes to decentralization- Blockchain and full ecosystem decentralization - Smart contracts - Decentralized Organizations- Platforms for decentralization.

UNIT II INTRODUCTION TO CRYPTOCURRENCY **9**

Bitcoin – Digital Keys and Addresses – Transactions – Mining – Bitcoin Networks and Payments – Wallets – Alternative Coins – Theoretical Limitations – Bitcoin limitations – Name coin – Prime coin – Zcash – Smart Contracts – Ricardian Contracts- Deploying smart contracts on a blockchain

UNIT III ETHEREUM **9**

Introduction - The Ethereum network - Components of the Ethereum ecosystem - Transactions and messages - Ether cryptocurrency / tokens (ETC and ETH) - The Ethereum Virtual Machine (EVM), Ethereum Development Environment: Test networks - Setting up a private net - Starting up the private network

UNIT IV WEB3 AND HYPERLEDGER **9**

Introduction to Web3 – Contract Deployment – POST Requests – Development Frameworks – Hyperledger as a Protocol – The Reference Architecture – Hyperledger Fabric – Distributed Ledger – Corda.

UNIT V EMERGING TRENDS **9**

Kadena – Ripple – Rootstock – Quorum – Tendermint – Scalability – Privacy – Other Challenges – Blockchain Research – Notable Projects – Miscellaneous Tools.

45 PERIODS

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BoS (IT)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain about the introduction of blockchain technology.
- Discuss about the usage of Cryptocurrency.
- Elaborate about the concept of Ethereum technology.
- Discuss about the Web3 and Hyperledger concepts.
- Discuss about the emerging trends related to blockchain technology.

TEXT BOOKS

1. Imran. Bashi, Mastering block chain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained, Packt Publishing, 2nd Edition, 2018

REFERENCES:

1. Peter Borovykh , Blockchain Application in Finance, Blockchain Driven, 2nd Edition, 2018
2. ArshdeepBahga, Vijay Madisetti, "Blockchain Applications: A Hands On Approach", VPT, 2017.

CHAIRMAN
BoS (IT)

20M105 **FINTECH PERSONAL FINANCE AND PAYMENTS**

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Study about the currency exchange and payment
- Acquire knowledge on the concept of digital finance and alternative finance.
- Learn about the concept of insurtech.
- Study about the process of peer to peer lending
- Acquire knowledge about the various regulatory issues related to finance.

UNIT I CURRENCY EXCHANGE AND PAYMENT **9**

Understand the concept of Crypto currency- Bitcoin and Applications -Cryptocurrencies and Digital Crypto Wallets -Types of Cryptocurrencies - Cryptocurrencies and Applications, block chain, Artificial Intelligence, machine learning. Fintech users, Individual Payments, RTGS Systems, Immediate Page 54 of 90 Payment Service (IMPS), Unified Payments Interface (UPI).Legal and Regulatory Implications of Crypto currencies, Payment systems and their regulations. Digital Payments Smart Cards, Stored-Value Cards, EC Micropayments, Payment Gateways, Mobile Payments, Digital and Virtual Currencies, Security, Ethical, Legal, Privacy, and Technology Issues

UNIT II DIGITAL FINANCE AND ALTERNATIVE FINANCE **9**

A Brief History of Financial Innovation, Digitization of Financial Services, Crowd funding, Charity and Equity, Introduction to the concept of Initial Coin Offering

UNIT III INSURETECH **9**

InsurTech Introduction , Business model disruption AI/ML in InsurTech, IoT and InsurTech ,Risk Modeling ,Fraud Detection Processing claims and Underwriting Innovations in Insurance Services.

UNIT IV PEER TO PEER LENDING **9**

P2P and Marketplace Lending, New Models and New Products in market place lending P2P Infrastructure and technologies , Concept of Crowdfunding Crowdfunding Architecture and Technology ,P2P and Crowdfunding unicorns and business models , SME/MSME Lending: Unique opportunities and Challenges, Solutions and Innovations.

UNIT V REGULATORY ISSUES **9**

FinTech Regulations: Global Regulations and Domestic Regulations, Evolution of RegTech, RegTech Ecosystem: Financial Institutions, RegTech Ecosystem: StartupsRegTech, Startups: Challenges, RegTech Ecosystem: Regulators, Use of AI in regulation and Fraud detection.

45 PERIODS

CHAIRMAN
BoS (IT)

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain about the currency exchange and payment.
- Discuss on the concept of digital finance and alternative finance.
- Elaborate about the concept of insurtech.
- Discuss about the process of peer to peer lending.
- Explain about the various regulatory issues related to finance.

TEXT BOOKS

1. Swanson Seth, Fintech for Beginners: Understanding and Utilizing the power of technology, Createspace Independent Publishing Platform,2016.

REFERENCES:

1. Models AuTanda, Fintech Bigtech And Banks Digitalization and Its Impact On Banking Business, Springer, 2019.
2. Henning Diedrich, Ethereum: Blockchains, Digital Assets, Smart Contracts, Decentralized Autonomous Organizations, Wildfire Publishing, 2016.
3. Jacob William, FinTech:TheBeginner's Guide to Financial Technology, Createspace Independent Publishing Platform, 2016.
4. IIBF, Digital Banking, Taxmann Publication, 2016.
5. Jacob William, Financial Technology, Create space Independent Pub, 2016.
6. Luke Sutton, Financial Technology: Bitcoin & Blockchain, Createspace Independent Pub, 2016.

CHAIRMAN
BoS (IT)

20M106 **INTRODUCTION TO FINTECH**

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Learn about history, importance and evolution of Fintech.
- Acquire the knowledge of Fintech in payment industry.
- Acquire the knowledge of Fintech in insurance industry.
- Learn the Fintech developments around the world.
- Study about the future of Fintech.

UNIT I INTRODUCTION 9

Fintech - Definition, History, concept, meaning, architecture, significance, Goals, key areas in Fintech, Importance of Fintech, role of Fintech in economic development, opportunities and challenges in Fintech, Evolution of Fintech in different sectors of the industry - Infrastructure, Banking Industry, Startups and Emerging Markets, recent developments in FinTech, future prospects and potential issues with Fintech.

UNIT II PAYMENT INDUSTRY 9

FinTech in Payment Industry-Multichannel digital wallets, applications supporting wallets, onboarding and KYC application, FinTech in Lending Industry- Formal lending, Informal lending, P2P lending, POS lending, Online lending, Payday lending, Microfinance, Crowdfunding.

UNIT III INSURANCE INDUSTRY 9

FinTech in Wealth Management Industry-Financial Advice, Automated investing, Socially responsible investing, Fractional Investing, Social Investing. FinTech in Insurance Industry- P2P insurance, On-Demand Insurance, On-Demand Consultation, Customer engagement through Quote to sell, policy servicing, Claims Management, Investment linked health insurance.

UNIT IV FINTECH AROUND THE GLOBE 9

FinTech developments - US, Europe and UK, Germany, Sweden, France, China, India, Africa, Australia, New Zealand, Brazil and Middle East, Regulatory and Policy Assessment for Growth of FinTech. FinTech as disruptors, Financial institutions collaborating with FinTech companies, The new financial world.

UNIT V FUTURE OF FINTECH 9

How emerging technologies will change financial services, the future of financial services, banking on innovation through data, why FinTech banks will rule the world, The FinTech Supermarket, Banks partnering with FinTech start-ups, The rise of BankTech, Fintech impact on Retail Banking, A future without money, Ethics in Fintech.

CHAIRMAN
BoS (IT)

45 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the students will be able to,

- Explain about history, importance and evolution of Fintech.
- Discuss about the process of Fintech in payment industry.
- Discuss about the process of Fintech in insurance industry.
- Handle the process of the various Fintech around the world.
- Discuss about the future of Fintech.

TEXT BOOKS

1. Arner D., Barbers J., Buckley R, The evolution of FinTech: a new post crisis paradigm, University of New South Wales Research Series, 2015

REFERENCES:

1. Susanne Chishti, Janos Barberis, The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, Wiley Publications, 2016.
2. Richard Hayen, FinTech: The Impact and Influence of Financial Technology on Banking and the Finance Industry, 2016.
3. Parag Y Arjunwadkar, FinTech: The Technology Driving Disruption in the financial service industry CRC Press, 2018.
4. Sanjay Phadke, Fintech Future : The Digital DNA of Finance Paperback .Sage Publications, 2020.
5. Pranay Gupta, T. Mandy Tham, Fintech: The New DNA of Financial Services Paperback, 2018.

CHAIRMAN
BoS (IT)

20M201 **FOUNDATIONS OF ENTREPRENEURSHIP (COMMON TO ALL BRANCHES)**

L	T	P	C
3	0	0	3

OBJECTIVES:

The Students should be made to:

- To impart the entrepreneurial skills and traits essential to become successful entrepreneurs
- To develop and strengthen the entrepreneurial quality and environment
- To apply the principles and theories of entrepreneurship and management in Technology oriented business
- To empower the learners to run a Technology driven business efficiently and effectively
- To enhance knowledge on emerging trends in entrepreneurship

UNIT I INTRODUCTION TO ENTREPRENEURSHIP 9

Entrepreneurship- Definition, Need, Scope - Entrepreneurial Skill & Traits - Entrepreneur vs. Intrapreneur; Classification of entrepreneurs, Types of entrepreneurs -Factors affecting entrepreneurial development – Achievement Motivation – Contributions of Entrepreneurship to Economic Development.

UNIT II BUSINESS OWNERSHIP & ENVIRONMENT 9

Types of Business Ownership – Business Environmental Factors – Political-Economic-Sociological- Technological-Environmental-Legal aspects – Human Resources. Mobilisation-Basics of Managing Finance- Essentials of Marketing Management - Production and Operations Planning – Systems Management and Administration.

UNIT III FUNDAMENTALS OF TECHNOPRENEURSHIP 9

Introduction to Technopreneurship - Definition, Need, Scope- Emerging Concepts- Principles - Characteristics of a technopreneur - Impacts of Technopreneurship on Society – Economy- Job Opportunities in Technopreneurship - Recent trends.

UNIT IV APPLICATIONS OF TECHNOPRENEURSHIP 9

Technology Entrepreneurship - Local, National and Global practices - Intrapreneurship and Technology interactions, Networking of entrepreneurial activities – Launching - Managing Technology based Product / Service entrepreneurship - Success Stories of Technopreneurs - Case Studies.

UNIT V EMERGING TRENDS IN ENTREPRENEURSHIP 9

Effective Business Management Strategies for Franchising - Sub-Contracting - Leasing-Technopreneurs – Agripreneurs - Netpreneurs- Portfolio entrepreneurship - NGO Entrepreneurship – Recent Entrepreneurial Developments - Local – National – Global perspectives.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (MECH)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn the basics of Entrepreneurship
- Understand the business ownership patterns and environment
- Get awareness of the Job opportunities in Industries relating to Technopreneurship
- Know various applications of technopreneurs and successful technopreneurs
- Acquaint with the recent and emerging trends in entrepreneurship

TEXT BOOKS:

1. Khanka S S, "Entrepreneurial Development", S.Chand & Co. Ltd., New Delhi, 2021.
2. Donal F Kuratko, "Entrepreneurship Theory, Process, Practice" Cengage Learning, 11th Edition, 2019.

REFERENCES:

1. Daniel Mankani, "Technopreneurship: The successful Entrepreneur in the new Economy", Prentice Hall, 2003.
2. Edward Elgar, "Entrepreneurship, Cooperation and the Firm: The Emergence and Survival of High-Technology Ventures in Europe", Wiley Publications, 2007.
3. Lang J, "The High Tech Entrepreneur's Handbook", Ft.com, 2002.
4. David Sheff, "China Dawn: The Story of a Technology and Business Revolution", 2002.
5. Dennis Posadas, "JumpStart: A Technopreneurship Fable", Pearson Prentice Hall, 2009.
6. Frederico Gonzales and Barcelon M, "Basics of Technopreneurship: Module 1.1-1.2", President-PESO Inc; UP.

CHAIRMAN
BoS (MECH)

20M202	TEAM BUILDING AND LEADERSHIP MANAGEMENT FOR BUSINESS (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- To develop and strengthen the teams and to know the basic concepts
- To apply the principles and theories of Team Building in managing Technology oriented businesses
- To impart the Leadership skills and traits essential to become successful entrepreneurs
- To learn various leadership styles and theories for business development
- To empower the learners to build robust teams for running and leading a business efficiently and effectively

UNIT I INTRODUCTION TO MANAGING TEAMS **9**

Introduction to Team - Team Dynamics - Team Formation – Stages of Team Development - Enhancing teamwork within a group - Team Coaching - Team Decision Making - Virtual Teams - Self Directed Work Teams (SDWTs) -Multicultural Teams.

UNIT II MANAGING AND DEVELOPING EFFECTIVE TEAMS **9**

Team-based Organisations- Leadership roles in team-based organisations - Offsite training and team development - Experiential Learning - Coaching and Mentoring in team building - Building High-Performance Teams - Building Credibility and Trust - Skills for Developing Others - Team Building at the Top - Leadership in Teamwork Effectiveness.

UNIT III INTRODUCTION TO LEADERSHIP **9**

Introduction to Leadership - Leadership Myths – Characteristics of Leader, Follower and Situation - Leadership Attributes - Personality Traits and Leadership- Intelligence Types and Leadership - Power and Leadership - Delegation and Empowerment.

UNIT IV LEADERSHIP IN ORGANISATIONS **9**

Leadership Styles – LMX Theory- Leadership Theory and Normative Decision Model - Situational Leadership Model - Contingency Model and Path Goal Theory – Transactional and Transformational Leadership - Charismatic Leadership - Role of Ethics and Values in Organisational Leadership.

UNIT V LEADERSHIP EFFECTIVENESS **9**

Leadership Behaviour - Assessment of Leadership Behaviors - Destructive Leadership - Motivation and Leadership - Managerial Incompetence and Derailment Conflict Management - Negotiation and Leadership - Culture and Leadership - Global Leadership – Recent Trends in Leadership.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (MECH)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn the basics of managing teams for business
- Understand the techniques for developing effective teams for business management
- Know the fundamentals of leadership for running a business
- Apply various leadership styles and theories for business development
- Acquaint with emerging trends in leadership effectiveness for entrepreneurs

TEXT BOOKS:

1. Hughes R L, Ginnett R C, and Curphy G J, "Leadership: Enhancing the Lessons of Experience", McGraw Hill Education, India, 9th Edition, 2019.
2. Katzenback J R and Smith D K, "The Wisdom of Teams: Creating the High Performance Organizations", Harvard Business Review Press, 2015.

REFERENCES:

1. Haldar U K, "Leadership and Team Building", Oxford University Press, 2010.
2. Daft R L, "The Leadership Experience", Cengage, 2015.
3. Daniel Levi, "Group Dynamics for Teams", Sage Publications, 4th Edition, 2014.
4. Dyer W G, Dyer Jr W G, and Dyer J H., "Team Building: Proven Strategies for Improving Team Performance", Jossey-Bass, 5th Edition, 2013.

CHAIRMAN
BoS (MECH)

20M203	CREATIVITY AND INNOVATION IN ENTREPRENEURSHIP (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Develop the creativity skills among the learners
- Impart the knowledge of creative intelligence essential for entrepreneurs
- Know the applications of innovation in entrepreneurship
- Learn the concepts of innovation and entrepreneurship
- Apply innovative business models for business

UNIT I CREATIVITY 9

Creativity: Definition- Forms of Creativity-Essence, Elaborative and Expressive Creativities-Quality of Creativity-Existential, Entrepreneurial and Empowerment Creativities – Creative Environment- Creative Technology- - Creative Personality and Motivation.

UNIT II CREATIVE INTELLIGENCE 9

Creative Intelligence: Convergent thinking ability – Traits Congenial to creativity – Creativity Training- Criteria for evaluating Creativity-Credible Evaluation- Improving the quality of our creativity – Creative Tools and Techniques - Blocks to creativity- fears and Disabilities-Strategies for Unblocking- Designing Creativity Enabling Environment.

UNIT III INNOVATION 9

Innovation: Definition- Levels of Innovation- Incremental vs Radical Innovation-Product Innovation and Process- Technological, Organizational Innovation – Indicators- Characteristics of Innovation in Different Sectors. Theories in Innovation and Creativity- Design Thinking and Innovation- Innovation as Collective Change-Innovation as a system.

UNIT IV INNOVATION AND ENTREPRENEURSHIP 9

Innovation and Entrepreneurship: Entrepreneurial Mindset, Motivations and Behaviours-Opportunity Analysis and Decision Making- Industry Understanding - Entrepreneurial Opportunities- Entrepreneurial Strategies – Technology Pull/Market Push – Product -Market fit.

UNIT V INNOVATIVE BUSINESS MODELS 9

Innovative Business Models: Customer Discovery-Customer Segments-Prospect Theory and Developing Value Propositions- Developing Business Models: Elements of Business Models – Innovative Business Models: Elements, Designing Innovative Business Models- Responsible Innovation and Creativity

TOTAL: 45 PERIODS

CHAIRMAN
BoS (MECH)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn the basics of creativity for developing Entrepreneurship
- Know the importance of creative intelligence for business growth
- Understand the advances through Innovation in Industries
- Apply the applications of innovation in building successful ventures
- Acquaint with developing innovative business models to run the business efficiently and effectively

TEXT BOOKS:

1. Khanka S S., "Creativity and Innovation in Entrepreneurship", Sultan Chand & Sons, 2021.
2. Pradip N Khandwalla, "Lifelong Creativity, An Unending Quest", Tata Mc Graw Hill, 2004.

REFERENCES:

1. Paul Trott, "Innovation Management and New Product Development", 4th Edition, Pearson, 2018.
2. Vinnie Jauhari and Sudanshu Bhushan, "Innovation Management", Oxford Higher Education, 2014.
3. Krishnamacharyulu C S G and Lalitha R, "Innovation Management"., Himalaya Publishing House, 2010.
4. Dale Timpe, "Creativity", Jaico Publishing House, 2nd Edition, 2003.
5. Brian Clegg, Paul Birch, "Creativity", Kogan Page Limited, 7th Edition, 2009.
6. Geoff Love and Raj Echambadi's., "Strategic Innovation: Building and Sustaining Innovative Organizations", Coursera.

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BoS (MECH)

20M204	PRINCIPLES OF MARKETING MANAGEMENT FOR BUSINESS (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Provide basic knowledge of concepts, principles, tools and techniques of marketing for entrepreneurs
- Provide an exposure to the students pertaining to the nature and Scope of marketing, which they are expected to possess when they enter the industry as practitioners
- Give them an understanding of fundamental premise underlying market driven strategies and the basic philosophies and tools of marketing management for business owners
- Understand the strategies in product promotion and distributions
- Analyze the issues in marketing management

UNIT I INTRODUCTION TO MARKETING MANAGEMENT 9

Introduction - Market and Marketing – Concepts- Functions of Marketing - Importance of Marketing - Marketing Orientations - Marketing Mix-The Traditional 4Ps - The Modern Components of the Mix - The Additional 3Ps - Developing an Effective Marketing Mix.

UNIT II MARKETING ENVIRONMENT 9

Introduction - Environmental Scanning - Analysing the Organisation's Micro Environment and Macro Environment - Differences between Micro and Macro Environment – Techniques of Environment Scanning - Marketing organization - Marketing Research and the Marketing Information System, Types and Components.

UNIT III PRODUCT AND PRICING MANAGEMENT 9

Product- Meaning, Classification, Levels of Products – Product Life Cycle (PLC) - Product Strategies - Product Mix - Packaging and Labelling - New Product Development - Brand and Branding - Advantages and disadvantages of branding Pricing - Factors Affecting Price Decisions - Cost Based Pricing - Value Based and Competition Based Pricing - Pricing Strategies - National and Global Pricing.

UNIT IV PROMOTION AND DISTRIBUTION MANAGEMENT 9

Introduction to Promotion – Marketing Channels- Integrated Marketing Communications (IMC) - Introduction to Advertising and Sales Promotion – Basics of Public Relations and Publicity - Personal Selling - Process - Direct Marketing - Segmentation, Targeting and Positioning (STP)- Logistics Management- Introduction to Retailing and Wholesaling.

UNIT V CONTEMPORARY ISSUES IN MARKETING MANAGEMENT 9

Introduction - Relationship Marketing Vs. Relationship Management - Customer Relationship Management (CRM) - Forms of Relationship Management - CRM practices - Managing Customer Loyalty and Development – Buyer-Seller Relationships- Buying Situations in Industrial / Business Market - Buying Roles in Industrial Marketing - Factors that Influence Business - Services Marketing - E-Marketing or Online Marketing.

TOTAL: 45 PERIODS

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BoS (MECH)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Get the awareness of marketing management process
- Understand the marketing environment
- Acquaint about product and pricing strategies
- Gain Knowledge of promotion and distribution in marketing management
- Comprehend the contemporary marketing scenarios and offer solutions to marketing issues

TEXT BOOKS:

1. Sherlekar S A, "Marketing Management", Himalaya Publishing House, 2016.
2. Philip Kotler and Kevin Lane Keller, "Marketing Management", 15th Edition, Pearson, 2015.

REFERENCES:

1. Vijay Prakash Anand, "Marketing Management: An Indian Perspective", Biztantra, 2nd Edition, 2016.
2. Ramaswamy V S and Namakumari S, "Marketing Management: Global Perspective, Indian Context", Macmillan Publishers India, 5th Edition, 2015.
3. Kazmi S H H., "Marketing Management", Excel Books India, 2013.
4. Dr. Gupta C B and Dr. Rajan Nair N, "Marketing Management: Text and Cases", 17th Edition, 2016.

CHAIRMAN
BoS (MECH)

20M205	HUMAN RESOURCE MANAGEMENT FOR ENTREPRENEURS (COMMON TO ALL BRANCHES)	L	T	P	C
		3	0	0	3

OBJECTIVES:

The Students should be made to:

- Introduce the basic concepts, structure and functions of human resource management for entrepreneurs
- Understand the methods and techniques followed by Human Resource Management practitioners
- Create an awareness of the roles, functions and functioning of human resource department
- Gain knowledge on training and development of employees
- Empower the learners stronger in controlling the human resources

UNIT I INTRODUCTION TO HRM 9

Concept, Definition, Objectives- Nature and Scope of HRM - Evolution of HRM - HR Manager Roles- Skills - Personnel Management Vs. HRM - Human Resource Policies - HR Accounting - HR Audit - Challenges in HRM.

UNIT II HUMAN RESOURCE PLANNING 9

HR Planning - Definition - Factors- Tools - Methods and Techniques - Job analysis- Job rotation- Job Description - Career Planning - Succession Planning - HRIS - Computer Applications in HR - Recent Trends.

UNIT III RECRUITMENT AND SELECTION 9

Sources of recruitment- Internal Vs. External - Domestic Vs. Global Sources -eRecruitment - Selection Process- Selection techniques -eSelection- Interview Types- Employee Engagement.

UNIT IV TRAINING AND EMPLOYEE DEVELOPMENT 9

Types of Training - On-The-Job, Off-The-Job - Training Needs Analysis – Induction and Socialisation Process - Employee Compensation - Wages and Salary Administration – Health and Social Security Measures- Green HRM Practices.

UNIT V CONTROLLING HUMAN RESOURCES 9

Performance Appraisal – Types - Methods - Collective Bargaining - Grievances Redressal Methods – Employee Discipline – Promotion – Demotion - Transfer – Dismissal - Retrenchment - Union Management Relationship - Recent Trends.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the Evolution of HRM and Challenges faced by HR Managers
- Learn about the HR Planning Methods and practices
- Acquaint about the Recruitment and Selection Techniques followed in Industries
- Known about the methods of Training and Employee Development
- Comprehend the techniques of controlling human resources in organisations

TEXT BOOKS:

1. Gary Dessler and Biju Varkkey, "Human Resource Management", Pearson, 14th Edition, 2015.
2. Mathis and Jackson, "Human Resource Management", Cengage Learning, 15th Edition, 2017.

REFERENCES:

1. David A Decenzo, Stephen P Robbins, and Susan L Verhulst, "Human Resource Management", Wiley, International Student Edition, 2014.
2. Wayne Mondy R, "Human Resource Management", Pearson, 2015.
3. Luis R Gomez-Mejia, David B Balkin, Robert L Cardy, "Managing Human Resource", PHI Learning, 2012.
4. John M Ivancevich, "Human Resource Management", McGraw Hill Irwin, 12th Edition, 2013.
5. Aswathappa K, Sadhna Dash, "Human Resource Management - Text and Cases", McGraw Hill, 9th Edition, 2021.
6. Uday Kumar Haldar, Juthika Sarkar, "Human Resource Management", Oxford, 2012.

CHAIRMAN
BoS (MECH)

20M206	FINANCING NEW BUSINESS VENTURES (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The Students should be made to:

- Impart the knowledge essential for entrepreneurs for financing new ventures
- Develop the basics of business venture financing
- Acquaint the learners with the sources of debt and equity financing
- Know the learners with sources of equity financing
- Empower the learners towards fund raising for new ventures effectively

UNIT I ESSENTIALS OF NEW BUSINESS VENTURE 9

Setting up new Business Ventures – Need - Scope - Franchising - Location Strategy, Registration Process - State Directorate of Industries- Financing for New Ventures - Central and State Government Agencies - Types of loans – Financial Institutions - SFC, IDBI, NSIC and SIDCO.

UNIT II INTRODUCTION TO VENTURE FINANCING 9

Venture Finance – Definition – Historic Background - Funding New Ventures- Need – Scope – Types - Cost of Project - Means of Financing - Estimation of Working Capital - Requirement of funds – Mix of Debt and Equity - Challenges and Opportunities.

UNIT III SOURCES OF DEBT FINANCING 9

Fund for Capital Assets - Term Loans - Leasing and Hire-Purchase - Money Market instruments – Bonds, Corporate Papers – Preference Capital- Working Capital Management- Fund based Credit Facilities - Cash Credit - Over Draft.

UNIT IV SOURCES OF EQUITY FINANCING 9

Own Capital, Unsecured Loan - Government Subsidies, Margin Money- Equity Funding - Private Equity Fund- Schemes of Commercial banks - Angel Funding – Crowd funding- Venture Capital.

UNIT V METHODS OF FUND RAISING FOR NEW VENTURES 9

Investor Decision Process - Identifying the appropriate investors- Targeting investors- Developing Relationships with investors - Investor Selection Criteria- Company Creation- Raising Funds - Seed Funding- VC Selection Criteria – Process- Methods- Recent Trends.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn the basics of starting a new business venture
- Understand the basics of venture financing
- Know the sources of debt financing
- Understand the sources of equity financing
- Acquaint with the methods of fund raising for new business ventures

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TEXT BOOKS:

1. Brealey and Myers., "Principles of Corporate Finance", McGraw Hill Education (India) Private Limited, 12th Edition, 2018.
2. Prasanna Chandra, "Projects: Planning, Analysis, Selection, Financing, Implementation and Review", McGraw Hill Education India Pvt Ltd, New Delhi, 2019.

REFERENCES:

1. Andrew Fight., "Introduction to Project Finance". Butterworth-Heinemann, 2006.
2. Andrew Metrick and Ayako Yasuda., "Venture Capital and the Finance of Innovation", John Wiley and Sons, Inc, 2nd Edition, 2010.
3. Brad Feld and Jason Mendelson., "Venture Deals", John Wiley & Sons, Inc., 3rd Edition, 2016.
4. John May and John Simons, "Every Business Needs an Angel: Getting the Money You Need to Make Your Business Grow", Crown Business, 2001.
5. Paul Alan Gompers and Joshua Lerner, "The Money of Invention: How Venture Capital Creates New Wealth", Harvard Business Press, 2001.
6. Justin J. Camp, "Venture Capital Due Diligence: A Guide to Making Smart Investment Choices and Increasing Your Portfolio Returns", John Wiley & Sons, 2002.
7. Thomas Byers, "Technology Ventures: From Idea to Enterprise", McGraw Hill Higher Education, 2014.
8. Josh Lerner, Ann Leamon, and Felda Hardymon, "Venture Capital, Private Equity, and The Financing of Entrepreneurship", 2012.

CHAIRMAN
BoS(MECH)

20M301	PRINCIPLES OF PUBLIC ADMINISTRATION (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the nature of public administration.
- Learn the different functions of administration.
- Learn the different relationships and approaches.
- Understand the Bureaucratic and ecological approaches.
- Know about the leadership approaches, communication types and decision making process

UNIT-I **9**

1. Meaning, Nature and Scope of Public Administration
2. Importance of Public Administration
3. Evolution of Public Administration

UNIT-II **9**

1. New Public Administration
2. New Public Management
3. Public and Private Administration

UNIT-III **9**

1. Relationships with Political Science, History and Sociology
2. Classical Approach
3. Scientific Management Approach

UNIT-IV **9**

1. Bureaucratic Approach: Max Weber
2. Human Relations Approach : Elton Mayo
3. Ecological Approach : Riggs

UNIT-V **9**

1. Leadership: Leadership - Styles - Approaches
2. Communication: Communication Types - Process - Barriers
3. Decision Making: Decision Making - Types, Techniques and Processes.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the role of public administration.
- Represent functions of administration.
- Provide the relationships and approaches in administration
- Idea about the bureaucratic and ecological approaches.
- Implement the leadership approaches, communication types and decision making process.

REFERENCES:

1. Avasthi and Maheswari: Public Administration in India, Agra:Lakshmi Narain Agarwal,2013.
2. Ramesh K Arora: Indian Public Administration, New Delhi: Wishwa Prakashan, 2012.
3. R.B. Jain: Public Administration in India,21st Century Challenges for Good Governance, New Delhi: Deep and Deep, 2002.
4. Rumki Basu: Public Administration:Concept and Theories, New Delhi:Sterling, 2013.
5. R. Tyagi, Public Administration, Atma Ram & Sons, New Delhi, 1983.

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BOS/ECE

20M302	ELEMENTS OF PUBLIC ADMINISTRATION	L T P C
	(COMMON TO ALL BRANCHES)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the nature of administration in modern society
- Learn the relationships with social science.
- Learn about the organization functions and its types.
- Understand the behavior of chief executive and its role.
- Know about the personnel administration and developing society

UNIT I **9**

Administration in Modern Society; Pubic and Private administration; Evolution of the study of Public Administration. Concept of good governance.

UNIT II **9**

Public Administration as a social science; Relationship with other Social Sciences: Political Science, Economics, Sociology, Law and Psychology. Approaches to the study of Public Administration : Classical and Human Relation

UNIT III **9**

Principles of Organisations : Hierarchy, Unity of command, Span of control, Coordination, Centralisation, Decentralisation, Authority and Responsibility; Formal and Informal Organisation.

UNIT IV **9**

Chief Executive, Line and Staff, Supervision, Delegation, Leadership, Communication, Decision making , Morale and Motivation .

UNIT V **9**

Personnel Administration : Meaning and nature of Bureaucracy; Civil Services and their role in a developing society; Classification, Recruitment, Training, Promotion, Disciplinary action, code of conduct..

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Cope up with modern society.
- Maintain a good relationship with social.
- Understand the organization functions.
- Behaves as a good chief for subordinates.
- Get a idea about chief executive and follow a good code of conduct.

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REFERENCES:

1.John Pfiffiner and Robert Presthus.: Public Administration

2. Dimock & Dimock : Public Administration

3. Terry : Principles of Management

4. John D. Millet : Management in Public Services.

5. E.N. Gladden : Essentials of Public Administration

6. M.P. Shrama : Principle & Practices of Pub. Admn.,Kitab Mahal, Allahabad . Crozior M : The Bureaucratic phenomenon (Chand)

CHAIRMAN
BOS/ECE

20M303	PUBLIC PERSONNEL ADMINISTRATION	L T P C
	(COMMON TO ALL BRANCHES)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the nature of personnel administration.
- Learn the different relationships and integrity in administration.
- Understand the recruitment process and training methods
- Understand the different services in public administration.
- Knowledge about employer employee relations

UNIT-I **9**

1. Meaning, Scope and Importance of Personnel Administration
2. Types of Personnel Systems: Bureaucratic, Democratic and Representative systems

UNIT-II **9**

1. Generalist Vs Specialist
2. Civil Servants' Relationship with Political Executive
3. Integrity in Administration.

UNIT-III **9**

1. Recruitment: Direct Recruitment and Recruitment from Within
2. Training: Kinds of Training
3. Promotion

UNIT-IV **9**

1. All India Services
2. Service Conditions
3. State Public Service Commission

UNIT-V **9**

1. Employer Employee Relations
2. Wage and Salary Administration
3. Allowances and Benefits

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Execute a perfect personnel administration.
- Idea about the different relationships and integrity in administration.
- Know the recruitment process and training methods
- Prepare for the different services in public administration.
- Maintain a good relation with employer.

REFERENCES:

1. Stahl Glean O: Public Personnel Administration
2. Parnandikar Pai V.A: Personnel System for Development Administration.
3. Bhambhiru . P: Bureaucracy and Policy in India.
4. Dwivedi O.P and Jain R.B: India's Administrative state.
5. Muttalis M.A: Union Public Service Commission.
6. Bhakara Rao .V: Employer Employee Relations in India.
7. Davar R.S. Personnel Management & Industrial Relations
8. Rumki Basu: Public Administration:Concept and Theories, New Delhi:Sterling, 2013.
9. R. Tyagi, Public Administration, Atma Ram & Sons, New Delhi, 1983.

CHAIRMAN
BOS/ECE

20M304	ADMINISTRATIVE THEORIES (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the identity of public administration.
- Learn the different models of organization and relationships.
- Understand the organizational goal and design
- Understand the different theoris of motivation and laederships in public administration.
- Knowledge about different administrative thinkers

UNIT I **9**

Meaning, Scope and significance of Public Administration, Evolution of Public Administration as adiscipline and Identity of Public Administration

UNIT II **9**

Theories of Organization: Scientific Management Theory, Classical Model, Human Relations Theory

UNIT III **9**

Organization goals and Behaviour, Groups in organization and group dynamics, Organizational Design.

UNIT IV **9**

Motivation Theories, content, process and contemporary; Theories of Leadership: Traditional and Modern: Process and techniques of decision-making

UNIT V **9**

Administrative thinkers: Kautilya, Woodrow Willson, C.I. Barnard . Peter Drucker.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Know the identity of public administration.
- Knowledge about the different models of organization and relationships.
- Get clear idea of the organizational goal and design
- Knowledge about the different theories of motivation and leaderships in public administration.
- Analyze the different administrative thinkers idea to implement

REFERENCES:

1. Crozior M : The Bureaucratic phenomenon (Chand)
2. Blau. P.M and Scott. W : Formal Organizations (RKP)
3. Presthus. R : The Organizational Society (MAC)
4. Alvi, Shum Sun Nisa : Eminent Administrative Thinkers.
5. Keith Davis : Organization Theory (MAC)

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BOS/ECE

20M305	INDIAN ADMINISTRATIVE SYSTEM (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the Indian administration system.
- Learn the different roles of government authorities.
- Understand the constitutional amendment Act.
- Understand the functions of Integrity and Vigilance in Indian Administration.
- Knowledge about corruption and different policies of government

UNIT I **9**

Evolution and Constitutional Context of Indian Administration, Constitutional Authorities: Finance Commission, Union Public Services Commission, Election Commission, Comptroller and Auditor General of India, Attorney General of India

UNIT II **9**

Role & Functions of the District Collector, Relationship between the District Collector and Superintendent of Police, Role of Block Development Officer in development programmes, Local Government

UNIT III **9**

Main Features of 73rd Constitutional Amendment Act 1992, Salient Features of 74th Constitutional Amendment Act 1992

UNIT IV **9**

Coalition politics in India, Integrity and Vigilance in Indian Administration

UNIT V **9**

Corruption – Ombudsman, Lok Pal & Lok Ayuktha

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Know about the Indian administration system.
- Knowledge about the different roles of government authorities.
- Know the constitutional amendment Act.
- Understand the functions of Integrity and Vigilance in Indian Administration.
- Get Awareness about corruption and different policies of government

REFERENCES:

1. S.R. Maheswari : Indian Administration
2. Khera. S.S : Administration in India
3. Ramesh K. Arora : Indian Public Administration
4. T.N. Chaturvedi : State administration in India
5. Basu, D.D : Introduction to the Constitution of India

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BOS/ECE

20M306	PUBLIC POLICY ADMINISTRATION (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the public policy in administration system.
- Learn the different approaches of policies.
- Understand the stages involved in policy making process.
- Understand the role of Interest groups and political parties.
- Knowledge about public policies of government

UNIT-I **9**

Meaning and Definition of Public Policy - Nature, Scope and Importance of public policy – Public policy relationship with social sciences especially with political science and Public Administration.

UNIT-II **9**

Approaches in Policy Analysis - Institutional Approach – Incremental Approach and System's Approach – Dror's Optimal Model

UNIT-III **9**

Major stages involved in Policy making Process – Policy Formulation – Policy Implementation – Policy Evaluation.

UNIT-IV **9**

Institutional Framework of Policy making – Role of Bureaucracy – Role of Interest Groups and Role of Political Parties.

UNIT-V **9**

Introduction to the following Public Policies – New Economic Policy – Population Policy – Agriculture policy - Information Technology Policy.

TOTAL: 45 PERIODS

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BOS/ECE

OUTCOMES:

On successful completion of this course, the students will be able to,

- Get aware about the public policy in administration system.
- Implement the different approaches of policies.
- Get knowledge about the stages involved in policy making process.
- Know the role of Interest groups and political parties.
- Get a knowledge about public policies of government

REFERENCES:

1. Rajesh Chakrabarti & Kaushik Sanyal : Public Policy in India, Oxford University Press, 2016.
2. Kuldeep Mathur : Public Policy and Politics in India, Oxford University Press, 2016.
3. Bidyutv Chakrabarty: Public Policy: Concept, Theory and Practice, 2015.
4. Pradeep Saxena : Public Policy Administration and Development
5. Sapru R.K. : Public Policy: Formulation, Implementation and Evaluation, Sterling Publishers,2016.

CHAIRMAN
BOS/ECE

20M401	STATISTICS FOR MANAGEMENT	L T P C
	(COMMON TO ALL BRANCHES)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Learn the applications of distribution techniques
- Understand the sampling and estimation concepts
- Analyze Hypothesis Testing and their applications
- Know about different tests for analytics
- Provide the students to apply the correlation and regressions for estimating business

UNIT I INTRODUCTION **9**

Basic definitions and rules for probability, Bayer's theorem and random variables, Probability distributions: Binomial, Poisson, Uniform and Normal distributions.

UNIT II SAMPLING DISTRIBUTION AND ESTIMATION **9**

Introduction to sampling distributions, Central limit theorem and applications, sampling techniques, Point and Interval estimates of population parameters.

UNIT III TESTING OF HYPOTHESIS - PARAMETIRC TESTS **9**

Hypothesis testing: one sample and two sample tests for means of large samples (z-test), one sample and two sample tests for means of small samples (t-test), ANOVA one way.

UNIT IV NON-PARAMETRIC TESTS **9**

Chi-square tests for independence of attributes and goodness of fit, Kolmogorov-Smirnov - test for goodness of fit, Mann - Whitney U test and Kruskal Wallis test.

UNIT V CORRELATION AND REGRESSION **9**

Correlation - Rank Correlation - Regression - Estimation of Regression line - Method of Least Squares - Standard Error of estimate.

TOTAL: 45 PERIODS

CHAIRMAN
BoS (AD)

OUTCOMES:

On successful completion of this course, the students will be able to,

- Facilitate objective solutions in distribution techniques
- Analyze and solve sampling and estimation concepts
- Apply statistical techniques for Hypothesis Testing
- Develop skill-set that is in demand in both the research and business environments
- Enable the students to apply the correlation and regressions to estimate the business

TEXT BOOKS:

1. Richard I Levin, David S Rubin, Masood H Siddiqui, Sanjay Rastogi, "Statistics for Management", Pearson Education, 8th Edition, 2017.
2. Ken Black, "Applied Business Statistics", 7th Edition, Wiley India Edition, 2012.

REFERENCES:

1. Prem S Mann, "Introductory Statistics", Wiley Publications, 9th Edition, 2015.
2. Srivastava T N and Shailaja Rego, "Statistics for Management", Tata McGraw Hill, 3rd Edition 2017.
3. David R Anderson, Dennis J Sweeney, Thomas A Williams, Jeffrey D Camm, James J Cochran, "Statistics for business and economics", 13th Edition, Thomson (South – Western) Asia, Singapore, 2016.
4. Vohra N D, "Business Statistics", Tata McGraw Hill, 2017.

CHAIRMAN
BoS (AD)

20M402	DATA MINING FOR BUSINESS INTELLIGENCE (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Know how to derive meaning form huge volume of data and information
- Understand how knowledge discovering process is used in business decision making
- Learn about predictive Analytics and their applications
- Apply the techniques of clustering and classification in Business Intelligence
- Able to use various algorithms for Machine Learning and Artificial Intelligence.

UNIT I INTRODUCTION 9

Data mining, Text mining, Web mining, Data ware house.

UNIT II DATA MINING PROCESS 9

Data mining process - KDD, CRISP-DM, SEMMA Prediction performance measures.

UNIT III PREDICTION TECHNIQUES 9

Data visualization, Time series - ARIMA, Winter Holts,

UNIT IV CLASSIFICATION AND CLUSTERING TECHNIQUES 9

Classification, Association, Clustering.

UNIT V MACHINE LEARNING AND AI 9

Genetic algorithms, Neural network, Fuzzy logic, Ant Colony optimization, Particle Swarm Optimization

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Learn to apply various data mining techniques into various areas of different domains
- Be able to interact competently on the topic of data mining for business intelligence
- Apply various prediction techniques
- Learn about clustering and classification technique
- Develop and implement machine learning algorithms

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BoS (AD)

TEXT BOOKS:

1. Ralph Kimball and Richard Merz, "The data warehouse toolkit", John Wiley, 3rd Edition, 2013.
2. Galit Shmueli, Nitin R Patel and Peter C Bruce, "Data Mining for Business Intelligence-Concepts, Techniques and Applications", Wiley, India, 2010.

REFERENCES:

1. Jaiwei Ham and Micheline Kamber, "Data Mining concepts and techniques", Kauffmann Publishers2006
2. Efraim Turban, Ramesh Sharda, Jay E. Aronson and David King, "Business Intelligence", Prentice Hall, 2008.
3. Inmon W H, "Building the Data Warehouse", fourth Edition Wiley India pvt. Ltd. 2005.
4. Michel Berry and Gordon Linoff, "Mastering Data mining", John Wiley and Sons Inc, 2nd Edition, 2011.
5. Michel Berry and Gordon Linoff, "Data mining techniques for Marketing", Sales and Customer support, John Wiley, 2011.
6. Gupta G K, "Introduction to Data mining with Case Studies", Prentice hall of India, 2011
7. Giudici, "Applied Data mining – Statistical Methods for Business and Industry", John Wiley, 2009.
8. Elizabeth Vitt, Michael Luckevich Stacia Misner, "Business Intelligence", Microsoft, 2011.
9. Michalewicz Z, Schmidt M Michalewicz M and Chiriac C, "Adaptive Business Intelligence", Springer Verlag, 2007

CHAIRMAN
BoS (AD)

20M403	HUMAN RESOURCE ANALYTICS	L T P C
	(COMMON TO ALL BRANCHES)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Develop the ability of the learners to define and implement HR metrics that are aligned with the overall business strategy
- Know the different types of HR metrics and understand their respective impact and application
- Understand the impact and use of HR Analytics in Training and Development
- Understand common workforce issues and analyze for engaging the employees
- Learn about Workforce Diversity and Development Metrics

UNIT I INTRODUCTION TO HR ANALYTICS 9

People Analytics - stages of maturity - Human Capital in the Value Chain: impact on business - HR metrics and KPIs.

UNIT II HR ANLYTICS I: RECRUITMENT 9

Recruitment Metrics : Fill-up ratio - Time to hire - Cost per hire - Early turnover - Employee referral hires - Agency hires - Lateral hires - Fulfillment ratio- Quality of hire.

UNIT III HR ANALYTICS - TRAINING AND DEVELOPMENT 9

Training & Development Metrics: Percentage of employees trained- Internally and externally trained-Training hours and cost per employee - ROI.

UNIT IV HR ANALYTICS EMPLOYEE ENGAGEMENT AND CAREER PROGRESSION 9

Employee Engagement Metrics: Talent Retention index - Voluntary and involuntary turnover - grades, performance, and service tenure - Internal hired index Career Progression Metrics: Promotion index- Rotation index - Career path index.

UNIT V HR ANALYTICS IV: WORKFORCE DIVERSITY AND DEVELOPMENT 9

Workforce Diversity and Development Metrics: Employees per manager - Workforce age profiling - Workforce service profiling - Churn over index - Workforce diversity index - Gender mix

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Learners will be conversant about HR metrics and ready to apply at work settings
- Learners will be able to resolve HR issues using people analytics
- Able to analyze using HR Analytics for Training and Development
- Develop Employee Engagement Metrics and Career Progression Metrics on their own.
- Use Workforce Diversity and Development Metrics for developing Business.

TEXT BOOKS:

1. Edwards M R., & Edwards K, "Predictive HR Analytics: Mastering the HR Metric". London: Kogan Page, 2016.
2. Dipak Kumar Bhattacharyya, "HR Analytics Understanding Theories and Applications", SAGE Publications India, 2017.

REFERENCES:

1. Jac Fitzenz, "The New HR Analytics", AMACOM, 2010.
2. "Human Resources kit for Dummies", 3rd Edition, Max Messmer, 2003.
3. Sesil J C, "Applying advanced analytics to HR management decisions: Methods for selection, developing incentives, and improving collaboration. Upper Saddle River", New Jersey: Pearson Education, 2014.
4. Pease G, & Beresford B, "Developing Human Capital: Using Analytics to Plan and Optimize Your Learning and Development Investments", Wiley, 2014.
5. Phillips J, & Phillips P P, "Making Human Capital Analytics Work: Measuring the ROI of Human Capital Processes and OUTCOME", McGraw-Hill, 2014.
6. "HR Scorecard and Metrices", HBR, 2001.

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20M404	MARKETING AND SOCIAL MEDIA WEB ANALYTICS (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Learn the applications Marketing Analytics for budget and performance.
- Showcase the opportunities that exist today to leverage the power of the web and social media
- Understand the Social Media Policies and problems posed by emerging social media
- Analyze the web data using web analytics strategies.
- Familiarize with various web analytics tools such as Google Analytics, Adobe Analytics, or other similar platforms

UNIT I MARKETING ANALYTICS **9**

Marketing Budget and Marketing Performance Measure, Marketing - Geographical Mapping, Data Exploration, Market Basket Analysis

UNIT II COMMUNITY BUILDING AND MANAGEMENT **9**

History and Evolution of Social Media-Understanding Science of Social Media - Goals for using Social Media - Social Media Audience and Influencers - Digital PR- Promoting Social Media Pages- Linking Social Media Accounts-The Viral Impact of Social Media.

UNIT III SOCIAL MEDIA POLICIES AND MEASUREMENTS **9**

Social Media Policies-Etiquette, Privacy- ethical problems posed by emerging social media technologies - The Basics of Tracking Social Media.

UNIT IV WEB ANALYTICS **9**

Data Collection, Overview of Qualitative Analysis, Business Analysis, KPI and Planning, Critical Components of a Successful Web Analytics Strategy, Proposals & Reports, Web Data Analysis.

UNIT V SEARCH ANALYTICS **9**

Search engine optimization (SEO), user engagement, user-generated content, web traffic analysis, online security, online ethics, data visualization.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the fundamentals and importance of marketing analytics
- Gain familiarity with popular web analytics tools and technologies used in marketing and social media, such as Google Analytics, Facebook Insights, or Twitter Analytics
- Learn about Social media policies and measurements
- Assess the effectiveness of marketing and social media campaigns by tracking and analyzing key metrics and KPIs, and make data-driven decisions
- Adapt to emerging technologies, trends, and changes in the field of web analytics and social media marketing, and stay updated with industry advancements.

TEXT BOOKS:

1. Takeshi Moriguchi, "Web Analytics Consultant Official Textbook", 7th Edition, 2016.
2. Christian Fuchs, "Social Media a critical introduction", SAGE Publications Ltd, 2014.

REFERENCES:

1. Shrivastava K M, "Social Media in Business and Governance", Sterling Publishers Private Limited, 2013.
2. Bittu Kumar, "Social Networking", V & S Publishers, 2013.
3. Avinash Kaushik, "Web Analytics An Hour a Day", Wiley Publishing, 2007.
4. Ric T Peterson, "Web Analytics Demystified", Celilo Group Media and Café Press 2004.

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20M405	OPERATION AND SUPPLY CHAIN ANALYTICS (COMMON TO ALL BRANCHES)	L T P C 3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the role of analytics in operations and supply chain management
- Learn fundamental concepts and techniques in Warehousing Decisions
- Know the Inventory management methods and models
- Use the network models and algorithms for transportation
- Learn Multiple Criteria Decision Making (MCDM) models is to equip students with the knowledge and skills to effectively analyze complex decision problems involving multiple criteria or objectives

UNIT I INTRODUCTION 9

Descriptive, predictive and prescriptive analytics, Data Driven Supply Chains - Basics, transforming supply chains.

UNIT II WAREHOUSING DECISIONS 9

P-Median Methods - Guided LP Approach, Greedy Drop Heuristics, Dynamic Location Models, Space Determination and Layout Methods.

UNIT III INVENTORY MANAGEMENT 9

Dynamic Lot sizing Methods, Multi-Echelon Inventory models, Aggregate Inventory system and LIMIT, Risk Analysis in Supply Chain, Risk pooling strategies.

UNIT IV TRANSPORTATION NETWORK MODELS 9

Minimal Spanning Tree, Shortest Path Algorithms, Maximal Flow Problems, Transportation Problems, Set covering and Set Partitioning Problems, Travelling Salesman Problem, Scheduling Algorithms.

UNIT V MCDM MODELS 9

Analytic Hierarchy Process (AHP), Data Envelopment Analysis (DEA), Fuzzy Logic and Techniques, the analytical network process (ANP), TOPSIS.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Enable quantitative solutions in business decision making under conditions of certainty, risk and uncertainty.
- Ability to learn techniques to optimize warehouse processes and improve overall operational efficiency.
- Familiar with inventory management principles within the context of warehousing
- Gain a comprehensive understanding of the fundamental principles and concepts of transportation networks, including the role of transportation in supply chain management
- Apply the various MCDM methods and techniques

TEXT BOOKS:

1. Gerhard J Plenert, "Supply Chain Optimization through Segmentation and Analytics", CRC Press, Taylor & Francis Group, 2014.
2. Muthu Mathirajan, Chandrasekharan Rajendran, Sowmyanarayanan Sadagopan, Arunachalam Ravindran, Parasuram Balasubramanian, "Analytics in Operations/Supply Chain Management", I.K. International Publishing House Pvt. Ltd., 2016.

REFERENCES:

1. Nada R Sanders, "Big data driven supply chain management: A framework for implementing analytics and turning information into intelligence", Pearson Education, 2014.
2. Michael Watson, Sara Lewis, Peter Cacioppi, Jay Jayaraman, "Supply Chain Network Design: Applying Optimization and Analytics to the Global Supply Chain", Pearson Education, 2013.
3. Anna Nagurney, Min Yu, Amir H Masoumi, Ladimer S Nagurney, "Networks Against Time: Supply Chain Analytics for Perishable Products", Springer, 2013.

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20M406	FINANCIAL ANALYTICS	L T P C
	(COMMON TO ALL BRANCHES)	3 0 0 3

OBJECTIVES:

The Student should be made to:

- Understand the principles of corporate finance and analyze financial statements
- Apply finance market analysis in real-world scenarios
- Ability to apply theoretical knowledge to practical portfolio management and investment decision-making
- Learn Technical analysis for predicting financial data using charts and fundamental
- Able to assess the risk of default and assign credit ratings or risk scores

UNIT I CORPORATE FINANCE ANALYSIS **9**

Basic corporate financial predictive modeling - Project analysis - cash flow analysis - cost of capital, Financial Break even modelling, Capital Budget model-Payback, NPV, IRR.

UNIT II FINANCIAL MARKET ANALYSIS **9**

Estimation and prediction of risk and return (bond investment and stock investment) - Time series examining nature of data, Value at risk, ARMA, ARCH and GARCH.

UNIT III PORTFOLIO ANALYSIS **9**

Portfolio Analysis - capital asset pricing model, Sharpe ratio, Option pricing models - binomial model for options, Black Scholes model and Option implied volatility.

UNIT IV TECHNICAL ANALYSIS **9**

Prediction using charts and fundamentals - RSI, ROC, MACD, moving average and candle charts, simulating trading strategies. Prediction of share prices.

UNIT V CREDIT RISK ANALYSIS **9**

Credit Risk analysis - Data processing, Decision trees, logistic regression and evaluating credit risk model.

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain a solid understanding of the fundamental principles and concepts of corporate finance, including time value of money, risk and return, capital budgeting, cost of capital, and capital structure
- Apply finance market analysis techniques to real-world scenarios through case studies, simulations, or projects
- Use portfolio analysis in real-world scenarios
- The learners should be able to perform technical analysis for decision making using excel, Python and R
- Understand the techniques can be used to reduce credit risk exposure

TEXT BOOKS:

1. Yuxing Yan, "Python for Finance", Paperback – Import, 30 Jun 2017.
2. James Ma Weiming "Mastering Python for Finance Paperback", Import, 29 Apr 2015.

REFERENCES:

1. Mark J Bennett, Dirk L Hugen, "Financial analytics with R", Cambridge University Press.
2. Pavel Ryzhov, "Haskell Financial Data Modeling and Predictive Analytics", Paperback – Import, 25 Oct 2013.
3. Edward E Williams, John A Dobelman "Quantitative Financial Analytics: The Path to Investment Profits Paperback" – Import, 11 Sep 2017

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20M501 SUSTAINABLE INFRASTRUCTURE DEVELOPMENT

(Common to all Branches) **L T P C**

3 0 0 3

OBJECTIVES:

The student should be made to:

- Gain knowledge on sustainable development goals and practices.
- Understand the concepts involved in sustainable infrastructure planning.
- Acquire knowledge on design, construction practices and techniques in construction.
- Explore the construction materials required for sustainable construction.
- Assess various measures for sustainable maintenance of infrastructure projects.

UNIT I SUSTAINABLE DEVELOPMENT GOALS **9**

Definitions, principles and history of Sustainable Development - Sustainable development goals (SDG): global and Indian – Infrastructure Demand and Supply - Environment and Development linkages - societal and cultural demands – Sustainability indicators - Performance indicators of sustainability and Assessment mechanism - Policy frameworks and practices: global and Indian – Infrastructure Project finance – Infrastructure project life cycle - Constraints and barriers for sustainable development - future directions.

UNIT II SUSTAINABLE INFRASTRUCTURE PLANNING **9**

Overview of Infrastructure projects: Housing sector, Power sector, Water supply, road, rail and port transportation sector, rural and urban infrastructure. Environmental Impact Assessment (EIA), Land acquisition -Legal aspects, Resettlement &Rehabilitation and Development - Cost effectiveness Analysis - Risk Management Framework for Infrastructure Projects, Economic, demand, political, socio-environmental and cultural risks. Shaping the Planning Phase of Infrastructure Projects to mitigate risks, Designing Sustainable Contracts, Negotiating with multiple Stakeholders on Infrastructure Projects. Use of ICT tools in planning – Integrated planning - Clash detection in construction - BIM (Building Information Modelling).

UNIT III SUSTAINABLE CONSTRUCTION PRACTICES AND TECHNIQUES **9**

Sustainability through lean construction approach - Enabling lean through information technology – Lean in planning and design - IPD (Integrated Project Delivery) - Location

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Based Management System - Geospatial Technologies for machine control, site management, precision control and real time progress monitoring - Role of logistics in achieving sustainable construction – Data management for integrated supply chains in construction - Resource efficiency benefits of effective logistics - Sustainability in geotechnical practice – Design considerations, Design Parameters and Procedures – Quality control and Assurance - Use of sustainable construction techniques: Precast concrete technology, Pre-engineered buildings

UNIT IV SUSTAINABLE CONSTRUCTION MATERIALS 9

Construction materials: Concrete, steel, glass, aluminium, timber and FRP - No/Low cement concrete - Recycled and manufactured aggregate - Role of QC and durability - Sustainable consumption – Eco-efficiency - green consumerism - product stewardship and green engineering - Extended producer responsibility – Design for Environment Strategies, Practices, Guidelines, Methods, And Tools. Eco-design strategies –Design for Disassembly - Dematerialization, rematerialization, transmaterialization – Green procurement and green distribution - Analysis framework for reuse and recycling – Typical constraints on reuse and recycling - Communication of Life Cycle Information - Indian Eco mark scheme - Environmental product declarations – Environmental marketing- Life cycle Analysis (LCA), Advances in LCA: Hybrid LCA, Thermodynamic LCA - Extending LCA - economic dimension, social dimension - Life cycle costing (LCC) - Combining LCA and LCC – Case studies

UNIT V SUSTAINABLE MAINTENANCE OF INFRASTRUCTURE PROJECTS 9

Case Studies - Sustainable projects in developed countries and developing nations - An Integrated Framework for Successful Infrastructure Planning and Management - Information Technology and Systems for Successful Infrastructure Management, - Structural Health Monitoring for Infrastructure projects - Innovative Design and Maintenance of Infrastructure Facilities - Capacity Building and Improving the Governments Role in Infrastructure Implementation, Infrastructure Management Systems and Future Directions. – Use of Emerging Technologies – IoT, Big Data Analytics and Cloud Computing, Artificial Intelligences, Machine and Deep Learning, Fifth Generation (5G) Network services for maintenance

TOTAL: 45 PERIODS

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OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the environment sustainability goals at global and Indian scenario.
- Recognize risks in development of projects and suggest mitigation measures.
- Apply lean techniques, LBMS and new construction techniques to achieve sustainability in infrastructure construction projects.
- Explain Life cycle analysis and life cycle cost of sustainable construction materials.
- Explore the new technologies adopted for maintenance of infrastructure projects.

REFERENCE BOOKS:

1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition, Wiley Publishers 2016.
2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016.
3. Craig A. Langston & Grace K.C. Ding, Sustainable Practices in the Built Environment, Butterworth Heinemann Publishers, 2011.
4. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2016.
5. New Building Materials and Construction World magazine.
6. Kerry Turner. R, "Sustainable Environmental Management", Principles and Practice Publisher: Belhaven Press, ISBN: 1852930039.
7. Munier N, "Introduction to Sustainability", Springer2005
8. Sharma, "Sustainable Smart Cities In India: Challenges And Future Perspectives", SPRINGER, 2022.
9. Ralph Horne, Tim Grant, Karli Verghese, Life Cycle Assessment: Principles, Practice and Prospects, Csiro Publishing, 2009.
10. European Commission - Joint Research Centre - Institute for Environment and Sustainability: International Reference Life Cycle Data System (ILCD) Handbook - General guide for Life Cycle Assessment - Detailed guidance. Luxembourg. European Union; 2010.
11. Hudson, Haas, Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997).
12. Greger Lundesjö, Supply Chain Management and Logistics in Construction: Delivering Tomorrow's Built Environment, Kogan Page Publishers, 2015.

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20M502 SUSTAINABLE AGRICULTURE AND ENVIRONMENTAL MANAGEMENT

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the issues of sustainability in agro ecology, agro ecosystem.
- Study soil health, soil erosion, control measures and suggest the management practices to improve soil nutrition.
- Explore the techniques needed for water management which leads to efficient storage system.
- Identify types and sources of agricultural wastes and suggest the suitable technologies for its sustainable management.
- Evaluate proper techniques adopted for sustainable food production.

UNIT I AGROECOLOGY, AGROECOSYSTEM AND SUSTAINABLE AGRICULTURE CONCEPTS **9**

Ecosystem definition - Biotic *Vs.* abiotic factors in an ecosystem - Ecosystem processes - Ecological services and agriculture - Problems associated with industrial agriculture/food systems - Defining sustainability - Characteristics of sustainable agriculture - Difference between regenerative and sustainable agriculture systems

UNIT II SOIL HEALTH, NUTRIENT AND PEST MANAGEMENT **9**

Soil health definition - Factors to consider (physical, chemical and biological) - Composition of healthy soils - Soil erosion and possible control measures - Techniques to build healthy soil - Management practices for improving soil nutrient - Ecologically sustainable strategies for pest and disease control

UNIT III WATER MANAGEMENT **9**

Soil water storage and availability - Plant yield response to water - Reducing evaporation in agriculture - Earthworks and tanks for rainwater harvesting - Options for improving the productivity of water - Localized irrigation - Irrigation scheduling - Fertigation - Advanced irrigation systems and agricultural practices for sustainable water use

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UNIT IV ENERGY AND WASTE MANAGEMENT 9

Types and sources of agricultural wastes - Composition of agricultural wastes - Sustainable technologies for the management of agricultural wastes - Useful and high value materials produced using different processes from agricultural wastes - Renewable energy for sustainable agriculture

UNIT V EVALUATING SUSTAINABILITY IN AGROECOSYSTEMS 9

Indicators of sustainability in agriculture - On-farm evaluation of agroecosystem sustainability - Alternative agriculture approaches/ farming techniques for sustainable food production - Goals and components of a community food system - Case studies

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Explore the knowledge about the concepts, principles and advantages of sustainable agriculture.
- Discuss the sustainable ways in managing soil health, nutrients, pests and diseases.
- Suggest the ways to optimize the use of water in agriculture to promote an ecological use of resources.
- Develop energy and waste management plans for promoting sustainable agriculture in non-sustainable farming areas.
- Assess an ecosystem for its level of sustainability and prescribe ways of converting to a sustainable system through the redesign of a conventional agroecosystem.

REFERENCE BOOKS:

1. Approaches to Sustainable Agriculture – Exploring the Pathways Towards the Future of Farming, Oberc, B.P. & Arroyo Schnell, A., IUCN, Belgium, 2020
2. Natural bioactive products in sustainable agriculture, Singh, J. & Yadav, A.N., Springer, 2020
3. Organic Farming for Sustainable Agriculture, Nandwani, D., Springer, 2016
4. Principles of Agronomy for Sustainable Agriculture, Villalobos, F.J. &Fereres, E., Springer, 2016
5. Sustainable Agriculture for Food Security: A Global Perspective, Balkrishna, A., CRC Press, 2021
6. Sustainable Energy Solutions in Agriculture, Bundschuh, J. & Chen, G., CRC Press, 2014

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20M503 **SUSTAINABLE BIO MATERIALS**

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Impart knowledge on biomaterials and their properties.
- Recognize the fundamentals aspects, types of biopolymers and its applications.
- Learn about the properties of bio ceramics and bio composites.
- Discuss biomedical metals, with its types, properties and applications.
- Understand the significance of bionanomaterials and its applications.

UNIT I INTRODUCTION TO BIOMATERIALS 9

Introduction: Definition of biomaterials, requirements & classification of biomaterials- Types of Biomaterials- Degradable and resorbable biomaterials- engineered natural materials- Biocompatibility-Hydrogels-pyrolitic carbon for long term medical implants-textured and porous materials-Bonding types- crystal structure-imperfection in crystalline structure- surface properties and adhesion of materials –strength of biological tissues-performance of implants-tissue response to implants- Impact and Future of Biomaterials

UNIT II BIO POLYMERS 9

Molecular structure of polymers -Molecular weight - Types of polymerization techniques– Types of polymerization reactions- Physical states of polymers- Common polymeric biomaterials - Polyethylene -Polymethylmethacrylate (PMMA-Polylactic acid (PLA) and polyglycolic acid (PGA) - Polycaprolactone (PCL) - Other biodegradable polymers – Polyurethan- reactions polymers for medical purposes - Collagens- Elastin- Cellulose and derivatives-Synthetic polymeric membranes and their biological applications.

UNIT III BIO CERAMICS AND BIOCOMPOSITES 9

General properties- Bio ceramics -Silicate glass - Alumina (Al_2O_3) -Zirconia (ZrO_2)-Carbon-Calcium phosphates (CaP)- Resorbable Ceramics- surface reactive ceramics- Biomedical Composites- Polymer Matrix Composite (PMC)-Ceramic Matrix Composite(CMC)-Metal Matrix Composite (MMC)– glass ceramics - Orthopedic implants-Tissue engineering scaffolds

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UNIT IV METALS AS BIOMATERIALS 9

Biomedical metals-types and properties-stainless steel-Cobalt chromium alloys-Titanium alloys- Tantalum-Nickel titanium alloy (Nitinol)- magnesium-based biodegradable alloys-surface properties of metal implants for osteointegration-medical application-corrosion of metallic implants – biological tolerance of implant metals

UNIT V NANOBIOMATERIALS 9

Meatllic nanobiomaterials– Nanopolymers –Nanoceramics - Nanocomposites -Carbon based nanobiomaterials - transport of nanoparticles- release rate-positive and negative effect of nanosize- nanofibres -Nano and micro features and their importance in implant performance-Nanosurface and coats-Applications nanoantibiotics - Nanomedicines- Biochips – Biomimetics - BioNEMs -Biosensor- Bioimaging/Molecular Imaging - challenges and future perspective.

TOTAL : 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Impart knowledge on surface properties, adhesion and performance of biomaterials.
- Analyze an overview of polymerization techniques, reactions of various biopolymers.
- Enhance the importance and properties of different bio ceramics and bio composite materials.
- Acquire knowledge on metals as biomaterials.
- Apply nano biomaterials in biomedical and other applications.

REFERENCE BOOKS:

1. Devarajan Thangadurai, Jeyabalan Sangeetha, Ram Prasad "Functional Bionanomaterials" springer, 2020.
2. C. Mauli Agrawal, Joo L. Ong, Mark R. Appleford, Gopinath Mani "Introduction to Biomaterials Basic Theory with Engineering Applications" Cambridge University Press, 2014.
3. Donglu shi "Introduction to Biomaterials" Tsinghua University press, 2006.
4. Joon Park, R.S.Lakes "Biomaterials An Introduction" third edition, Springer 2007.
5. M.Jaffe,W.Hammond, P.Tolias and T.Arinzeh "Characterization of Biomaterials" Wood head publishing, 2013.
6. Buddy D.Ratner and Allan S.Hoffman Biomaterials Science "An Introduction to Material in Medicine" Third Edition, 2013.
7. Leopoido Javier Rios Gonzalez. "Handbook of Research on Bioenergy and Biomaterials: Consolidated and green process" Apple academic press, 2021.
8. Sujata.V.Bhat Biomaterials; Narosa Publishing house, 2002.

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20M504 MATERIALS FOR ENERGY SUSTAINABILITY

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the challenges and demands of sustainable energy sources.
- Gain fundamental knowledge about electrochemical devices and materials.
- Classify the various types of fuel cells.
- Illustrate the novel materials and their usage in photovoltaic application.
- Identify the basic principles of various types of supercapacitors and types of nano composites used in SC electrodes.

UNIT I SUSTAINABLE ENERGY SOURCES 9

Introduction to energy demand and challenges ahead – sustainable source of energy (wind, solar etc.) – electrochemical energy systems for energy harvesting and storage – materials for sustainable electrochemical systems building – India centric solutions based on locally available materials – Economics of wind and solar power generators vs. conventional coal plants – Nuclear energy

UNIT II ELECTROCHEMICAL DEVICES 9

Electrochemical Energy – Difference between primary and secondary batteries – Secondary battery (Li-ion battery, Sodium-ion battery, Li-S battery, Li-O_2 battery, Nickel Cadmium, Nickel Metal Hydride) – Primary battery (Alkaline battery, Zinc-Carbon battery) – Materials for battery (Anode materials – Lithiated graphite, Sodiated hard carbon, Silicon .doped graphene, Lithium Titanate) (Cathode Materials – S, $LiCoO_2$, $LiFePO_4$, $LiMn_2O_4$) – Electrolytes for Lithium-ion battery (ethylene carbonate and propylene carbonate based).

UNIT III FUEL CELLS 9

Principle of operation of fuel cells – types of fuel cells (Proton exchange membrane fuel cells, alkaline fuel cell, direct methanol fuel cells, direct borohydride fuel cells, phosphoric acid fuel cells, solid oxide fuel cells, and molten carbonate fuel cells) – Thermodynamics of fuel cell –

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Fuel utilization – electrolyte membrane (proton conducting and anion conducting)– Catalysts (Platinum, Platinum alloys, carbon supported platinum systems and metal oxide supported platinum catalysts) – Anatomy of fuel cells (gas diffusion layer, catalyst layer, flowfield plate, current conductors, bipolar plates and monopolar plates).

UNIT IV PHOTOVOLTAICS 9

Physics of the solar cell – Theoretical limits of photovoltaic conversion – bulk crystal growth of Si and wafering for photovoltaic application - Crystalline silicon solar cells – thin film silicon solar cells – multijunction solar cells – amorphous silicon based solar cells – photovoltaic concentrators – $Cu(InGa)Se_2$ solar cells – Cadium Telluride solar cells – dye sensitized solar cells – Perovskite solar cells – Measurement and characterization of solar cells - Materials used in solar cells (metallic oxides, CNT films, graphene, OD fullerenes, single-multi walled carbon nanotubes, two-dimensional Graphene, organic or Small molecule-based solar cells materials - copper-phthalocyanine and perylenetetracarboxylicbis -benzine – fullerenes - boron subphthalocyanine- tin (II) phthalocyanine).

UNIT V SUPERCAPACITORS 9

Supercapacitor –types of supercapacitors (electrostatic double-layer capacitors, pseudo capacitors and hybrid capacitors) - design of supercapacitor-three and two electrode cell-parameters of supercapacitor- Faradaic and non - Faradaic capacitance – electrode materials (transition metal oxides (MO), mixed metal oxides, conducting polymers (CP), Mxenes, nanocarbons, non-noble metal, chalcogenides, hydroxides and 1D-3D metal-organic frame work (MOF), activated carbon fibres (ACF)- Hydroxides-Based Materials - Polyaniline (PANI), a ternary hybrid composite-conductive polypyrrole hydrogels – Different types of nanocomposites for the SC electrodes (carbon–carbon composites, carbon-MOs composites, carbon-CPs composites and MOs-CPs composites) - Two-Dimensional (2D) Electrode Materials - 2D transition metal carbides, carbonitrides, and nitrides.

TOTAL : 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Acquire knowledge about various sources of energy sustainability.
- Understand the principles of different electrochemical devices.

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- Examine the working principle of fuel cells and their applications.
- Summarize the various photovoltaic applications and the materials used.
- Gain knowledge on different types of supercapacitors and the performance of various materials.

REFERENCE BOOKS:

1. Electrode Materials for Supercapacitors: A Review of Recent Advances, Parnia Forouzandeh, Vignesh Kumaravel and Suresh C. Pillai, catalysts 2020.
2. Recent advances, practical challenges, and perspectives of intermediate temperature solid oxide fuel cell cathodes Amanda Ndubuisi, Sara Abouali, Kalpana Singh and Venkataraman Thangadurai, J. Mater. Chem. A, 2022.
3. Functional materials for sustainable energy applications; John A. Kilner, Stephen J. Skinner, Stuart J. C. Irvine and Peter P. Edwards.
4. Hand Book of Fuel Cells: Fuel Cell Technology and Applications, Wolf Vielstich, Arnold Lamm, Hubert Andreas Gasteiger, Harumi Yokokawa, Wiley, London 2003.
5. B.E. Conway, Electrochemical supercapacitors: scientific fundamentals and technological applications, Kluwer Academic / Plenum publishers, New York, 1999.
6. T.R. Crompton, Batteries reference book, Newners, 3rd Edition, 2002.
7. Materials for Supercapacitor applications; B.Viswanathan. M.Aulice Scibioh
8. Review of next generation photovoltaic solar cell technology and comparative materialistic development Neeraj Kant, Pushpendra Singh, Materials Today: Proceedings, 2022.

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20M505 **GREEN TECHNOLOGY**

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Acquire knowledge on green chemistry and its applications.
- Identify the types of pollution and its sources.
- Classify solvents, green reagents and study the design process of chemical and microwave methods.
- Interpret the real time analysis for prevention of pollution and to provide green engineering solutions to reduce carbon foot print.
- Infer knowledge on nano materials and green nano technology.

UNIT I PRINCIPLES OF GREEN CHEMISTRY 9

Historical Perspectives and Basic Concepts. The twelve Principles of Green Chemistry and green engineering. Green chemistry metrics- atom economy, E factor, reaction mass efficiency, and other green chemistry metrics, application of green metrics analysis to synthetic plans.

UNIT II POLLUTION TYPES 9

Pollution – types, causes, effects, and abatement. Waste – sources of waste, different types of waste, chemical, physical and biochemical methods of waste minimization and recycling.

UNIT III GREEN REAGENTS AND GREEN SYNTHESIS 9

Environmentally benign processes- alternate solvents- supercritical solvents, ionic liquids, water as a reaction medium, energy-efficient design of processes- photo, electro and sono chemical methods, microwave-assisted reactions

UNIT IV DESIGNING GREEN PROCESSES 9

Safe design, process intensification, in process monitoring. Safe product and process design – Design for degradation, Real-time Analysis for pollution prevention, inherently safer chemistry for accident prevention.

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UNIT V GREEN NANOTECHNOLOGY 9

Nanomaterials for water treatment, nanotechnology for renewable energy, nanotechnology for environmental remediation and waste management, nanotechnology products as potential substitutes for harmful chemicals, environmental concerns with nanotechnology

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the principles of green engineering and technology.
- Learn different types of waste, chemical, physical and biochemical methods of waste minimization.
- Modify processes and products to make them green and safe through green synthesis and green reagents.
- Design safe products through green process to prevent pollution using green technology.
- Apply advanced green nanotechnology in green synthesis to reduce environmental impacts.

TEXT BOOKS:

1. Green technology and design for the environment, Samir B. Billatos, Nadia A. Basaly, Taylor & Francis, Washington, DC, 1997

2. Green Chemistry – An introductory text - M. Lancaster, RSC, 2016.

3. Green chemistry metrics - Alexi Lapkin and david Constable (Eds) ,Wiley publications,2008

REFERENCE BOOKS:

1. Environmental chemistry, Stanley E Manahan, Taylor and Francis, 2017

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20M506 ENVIRONMENTAL QUALITY MONITORING AND ANALYSIS

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the concepts of environmental monitoring and standards.
- Study the complexity of the environmental parameters through monitoring programme.
- Analyze the organic pollutants and quality through environmental analysis and monitoring by proper methods.
- Evaluate environmental monitoring programme and risk assessment.
- Identify the automated data acquisition for process monitoring and control.

UNIT I ENVIRONMENTAL MONITORING AND STANDARDS 9

Introduction- Environmental Standards- Classification of Environmental Standards- Global Environmental Standards- Environmental Standards in India- Ambient air quality standards- water quality standard- Environmental Monitoring-Need for environmental monitoring- Concepts of environmental monitoring- Techniques of Environmental Monitoring.

UNIT II MONITORING OF ENVIRONMENTAL PARAMETERS 9

Current Environmental Issues- Global Environmental monitoring programme-International conventions- Application of Environmental Monitoring- Atmospheric Monitoring - screening parameters – Significance of environmental sampling- sampling methods – water sampling - sampling of ambient air-sampling of flue gas.

UNIT III ANALYTICAL METHODS FOR ENVIRONMENTAL MONITORING 9

Classification of Instrumental Method- Analysis of Organic Pollutants by Spectrophotometric methods -Determination of nitrogen, phosphorus and, chemical oxygen demand (COD) in sewage; Biochemical oxygen demand (BOD)- Sampling techniques for air pollution measurements; analysis of particulates and air pollutants like oxides of nitrogen, oxides of sulphur, carbon monoxide, hydrocarbon; Introduction to advanced instruments for environmental analysis

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UNIT IV ENVIRONMENTAL MONITORING PROGRAMME (EMP) & RISK ASSESSMENT **9**

Water quality monitoring programme- national water quality monitoring- Parameters for National Water Quality Monitoring- monitoring protocol - Process of risk assessment- hazard identification-exposure assessment- dose-response assessment - risk characterization.

UNIT V AUTOMATED DATA ACQUISITION AND PROCESSING **9**

Data Acquisition for Process Monitoring and Control - The Data Acquisition System - Online Data Acquisition, Monitoring, and Control - Implementation of a Data Management System - Review of Observational Networks -Sensors and transducers- classification of transducers- data acquisition system- types of data acquisition systems- data management and quality control - regulatory overview.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand environmental quality standards in India.
- Analyze current environmental issues, sampling methods and monitoring techniques.
- Identify the various instrumental methods and their principles for environmental monitoring.
- Enrich the significance of environmental standards through environmental monitoring programme.
- Study types and systems of data acquisition systems and processing.

TEXTBOOKS:

1.Environmental monitoring Handbook, Frank R. Burden, 2002 by The McGraw-Hill Companies, Inc.
2.Handbook of environmental analysis: chemical pollutants in the air, water, soil, and soild wastes / Pradyot Patnaik, 1997 by CRC Press, Inc

REFERENCE BOOKS:

1. Environmental monitoring / edited by G. Bruce Wiersma, © 2004 by CRC Press LLC.
2.H. H. Willard, L. L. Merit, J. A. Dean and F. A. Settle, Instrumental Methods of Analysis, CBP Publishers and Distributors, New Delhi, 1988.
3.Heaslip, G. (1975) Environmental Data Handling. John Wiley & Sons. New York.

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20M507 INTEGRATED ENERGY PLANNING FOR SUSTAINABLE DEVELOPMENT

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Create awareness on the energy scenario of India with respect to world.
- Understand the fundamentals of energy sources, energy efficiency and environmental standards.
- Familiarization on the concept of sustainable development goal and its benefits.
- Recognize the potential of renewable energy sources and its conversion technologies for attaining sustainable development.
- Identify the suitable energy policies for sustainable development.

UNIT I ENERGY SCENARIO 9

Comparison of energy scenario – India and World (energy sources, generation mix, consumption pattern, T&D losses, energy demand, per capita energy consumption) – energy pricing – Energy security

UNIT II ENERGY AND ENVIRONMENT 9

Conventional Energy Sources - Emissions from fuels – Air, Water and Land pollution – Environmental standards - measurement and controls

UNIT III REMEDIAL OPTIONS 9

Sustainable Development: Concepts and Stakeholders, Sustainable Development Goal (SDG) -Social development: Poverty, conceptual issues and measures, impact of poverty. Globalization and Economic growth - Economic development: Economic inequalities, Incomeand growth.

UNIT IV RENEWABLE ENERGY TECHNOLOGY 9

Renewable Energy – Sources and Potential – Technologies for harnessing from Solar, Wind, Hydro, Biomass and Oceans – Principle of operation, relative merits and demerits.

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UNIT V ENERGY PLANNING FOR SUSTAINABLE DEVELOPMENT 9

National & State Energy Policy - National solar mission - Framework of Central Electricity Authority- National Hydrogen Mission - Energy and climate policy - State Energy Action Plan, RE integration, Road map for ethanol blending, Energy Efficiency and Energy Mix

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Understand the world and Indian energy scenario.
- Analyse energy projects, its impact on environment and suggest control strategies.
- Recognise the need of sustainable development and its impact on human resource development
- Apply renewable energy technologies for sustainable development.
- Categorize energy policies and planning for sustainable development.

REFERENCE BOOKS:

1. Energy Manager Training Manual (4Volumes) available at http://www.emea.org/gbook1.asp, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India.2004
2. Robert Ristirer and Jack P. Kraushaar, "Energy and the environment", Willey, 2005.
3. Godfrey Boyle, "Renewable Energy, Power for a Sustainable Future", Oxford University Press, U.K., 2012
4. Twidell, J.W. & Weir A., "Renewable Energy Resources", EFNSpon Ltd., UK, 2015.
5. Dhandapani Alagiri, Energy Security in India Current Scenario, The ICFAI University Press,2006.
6. M.H. Fulekar, Bhawana Pathak, R K Kale, "Environment and Sustainable Development"Springer,2016
7. https://www.niti.gov.in/verticals/energy

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20M508 ENERGY EFFICIENCY FOR SUSTAINABLE DEVELOPMENT

(Common to all Branches)

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the types of energy sources, energy efficiency and environmental implications of energy utilization.
- Create awareness on energy audit and its impacts.
- Categorize the techniques adopted for performance evaluation of energy efficiency in thermal utilities.
- Familiarize on the procedures adopted for energy conservation in electrical utilities.
- Identify the concepts of attaining sustainable development and social development goals.

UNIT I ENERGY AND ENVIRONMENT 9

Primary energy sources - Coal, Oil, Gas – India Vs World with respect to energy production and consumption, Climate Change, Global Warming, Ozone Depletion, UNFCCC, COP

UNIT II ENERGY AUDITING 9

Need and types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments

UNIT III ENERGY EFFICIENCY IN THERMAL UTILITIES 9

Energy conservation avenues in steam generation and utilization, furnaces, Thermic Fluid Heaters. Insulation and Refractories - Commercial waste heat recovery devices: recuperator, regenerator, heat pipe, heat exchangers (Plate, Shell & Tube), heat pumps, and thermo compression.

UNIT IV ENERGY CONSERVTION IN ELECTRICAL UTILITIES 9

Demand side management - Power factor improvement – Energy efficient transformers – Energy conservation avenues in Motors, HVAC, fans, blowers, pumps, air compressors,

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illumination systems and cooling towers

UNIT V SUSTAINABLE DEVELOPMENT 9

Sustainable Development: Concepts and Stakeholders, Sustainable Development Goal (SDG).Globalization and Economic growth. Economic development: Economic inequalities, Income and growth. Social development: Poverty, conceptual issues and measures, impact of poverty.

TOTAL: 45 PERIODS

OUTCOMES:

On successful completion of this course, the students will be able to,

- Gain knowledge on the prevailing energy scenario.
- Familiarise on energy audits and its relevance.
- Apply the concept of energy efficiency on thermal utilities.
- Identify the energy efficient conservation techniques in various electrical utilities.
- Explore sustainable development and its impact on human resource development.

REFERENCE BOOKS:

1. Energy Manager Training Manual (4Volumes) available at http://www.emea.org/gbook1.asp, a website administered by Bureau of Energy Efficiency (BEE), a statutorybody under Ministry of Power, Government of India.2004
2. Robert A. Ristinen, Jack J. Kraushaar, Jeffrey T. Brack, "Energy and the Environment", 4thEdition,Wiley,2022
3. Eastop. T.D& Croft D.R, "Energy Efficiency for Engineers and Technologists", Logman Scientific & Technical, ISBN-0-582-03184, 1990
4. W.R. Murphy and G. McKay "Energy Management" Butterworths, London 1987
5. Pratap Bhattacharyya, "Climate Change and Greenhouse Gas Emission", New IndiaPublishing Agency- Nipa,2020
6. Matthew John Franchetti , Defne Apul "Carbon Footprint Analysis: Concepts, Methods,Implementation, and Case Studies" CRC Press,2012
7. M.H. Fulekar, Bhawana Pathak, R K Kale, "Environment and Sustainable Development"Springer,2016
8. Sustainable development in India: Stocktaking in the run up to Rio+20: Report prepared by TERI for MoEF, 2011.

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