MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE

MADANAPALLE

(UGC-AUTONOMOUS)

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DEPARTMENT OF CIVIL ENGINEERING

Course Structure and Detailed Syllabi

For the students admitted to

B. Tech. Regular Four Year Degree Programme from the academic year 2020-21

and

B. Tech. Lateral Entry Scheme from the academic year 2021-22

B.TECH. CIVIL ENGINEERING

Madanapalle Institute of Technology & Science
Department of Civil Engineering

Vision

To become a globally recognized research and academic institution and thereby contribute to technological and socio-economic development of the nation.

Mission

To foster a culture of excellence in research, innovation, entrepreneurship, rational thinking and civility by providing necessary resources for generation, dissemination and utilization of knowledge and in the process create an ambience for practice-based learning to the youth for success in their careers.

Vision of the Department

To grow as a globally recognized Civil Engineering Department through cutting-edge education and research to bring sustainable cultural, economic and social growth in the nation.

Mission of the Department

To provide modern educational tools and techniques to the students in order to enrich them to solve complex civil engineering problems.

To develop sustainable technologies and solutions for various organizations involved in developmental activities through consultancy and research services.

To foster the socio-economic and cultural upliftment in the region through formal and informal education.

Program Outcomes

PO1: Fundamentals: Apply the knowledge of mathematics, science, engineering fundamentals, and Civil Engineering principles to the solution of complex problems in Civil Engineering.

PO2: Problem analysis: Identify, formulate, research literature, and analyze complex Civil Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO3: Design: Design solutions for complex Civil Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Investigation: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions related to Civil Engineering problems.

PO5: Tools: Create, select, and apply appropriate techniques, resources, and modern engineering tools such as CAD, FEM and GIS including prediction and modelling to complex Civil Engineering activities with an understanding of the limitations.

PO6: Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional Civil Engineering practice.

PO7: Environment: Understand the impact of the professional Civil Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Civil Engineering practice.

PO9: Teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex Civil Engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Management: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage Civil Engineering projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEO)

Civil Engineering graduates will:

Contribute to the cost effective and sustainable infrastructural growth in the region and nationwide.

Pursue higher education and involve in research to work out the solutions for complex civil engineering problems.

Demonstrate to be ethical, skilled and environment friendly professionals working to advance the cultural and socio-economic status of the country.

Program Specific Outcomes (PSO)

Establish the processes of planning, analysis and design of sustainable civil engineering systems using the concepts of basic science, humanities and engineering sciences.

Provide cost-effective, environment-friendly solutions to civil engineering problems through laboratory experiments and field investigations.

Exhibit professional and ethical values towards project execution through the knowledge of project management and public policies using modern as well as contemporary skills.

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE, MADANAPALLE

B. Tech Four Year Curriculum Structure

Branch: CIVIL ENGINEERING

Total Credits	160 Credits for 2020(Regular) & 121 Credits for 2021(Lateral Entry) Admitted Batch
	163 Credits for 2021(Regular) & 124 Credits 2022(Lateral Entry) Admitted Batch onwards

I. Induction Program and Holistic Development Activities

Sl.No.	Title	Duration
1	Induction Program (Mandatory)	Three weeks' duration at the start of First Year (Refer Annexure - I)
2	Holistic Development Activities (Every Student from Semester 2 – 8 should register for at least one activity)	Three hours per week (Activity list is enclosed in Annexure - I)
3	Virtual Laboratory (Students are encouraged to choose and register for any of the Virtual laboratories he /she is interested)	As specified by the Virtual Laboratory

I Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	20ENG101	Professional English	3	0	0	3	3
2	BSC	20MAT101	Engineering Calculus	3	1	0	4	4
3	BSC	20CHE101	Engineering Chemistry	3	0	0	3	3
4	ESC	20ME101	Engineering Graphics	2	0	2	4	3
5	ESC	20CSE101	Programming for Problem Solving (Python)	2	0	3	5	3.5
6	BSC	20CHE201	Chemistry Laboratory	0	0	3	3	1.5
7	ESC	20ME201	Workshop Practice	0	0	3	3	1.5
Total				**13**	**1**	**11**	**25**	**19.5**

I Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	20MAT102	Linear Algebra and Differential Equations	3	0	0	3	3
2	BSC	20PHY101	Engineering Physics	3	1	0	4	4
3	ESC	20EEE101	Basic Electrical Engineering	3	1	0	4	4
4	ESC	20CSE102	C Programming and Data Structures	3	0	0	3	3
5	HSMC	20ENG201	English for Professional Purposes Laboratory	0	0	2	2	1
6	BSC	20PHY201	Physics Laboratory	0	0	3	3	1.5
7	ESC	20EEE201	Electrical Engineering Laboratory	0	0	3	3	1.5
8	ESC	20CSE201	C Programming and Data Structures Laboratory	0	0	3	3	1.5
Total				**12**	**2**	**11**	**25**	**19.5**

(L = Lecture, T = Tutorial, P = Practical, C = Credit)

II Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	HSMC	20HUM101	Economics and Financial Accounting for Engineers	3	0	0	3	3
2	BSC	20MAT103	Numerical Methods	3	0	0	3	3
3	ESC	20CE101	Fundamentals of Engineering Mechanics	2	1	0	3	3
4	PCC	20CE102	Mechanics of Fluids	3	0	0	3	3
5	PCC	20CE103	Surveying	3	0	0	3	3
6	PCC	20CE201	Construction Technology Laboratory	0	0	3	3	1.5
7	PCC	20CE202	Surveying Laboratory	0	0	3	3	1.5
8	PCC	20CE203	Mechanics of Fluids Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course I (Refer Annexure IV)	1	0	2	3	2
10	MC	20HUM901	Indian Constitution	2	0	0	2	0
Total				**17**	**1**	**11**	**29**	**21.5**

II Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	BSC	20MAT104	Probability and Statistics for Engineers	3	0	0	3	3
2	PCC	20CE104	Environmental Engineering	3	0	0	3	3
3	PCC	20CE105	Engineering Hydrology	3	0	0	3	3
4	PCC	20CE106	Concrete Technology	3	0	0	3	3
5	PCC	20CE107	Strength of Materials	3	0	0	3	3
6	PCC	20CE204	Advanced Surveying Laboratory	0	0	3	3	1.5
7	PCC	20CE205	Strength of Materials Laboratory	0	0	3	3	1.5
8	PCC	20CE206	Environmental Engineering Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course II (Refer Annexure IV)	1	0	2	3	2
10	MC	20CHE901	Environmental Science	2	0	0	2	0
Total				**18**	**0**	**11**	**29**	**21.5**

III Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PCC	20CE108	Structural Analysis	3	0	0	3	3
2	PCC	20CE109	Irrigation Engineering	3	0	0	3	3
3	PCC	20CE110	Design of Concrete Structures	3	0	0	3	3
4	OE		Open Elective-I	3	0	0	3	3
5	PE		Professional Elective-I	3	0	0	3	3
6	PCC	20CE207	Concrete Technology Laboratory	0	0	3	3	1.5
7	PCC	20CE208	Advanced Civil Engineering Laboratory	0	0	3	3	1.5
8	SC		Skill Oriented Course III (Refer Annexure IV)	1	0	2	3	2
9	MC	20HUM902*/ 20HUM102#	Universal Human Values	2/3	0	0	2/3	0/3
10	PROJ	20CE701	Summer Internship-1**	0	0	3	3	1.5
Total				**18/ 19**	**0**	**11**	**29/ 30**	**21.5/ 24.5**

* 20HUM902 Universal Human Values is offered as non-credit mandatory course for 2020 (Regular) & 2021 (Lateral Entry) Admitted Batch

20HUM102 Universal Human Values is offered as three credit course for 2021 (Regular) & 2022 (Lateral Entry) Admitted Batch onwards

** 2 Months' internship during 2nd year summer vacation and to be evaluated in III Year I Semester

III Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PCC	20CE111	Geotechnical Engineering	3	0	0	3	3
2	PCC	20CE112	Transportation Engineering	3	0	0	3	3
3	PCC	20CE113	Design of Steel Structures	3	0	0	3	3
4	OE		Open Elective-II	3	0	0	3	3
5	PE		Professional Elective-II	3	0	0	3	3
6	PCC	20CE209	Geotechnical Engineering Laboratory	0	0	3	3	1.5
7	PCC	20CE210	Design Laboratory	0	0	3	3	1.5
8	PCC	20CE211	Transportation Engineering Laboratory	0	0	3	3	1.5
9	SC		Skill Oriented Course IV (Refer Annexure IV)	1	0	2	3	2
10	MC	20CE901	Disaster Management	2	0	0	2	0
Total				**18**	**0**	**11**	**29**	**21.5**

IV Year I Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PE		Professional Elective-III	3	0	0	3	3
2	PE		Professional Elective-IV	3	0	0	3	3
3	PE		Professional Elective-V	3	0	0	3	3
4	OE		Open Elective-III	3	0	0	3	3
5	OE		Open Elective-IV	3	0	0	3	3
6	OE-HSMC		Open Elective-V (Taken from Humanities & Social Science)	3	0	0	3	3
7	SC		Skill Oriented Course-V (Refer Annexure IV)	1	0	2	3	2
8	PROJ	20CE702	Summer Internship-2*	0	0	6	6	3
Total				**19**				**23**

* 2 Months internship during 3rd year summer vacation and to be evaluated in IV Year I Semester

IV Year II Semester

S. No.	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total	
1	PROJ	20CE703	Project Work and Internship	0	0	24	24	12
Total				**0**	**0**	**24**	**24**	**12**

ANNEXURE - I

THREE WEEK MANDATORY INDUCTION PROGRAMME

- Yoga and
- Meditation Sports
- and Games NSS
- NCC
- MITS Social Responsibility
- Club Management module
- Design Thinking
- Spoken and Written Communication

- *Proficiency modules*
  - Basic Computer Proficiency
  - Interpersonal Skills
  - Computer Graphics
  - Web Programming
  - Mobile Apps
  - Vocabulary Enhancement

HOLISTIC DEVELOPMENT ACTIVITIES

Description of Activities

1. Physical and Health
2. Culture
3. Literature and Media
4. Social Service
5. Self-Development
6. Nature and Environment
7. Innovation

ANNEXURE - II

OPEN ELECTIVE – I

(To be offered under MOOC's Category from SWAYAM – NPTEL)

Sl. No.	Course Code	Course Title	Course Offered by Department of
1	20HUM3M01	Project Management for Managers	Management Studies
2	20HUM3M02	Ethics in Engineering Practice	Management Studies
3	20HUM3M03	E – Business	Management Studies
4	20ME3M01	Operations Management	Mechanical
5	20ME3M02	Operations Research	Mechanical
6	20ME3M03	Design Thinking and Innovation	Mechanical
7	20EEE3M01	Non-Conventional Energy Sources	EEE
8	20EEE3M02	Design of Photovoltaic Systems	EEE
9	20ECE3M01	Microprocessors and Interfacing	ECE
10	20ECE3M02	Microprocessors and Microcontrollers	ECE
11	20ECE3M03	Semiconductor Opto-Electronics	ECE
12	20ECE3M04	System Design Through Verilog	ECE
13	20CSE3M01	Online Privacy	CSE
14	20CSE3M02	Privacy and Security in Online Social Media	CSE
15	20CSE3M03	Computer Architecture	CSE
16	20CSE3M04	Computer Architecture and Organization	CSE
17	20CST3M01	Software Engineering	CST
18	20IE3M01	Intellectual Property Rights and Competition Law	Multidisciplinary
19	20IE3M02	Introduction to Research	Multidisciplinary
20	20IE3M03	Roadmap for Patent Creation	Multidisciplinary
21	20IE3M04	Energy Conversion Technologies (Biomass And Coal)	Multidisciplinary
22	20IE3M05	Research Methodology	Multidisciplinary

Any new Interdisciplinary Course offered by SWAYAM NPTEL can be appended in future.

OPEN ELECTIVE – II (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20MAT302	Engineering Optimization	Mathematics
2	20PHY301	Optical Physics and its Applications	Physics
3	20PHY302	LASER Physics and Advanced LASER Technology	Physics
4	20CHE301	Introduction to Petroleum Industry	Chemistry
5	20CHE302	Green Chemistry and Catalysis for Sustainable Environment	Chemistry
6	20ME301	Material Science for Engineers	Mechanical
7	20ME302	Elements of Mechanical Engineering	Mechanical
8	20EEE301	Industrial Electrical Systems	EEE
9	20EEE302	Introduction to MEMS	EEE
10	20ECE301	Bio-Medical Electronics	ECE
11	20ECE302	VLSI Design	ECE
12	20CST301	Operating Systems	CST
13	20CSE301	JAVA Programming	CSE
14	20CSE302	Multimedia Technologies	CSE
Any advanced courses can be appended in future.			

OPEN ELECTIVE – III (To be offered under MOOC's Category from SWAYAM – NPTEL)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20HUM3M04	Management Information System	Management Studies
2	20HUM3M05	Business Analytics & Text Mining Modeling Using Python	Management Studies
3	20ME3M04	Power Plant Engineering	Mechanical
4	20ME3M05	Mechatronics and Manufacturing Automation	Mechanical
5	20EEE3M03	Introduction to Smart Grid	EEE
6	20EEE3M04	Transducers For Instrumentation	EEE
7	20CSE3M05	Software Testing	CSE
8	20CSE3M06	Multi-Core Computer Architecture – Storage and Interconnects	CSE
9	20CSE3M07	Introduction to Machine Learning	CSE
10	20CSE3M08	Fundamentals of Artificial Intelligence	CSE
11	20CST3M02	Ethical Hacking	CST
12	20IE3M06	Learning Analytics Tools	Multidisciplinary
13	20IE3M07	Design, Technology and Innovation	Multidisciplinary
Any new Interdisciplinary Course offered by SMAYAM NPTEL can be appended in future			

OPEN ELECTIVE – IV (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20PHY303	Thin Film Technology and its Applications	Physics
2	20CHE303	Introduction to Nano Science and Technology	Chemistry
3	20CHE304	Computational Methods in Materials Science and Engineering	Chemistry
4	20ME303	Total Quality Management	Mechanical
5	20ME304	Entrepreneurship	Mechanical
6	20EEE303	Robotics	EEE
7	20EEE304	Electrical Safety	EEE
8	20ECE303	Embedded Systems	ECE
9	20ECE304	DSP Architecture	ECE
10	20CSE303	Mobile Application Development	CSE
11	20CSE304	Software Project Management	CSE
12	20CST302	Cloud Computing	CST
Any advanced courses can be appended in future.			

OPEN ELECTIVE – V (HUMANITIES) (To be offered under Conventional Mode)			
Sl. No.	**Course Code**	**Course Title**	**Course Offered by Department of**
1	20HUM301	Principles of Management	Humanities
2	20HUM302	Human Resource Development	Humanities
3	20HUM303	Soft Skills	Humanities
4	20HUM304	National Cadet Corps	Humanities
Any new Interdisciplinary courses can be appended in future.			

ANNEXURE - III

List of Professional Electives – Civil Engineering

Professional Elective – I		
Sl. No.	**Course Code**	**Course Title**
1.	20CE401	Engineering Geology
2.	20CE402	Construction Planning and Management
3.	20CE403	Remote Sensing and GIS
4.	20CE404	Green Buildings and Energy Conservation
5.	20CE405	Air Pollution and Solid Waste Management
6.	20CE406	Building Materials and Construction
Any advanced courses can be appended in future.		

Professional Elective – II (To be offered under MOOC's Category from SWAYAM – NPTEL)		
Sl. No.	**Course Code**	**Course Title**
1.	20CE4M01	Modern Construction Materials
2.	20CE4M02	Composite Materials
3.	20CE4M03	Applied Environmental Microbiology
4.	20CE4M04	Energy Efficiency, Acoustic and Daylighting in Building
5.	20CE4M05	Environmental Remediation of Contaminated Sites
6.	20CE4M06	Geo-synthetic and Reinforced Soil Structures
7.	20CE4M07	Mineral resources: Geology, Exploration, Economics and Environment
8.	20CE4M08	Soil and Water Conservation Engineering
9.	20CE4M09	Urban Governance and Development Management
10.	20CE4M10	Safety in Construction
11.	20CE4M11	Plastic Waste Management
12.	20CE4M12	Air Pollution and Control
Any other new Disciplinary Course which doesn't exist in the Curriculum can be appended in future.		

Professional Elective – III		
Sl. No.	**Course Code**	**Course Title**
1.	20CE407	Advanced Strength of Material
2.	20CE408	Advanced Geotechnical Engineering- Foundations
3.	20CE409	Hydraulics and Hydraulic Machines
4.	20CE410	Finite Element Analysis
5.	20CE411	Environmental Impact Assessment
6.	20CE412	Traffic Engineering and Management
7.	20CE413	Railways Engineering
Any advanced courses can be appended in future.		

Professional Elective – IV		
Sl. No.	**Course Code**	**Course Title**
1.	20CE414	Geotechnical Exploration
2.	20CE415	Estimating and Costing
3.	20CE416	River Hydraulics and Sediment Transport
4.	20CE417	Advanced Structural Analysis
Any advanced courses can be appended in future.		

Professional Elective – V		
Sl. No.	**Course Code**	**Course Title**
1.	20CE418	Watershed Management
2.	20CE419	Bridge Engineering
3.	20CE420	Optimization in Structural Design
4.	20CE421	Offshore Structures
5.	20CE422	Ground Improvement Techniques
6.	20CE423	Pavement Design and Analysis
7.	20CE424	Port Engineering
Any advanced courses can be appended in future.		

ANNEXURE - IV

List of Skill Oriented Courses

Skill Oriented Course I

Sl. No.	Course Code	Name of the Course
1.	20ENG601	Corporate Communication
		Any other course can be added in future

Skill Oriented Course II

Sl. No.	Course Code	Name of the Course
1.	20CE601	Building Technology
2.	20CE602	Architecture
		Any other course can be added in future

Skill Oriented Course III

Sl. No.	Course Code	Name of the Course
1.	20CE603	Geospatial Data Analysis with QGIS
2.	20CE604	3D Design with Google Sketchup
		Any other course can be added in future

Skill Oriented Course IV

Sl. No.	Course Code	Course Title
1.	20CE605	Scilab in Civil Engineering
2	20CE606	Python in Civil Engineering
Any advanced courses can be appended in future.		

Skill Oriented Course V

Sl. No.	Course Code	Name of the Course
1.	20CE607	Revit Structure
2.	20CE608	Revit Architecture
3.	20CE609	Flood Modelling using HEC-RAS
		Any other course can be added in future

Annexure V

Minor in Civil Engineering
(Applicable to ME)

Stream Name: Civil Engineering - I

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Core Course**	20MDCE101	Surveying and Building Technology	3	0	0	3	3
2	**Professional Core Course**	20MDCE102	Basic Soil Mechanics and Foundation Engineering	3	0	0	3	3
III Year II Semester								
3	**Professional Core Course**	20MDCE103	Structural Engineering	3	0	0	3	3
4	**Professional Core Course**	20MDCE104	Water Resources Engineering	3	0	0	3	3
5	**Professional Core Course**	20MDCE201	Civil Engineering Laboratory	0	0	4	4	2
IV Year I Semester								
6	**Professional Core Course**	20MDCE105	Economics of Transportation Systems	3	0	0	3	3
7	**Professional Core Course**	20MDCE108	Basic Environmental Engineering	3	0	0	3	3
			Total	**18**	**0**	**4**	**22**	**20**

Annexure VI

Minor in Civil Engineering

(Applicable to CSE/CST/CSIT/EEE/ECE)

Stream Name: Civil Engineering - II

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Core Course**	20MDCE106	Engineering Mechanics and Materials	3	0	0	3	3
2	**Professional Core Course**	20MDCE101	Surveying and Building Technology	3	0	0	3	3
III Year II Semester								
3	**Professional Core Course**	20MDCE102	Basic Soil Mechanics and Foundation Engineering	3	0	0	3	3
4	**Professional Core Course**	20MDCE104	Water Resources Engineering	3	0	0	3	3
5	**Professional Core Course**	20MDCE201	Civil Engineering Laboratory	0	0	4	4	2
IV Year I Semester								
6	**Professional Core Course**	20MDCE107	Traffic and Road Safety Engineering	3	0	0	3	3
7	**Professional Core Course**	20MDCE108	Basic Environmental Engineering	3	0	0	3	3
			Total	**18**	**0**	**4**	**22**	**20**

Annexure VII

Honors in Civil Engineering

SI.No	Category	Course Code	Course Title	Hours Per Week				Credits
				L	T	P	Total Contact Hours	
III Year I Semester								
1	**Professional Elective Course (Choose any two from three courses)**	20HDCE101	Advanced Surveying	3	0	0	3	3
2		20HDCE102	Environmental Geotechniques	3	0	0	3	3
3		20HDCE103	Applied Hydraulics	3	0	0	3	3
			Sub Total	**6**	**0**	**0**	**6**	**6**
	III Year II Semester							
4	**Professional Elective Course (Choose any two from three courses)**	20HDCE104	Advanced Concrete Technology	3	0	0	3	3
5		20HDCE105	Design of Hydraulic Structures	3	0	0	3	3
6		20HDCE106	Transportation Infrastructure and Management	3	0	0	3	3
			Sub Total	**6**	**0**	**0**	**6**	**6**
	IV Year I Semester							
7	**Professional Elective Course (Choose any two from three courses)**	20HDCE107	Project Planning and Implementation	3	0	0	3	3
8		20HDCE108	Basic Structural Dynamics	3	0	0	3	3
9		20HDCE109	Repair and Rehabilitation of Structures	3	0	0	3	3
10	**SOC**	20HDCE601	Numerical Analysis using Python	1	0	2	3	2
			Sub Total	**7**	**0**	**2**	**9**	**8**
			Total	**19**	**0**	**2**	**21**	**20**

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B.Tech. I Year-I Semester

20ENG101 PROFESSIONAL ENGLISH
(Common to all branches)

L	T	P	C
3	0	0	3

Course Prerequisite: None

Course Description: Communication takes place in many forms, however the major impact and effectiveness is in its professionalism. This course defines, enlightens and enables learners to engage in Professional Communication by addressing all the areas of communication – Listening, Speaking, Reading and Writing. This course also deals with various types of communication – Verbal, Non-verbal, Storytelling, Crucial Conversations, Written Communication, Vocalics, Eye Contact, Posture, etc.
Course Objectives: This course enables the student to –

1. Engage effectively in a professional environment
2. Understand the intricacies and implications of professional communication
3. Use linguistic skills in any given context
4. Conduct self in a learning environment
5. Be better prepared for employment

UNIT I: Grammar & Vocabulary; Grammar **-** Tense, Reported Speech, Modals, Conditionals; Vocabulary development **-** prefixes, suffixes, compound words, synonyms & antonyms. (9)

UNIT II: Reading Skills & Written Communication; Reading - short comprehension passages, practice in skimming, scanning and predicting; Writing- completing sentences, developing hints; Paragraph writing- topic sentence, main ideas, coherence. (9)

UNIT III: Verbal & Non-verbal Aspects; Verbal - Introducing oneself, exchanging personal information, Using 'Wh'- Questions, asking and answering, yes or no questions- asking about routine actions and expressing opinions; **Non-Verbal** – Use of body language, combating nervousness. (9)

UNIT IV: Conversations; Listening-short texts & conversing, formal and informal conversations, short group conversations, speaking about oneself, sharing information of a personal kind speaking about one's friend. (9)

UNIT V: Business Environment & Etiquettes; greeting & taking leave; Writing e-mails, memos, reports, etc. (9)

Course Outcomes: At the end of the course, learners will be able to

1. Read articles and understand professional communication
2. Participate effectively in informal conversations
3. Introduce themselves and their friends and express opinions in English
4. Comprehend conversations and short talks delivered in English
5. Write short essays of a general kind and personal letters and emails in English.

Suggested Reading/Textbooks:

1. Guy Brook Hart & Norman Whitby; *Cambridge English-Business Benchmark: Pre-Intermediate to Intermediate*; Published by: Cambridge University Press.
2. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Intermediate (B1+)*; Published by: Cambridge University Press.

Reference:

1. AJ Thomson & AV Martinet; *A Practical English Grammar*; Oxford University Press, 2015.
2. Raymond Murphy; *English Grammar in Use with CD*; Cambridge University Press, 2013.
3. K.S. Yadurajan; *Modern English Grammar*; Oxford University Press, 2014.
4. William Strunk Jr; *The Elements of Style*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.
5. Joseph Devlin; *How to Speak and Write Correctly*; ITHACA, N.Y.; W.P. HUMPHREY, 2006
6. Anjana Agarwal; *Powerful Vocabulary Builder*; New Age Publishers, 2011.
7. *Writing Tutor*; Advanced English Learners' Dictionary; Oxford University Press, 2012.
8. *www.cambridgeenglish.org/in/*
9. https://learnenglish.britishcouncil.org/en/english-grammar
10. https://www.rong-chang.com/

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

20MAT101 ENGINEERING CALCULUS

L	T	P	C
3	1	0	4

Course Prerequisite: Mathematics at Intermediate or Equivalent Level

Course Description:

The course introduces the concepts of single variable and multivariable calculus with the view of its applications in various engineering fields. It prepares the students to develop various methods of finding derivatives and integrals; understanding of concepts related to continuous functions and enrich their experience in critical analysis.

Course Objectives:

1. To introduce the basic concepts of definite integrals, improper integrals, Beta and Gamma functions,
2. To acquire knowledge on mean value theorems in calculus.
3. To illustrate various techniques of testing the convergence of infinite series and introduces the functions of sine and cosine series.
4. To familiarize the knowledge of limit, continuity and the derivatives, extreme values in Multivariable.
5. To emphasize the role of Double and Triple integrals in dealing with area and volume of the regions.

Unit 1: Integral Calculus **(12)**

Definite integrals; Applications of definite integrals to evaluate area and length of curves, surface areas and volumes of revolutions; Beta and Gamma functions and their properties.

Unit 2: Differential Calculus **(12)**

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders (without proofs); indeterminate forms, Maxima and minima.

Unit 3: Sequence and Series **(12)**

Sequence and Series, their Convergence and tests for convergence; Power series, Taylor's series, Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

Unit 4: Multivariable Differential Calculus **(12)**

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers.

Unit 5: Multivariable Integral Calculus **(12)**

Multiple Integration: double integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes (double integration), triple integrals, gradient, curl and divergence, Green's, Stokes and Gauss divergence theorems (without proofs).

Course Outcomes:

At the end of the course, the students should be able to

1. Evaluate the definite integrals, Beta and Gamma functions and calculate length of curve and underlying area.
2. Relate the results of mean value theorems in calculus to Engineering problems.
3. Use the Power series and Fourier series for ascertaining the stability and convergence of various techniques.
4. Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.
5. Compute the area and volume by interlinking them to appropriate double and triple integrals.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42th Edition, 2012.
2. G. B. Thomas, Maurice D. Weir, Joel Hass, Frank R. Giordano, Thomas' Calculus Pearson education 11^{th} Edition, 2004.

Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11^{th} Reprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2^{nd} Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

20CHE101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

Course Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description: Deals with the basic principles of various branches of chemistry like physical, organic, inorganic, analytical and nanomaterial chemistry.

COURSE OBJECTIVES:

Students will

1. Understand, analyse and determine the impurities present in the water.
2. Appreciate the synthetic organic reactions used in daily life
3. Learn the principles of spectroscopies to analyse them.
4. Value the basic concepts of thermodynamics and electrochemistry.
5. Be exposed to the importance of nano and engineering materials used in their daily life and industry.

UNIT I: Impurities Present in Water and Water Treatment (9)

Impurities present in Water: Impurities in water (BIS and WHO standards), Hardness of water- determination of hardness - EDTA Method (numerical problems), Alkalinity of water (numerical problems), Estimation of Dissolved Oxygen by Winkler's method and its importance and Chlorides. Disadvantages (industry level) of using hard water (Boiler corrosion, Caustic embrittlement, Scale and Sludges). Softening of water (Ion exchange method), Treatment of brackish water by Reverse Osmosis method. Water treatment for civic applications: coagulation, sedimentation, filtration, sterilization - chlorination and ozonation. Concept of break point chlorination.

UNIT II: Periodic Properties and Organic Reactions (7)

Periodic properties: Electronic configurations, atomic and ionic sizes, ionization energies, oxidation states, molecular geometries. Organic Reactions: Introduction to substitution (S_N^1 and S_N^2), elimination (E_1 and E_2) - Addition, Condensation and Free Radical Polymerization Reaction (only the mechanism).

UNIT III: Spectroscopy (8)

Basic Principle and Applications of UV-Visible, FT-IR, Raman, Microwave and Nuclear Magnetic Resonance (NMR) Spectroscopy.

UNIT IV: Thermodynamics and Electrochemistry (11)

Thermodynamics: Systems, State Functions, Thermodynamic Functions: Work, Energy, Entropy and Free energy. Estimations of Entropy in Isothermal, Isobaric and Isochoric processes. Electrochemistry: Free energy and EMF. Cell potentials, the Nernst equation and applications. Batteries (Lead-Acid and Lithium ion) and Fuel-Cells (H_2-O_2).

UNIT V: Engineering Materials, Nanoscience & Nanotechnology (10)

Engineering Materials: Cement Materials and Manufacturing Process. Reactions in setting and hardening of Cement. Lubricants – definition, Properties of lubricants – Viscosity, Viscosity Index, Flash Point and Pour Point. Nanomaterials: Introduction, Classes/Types, Chemical synthesis of Nanomaterials: Chemical Vapor Deposition method (Carbon Nanotubes), Characterization by powder XRD (Scherrer's equation). Applications of Nanomaterials: Solar Energy and Photocatalytic Dye Degradation (TiO_2).

COURSE OUTCOMES:

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

1. Analyse and determine the impurities in water such as hardness, alkalinity for sustainable development.
2. Prepare organic compounds/polymers for environmental, safety and society need.
3. Comprehend the principles and applications of spectroscopies.
4. Apply the concept of free energy in thermodynamics, electrochemistry for solving the problems evolve in the engineering processes.
5. Acquire spotlight to the nanomaterials and basic engineering materials used in academics, industry, and daily life.

Textbooks:

1. **P. W. Atkins & Julio de Paula**, **'The Elements of Physical Chemistry',** Ninth edition (Oxford University Press, Oxford 2010).
2. **C. N. Banwell**, **Fundamentals of Molecular Spectroscopy,** Fourth Edition, (Tata McGraw Hill, 2008).
3. **Ralph H. Petrucci, F. Geoffrey Herring, Jeffry D. Madura, Carey Bissonnette, General Chemistry - Principles and Modern Applications,** Tenth Edition, (Pearson, 2011).
4. **Dr. S. S. Dara and Dr. S. S. Umare, A Textbook of Engineering Chemistry,** 1st Edition., (S. Chand & Company Ltd, 2000).
5. **T. Pradeep, Nano: The Essentials,** 1st Edition, **(**Tata McGraw-Hill Publishing Company Limited, 2017).

Reference Books:

1. 'Physical Chemistry', D. W. Ball, First Edition, India Edition (Thomson, 2007).
2. Perry's Chemical Engineers' Handbook, Don W. Green and Marylee Z. Southard, 9^{th} Edition (McGraw Hill, 2018).
3. Engineering Chemistry, Dr. Suba Ramesh and others, 1^{st} Edition (Wiley India, 2011).
4. Jain and Jain, Engineering Chemistry,16^{th} Edition (Dhanpat Rai Publishing Company (P) Ltd, 2016).
5. Amretashis Sengupta, Chandan Kumar Sarkar (eds.), Introduction to Nano Basics to Nanoscience and Nanotechnology (Springer-Verlag, Berlin, Heidelberg, 2015)

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

20ME101 ENGINEERING GRAPHICS

L	T	P	C
2	0	2	3

Course Prerequisite: None

Course Description: Introduction to AutoCAD commands, simple drawings, orthographic projections, projection of points, lines, planes; auxiliary projections; projections and sections of solids; development and intersection of surfaces; isometric projections.

Course Objectives:

1. Engineering Graphics is the primary medium for development and communicating design concepts.
2. Through this course the students are trained in Engineering Graphics concepts with the use of AutoCAD.
3. The latest ISI code of practice is followed while preparing the drawings using AutoCAD.
4. Computerized drawing is an upcoming technology and provides accurate and easily modifiable graphics entities.
5. Storage and Retrieval of Drawings is also very easy and it takes very less time to prepare the drawings. Also enhances the creativity.

UNIT I: INTRODUCTION TO AUTO CAD

Introduction to AutoCAD commands, simple drawings using AutoCAD, Introduction to orthographic Projections – Theory, techniques, first angle projections and third angle projections.

(12)

UNIT II: PROJECTIONS OF POINTS & LINES

Projections of points: Positions, notation system and projections.
Projections of lines: Positions, terms used, different cases, traces of lines and finding true length.

(12)

UNIT III: PROJECTIONS OF PLANES & SOLIDS

Projections of planes: Positions, terms used, different cases and projections procedure.
Projections of Solids: Projections of Regular Solids inclined to one plane (resting only on HP).

(12)

UNIT IV: SECTIONS AND DEVELOPMENTS OF SOLIDS

Section of solids: Sectional view of right regular solids (Prism and cylinder), true shapes of the sections.
Development of Surfaces: Development of surfaces of right regular solids (Prism, Cylinder and their Sectional Parts).

(12)

UNIT V: INTERSECTIONS & ISOMETRIC PROJECTIONS

Intersections of surfaces of solids: Intersection between prism Vs prism, prism Vs cylinder, cylinder Vs cylinder.

Isometric Projections: Theory of isometric drawing and orthographic views, Conversion of isometric view into orthographic views. **(12)**

Course Outcomes: Student will be able to

1. Identify various commands in AutoCAD software and apply AutoCAD skills to develop the new designs.
2. Draw the projections of points, straight lines using AutoCAD.
3. Draw the projections of the planes, solids using AutoCAD
4. Sketch the developments of solids, sections of solids using AutoCAD.
5. Draw the conversion of the isometric views to orthographic views and intersections of surfaces using AutoCAD.

Text Book:

1. D.M. Kulkarni, A.P. Rastogi and A.M. Sarkar., Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi 2009.
2. N D Bhat, Engineering Drawing, Charotar Publishing House, Gujarath,15th Edition, 2010.
3. K.L. Narayana, P. Kanniah, Engineering Drawing, Scitech Publishers, 2nd Edition, 2010.

References:

1. Dhananjay A Jolhe, Engineering Drawing: with an introduction to AutoCAD, Tata McGraw Hill, 2008.
2. Warren J. Luzadder & Jon M. Duff Fundamentals of Engineering Drawing, 11th edition, Prentice Hall of India, New Delhi.

Mode of Evaluation: Assignment, Mid Examination, End Examination

20CSE101 PROGRAMMING FOR PROBLEM SOLVING (PYTHON)

L	T	P	C
2	**0**	**3**	**3.5**

Course Prerequisite: None

Course Description:
Python is a language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience.
This course provides knowledge on how to implement programs in python language and to solve computational problems using the various programming constructs including data structures, functions, string handling mechanisms and file handling concepts.

Course Objectives:
1. Learn Python programming constructs.
2. Implement Python programs with conditional structures and loops.
3. Use functions for structuring Python programs.
4. Handle compound data using Python lists, tuples, and dictionaries.
5. Manipulate data using files handling in Python.
6. Getting exposed to the basics of Object Oriented Programming using Python.

UNIT-I
Introduction: Algorithms, building blocks of algorithms (flow chart), History of Python, features of Python Programming, Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. **Data Types -** Integers, Strings, Boolean.

a) Develop a flowchart for the various arithmetic operations on numbers.
b) Develop a flowchart to check whether the number is positive or negative.
c) Develop a flowchart for finding whether a given number is even or odd.
d) Develop a flowchart for finding biggest number among three numbers.
e) Develop a flowchart for displaying reversal of a number.
f) Develop a flowchart to print factorial of a number using function.
g) Develop a flowchart to generate prime numbers series up to N using function.
h) Develop a flowchart to check given number is palindrome or not using function.
i) Alexa travelled 150 kms by train. How much distance in miles she actually covered?

(12)

UNIT-II
Operators and Expressions: Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations. **Control Flow -** if, if-elif else, for, while, break, continue, pass.

a) Swapping of two number with and without using temporary variable.
b) If the age of Ram, Sam, and Khan are input through the keyboard, write a python program to determine the eldest and youngest of the three.

c) Develop a program that performs arithmetic operations (Addition, Subtraction, Multiplication, and Division) on integers. Input the two integer values and operator for performing arithmetic operation through keyboard. The operator codes are as follows:

- For code '+', perform addition.
- For code '-', perform subtraction.
- For code '*', perform multiplication.
- For code '/', perform division.

d) Implement the python program to generate the multiplication table.
e) Implement Python program to find sum of natural numbers
f) If the first name of a student is input through the keyboard, write a program to display the vowels and consonants present in his/her name.
g) The marks obtained by a student in 5 different subjects are input through the keyboard. Find the average and print the student grade as per the MITS examination policy as shown below.

% OBTAINED GRADE
90 - 100 O (Outstanding)
80 - 89 A+ (Excellent)
70 - 79 A (Very Good)
60 - 69 B+ (Good)
50 - 59 B (Above)
45 - 49 C (Average)
40 - 44 P (Pass)
< 40 F (Fail)

h) Implement Python Script to generate prime numbers series up to N.
i) Given a number x, determine whether it is Armstrong number or not. Hint: For example, 371 is an Armstrong number since 3**3 + 7**3 + 1**3 = 371. Write a program to find all Armstrong number in the range of 0 and 999.

(12)

UNIT-III

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences. Comprehensions. **Functions** - Defining Functions, Calling Functions, Passing Arguments, variable in python-Global and Local Variables.

a) Write a Python script to

- create a list
  - access elements from a list
  - slice lists
  - change or add elements to a list
  - delete or remove elements from a list

b) Write a Python script to read the values from a list and to display largest and smallest numbers from list.
c) Write a Python script to compute the similarity between two lists.
d) Write a Python script to read set of values from a Tuple to perform various operations.
e) Write a Python script to perform basic dictionary operations like insert, delete and display.
f) Write a Python program to count the occurrence of each word in a given sentence.
g) Define a dictionary named population that contains the following data.

Keys	Values
Shanghai	17.8
Istanbul	13.3
Karachi	13.0
Mumbai	12.5

h) Write a Python script to create Telephone Directory using dictionary and list to perform basic functions such as Add entry, Search, Delete entry, Update entry, View and Exit.
i) Implement Python script to display power of given numbers using function.
j) Implement a Python program that takes a list of words and returns the length of the longest one using function.

(12)

UNIT-IV
String Handling -Modules: Creating modules, import statement, from import statement, name spacing-**Files and Directories**

a) Implement Python program to perform various operations on string using string libraries.
b) Implement Python program to remove punctuations from a given string.
c) Write a Python program to change the case of the given string (convert the string from lower case to upper case). If the entered string is "computer", your program should output "COMPUTER" without using library functions.
d) Implement Python program to capitalize each word in a string. For example, the entered sentence "god helps only people who work hard" to be converted as "God Helps Only People Who Work Hard"
e) Write a Python script to display file contents.
f) Write a Python script to copy file contents from one file to another.
g) Write a Python script to combine two text files contents and print the number of lines, sentences, words, characters and file size.
h) Write a Python commands to perform the following directory operations.

- List Directories and Files
- Making a New Directory
- Renaming a Directory or a File
- Removing Directory or File

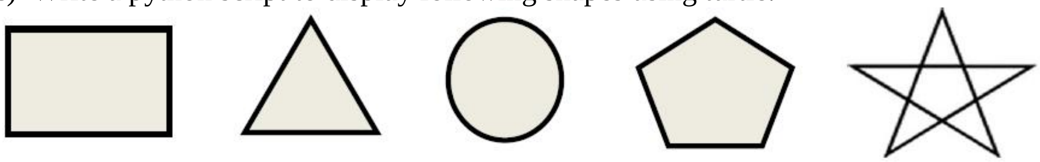
(12)

UNIT-V
Python packages: Predefined Packages and User-defined Packages, Package Creation.
Object Oriented Programming using Python: Introduction to OOP, Creating Classes and Objects in Python, Creating Methods in Python
Brief Tour of the Standard Library: Turtle

a) Create a package named Cars and build three modules in it namely, BMW, Audi and Nissan. Illustrate the modules using class. Finally we create the __init__.py file. This file will be placed inside Cars directory and can be left blank or we can put the initialization code into it.
b) Create a class by name Student with instance variables such as roll_no, name, year_of_study, branch, section, and marks in any five subjects. The class should also contain one method for calculating the percentage of marks and the other method for printing a report as follows:

Roll No.	Name	Year	Section	Branch	M1	M2	M3	M4	M5	Percentage
101	abc	I	A	CSE	58	68	95	47	56	64.8

c) Write a python script to display following shapes using turtle.



Course Outcomes:
At the end of the course, students will be able to
1. Understand problem solving techniques and their applications
2. Understand the syntax and semantics of python.
3. Demonstrate the use of Python lists and dictionaries.
4. Demonstrate the use of Python File processing, directories.
5. Describe and apply object-oriented programming methodology and Standard Library.

Text Books:
1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
References:
1. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
2. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013.
3. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers,LLC,2013.
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

Mode of Evaluation: Model Lab Examinations, External Lab End Examination.

20CHE201 CHEMISTRY LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisites: Basic Chemistry at Intermediate or equivalent level.

Course Description: It deals with basic principles of volumetric and instrumental analytical methods.

Course Objective: This Engineering Chemistry Laboratory is common to all branches of I Year B Tech. At the end of the course the student is expected to Students will

1. Learn to estimate the chemical impurities present in water such as hardness, alkalinity, chlorine, etc.
2. Understand and experience the formation of inorganic complex and analytical technique for trace metal determination.
3. Be trained to use the instruments to practically understand the concepts of electrochemistry.
4. Bridge theoretical concepts and their practical engineering applications, thus highlighting the role of chemistry in engineering.

Lab Experiments (12 Experiments)

1. Estimation of total, permanent and temporary hardness of water by EDTA method.
2. Estimation of alkalinity of water sample.
3. Estimation of dissolved oxygen by Winkler's method.
4. Determination of molecular weight of a polymer by using Ostwald's viscometer.
5. Determination of rate constant of an ester hydrolysis (Pseudo First Order reaction).
6. Determination of strength of a Strong acid (conc. H_2SO_4) by conductometric titration (Neutralisation Titration).
7. Conductometric titration of $BaCl_2$ Vs Na_2SO_4 (Precipitation Titration).
8. Dissociation constant of weak electrolyte by Conductometry.
9. Determination of percentage of Iron in Cement sample by colorimetry.
10. Estimation of ferrous ion by Potentiometric titration (Redox Titration).
11. Saponification value of oil.
12. Formation of Iron-1,10-phenanthroline complex and determination of iron by colorimetry.

Course Outcome: After the completion of the Engineering Chemistry Laboratory experiments, students will be able to

1. Develop and perform analytical chemistry techniques to address the water related problems (for e.g., hardness, alkalinity present in water) technically.
2. Handle electro-analytical instruments like digital conductivity meter and potentiometer to perform neutralization, precipitation, and redox titrations, respectively.
3. Acquire practical skills to handle spectro-photochemical methods to verify Beer-Lambert's Law.
4. Operate various instruments for the analysis of materials and produce accurate results in a given time frame.
5. Think innovatively and improve the creative skills that are essential for solving engineering problems.

Textbook:

1. Engineering Chemistry Lab Manual (2017-18), Dept. of Chemistry, Madanapalle Institute of Technology and Science, Madanapalle – 517325, Chittoor Dist., Andhra Pradesh, India.
2. "Vogel's Textbook of Qualitative Chemical Analysis", Arthur Israel Vogel, Prentice Hall, 2000.
3. Laboratory Manual on Engineering Chemistry, by Dr Sudha Rani, Dhanpat Rai Publishing house, 2009.
4. A Textbook on Experiments and calculations in Engineering Chemistry, by SS Dara, S Chand publications, 2015.
5. Laboratory Manual of Organic Chemistry, by Raj K Bansal, Wiley Eastern Limited, New age international limited, 2009.

Mode of evaluation: Continuous Internal Evaluation and End Semester Examination.

20ME201 WORKSHOP PRACTICE

L	T	P	C
0	0	3	1.5

Course Prerequisite: None

Course Description:
This course will provide students with a hands-on experience on various basic engineering practices. This course will also provide an opportunity to the students to experience the various steps involved in the industrial product fabrication.

Course Objectives:
1. Introduction to the use of Tools, Machinery and Power tools,
2. Hands on practice in Carpentry, Fitting, Forging, Tinsmith, Plumbing, Foundry, Welding, Fabrication of plastic components, Metrology, Fabrication of Polymer Composite materials, simple machine turning and wood turning, and basic electrical connections.
3. Introduction to 3 D Printing
4. Fabrication of final product at end of the semester.

LIST OF TRADES
1. Carpentry (Cross half lap Joint and Miter Joint)
2. Fitting (Square and 'V' fit)
3. Turning (Ball pane hammer and handles)
4. Forging (S hook L hook)
5. Tin smithy (Square tray)
6. Plumbing (Wash basin and simple connection)
7. Foundry (Solid and Split pattern)
8. Welding (Arc and Gas welding)
9. Fabrication of plastic components (Pen Stand)
10. Metrology (Internal and External dimension)
11. Composite Material Sample Preparation (Demo Only)
12. Introduction of Power Tools and CNC (Demo Only)
13. Introduction to 3D Printing (Demo Only)

Course Outcomes
On successful completion of this course, the student will be able to
1. Fabricate carpentry components with suitable joint and pipe connections including plumbing works.
2. Perform welding operation to join various structures.
3. Perform basic machining operations.
4. Create the models using sheet metal and plastic works.
5. Illustrate the operations of foundry, fitting and smithy
6. Fabricate a product using composite and plastic material
7. Design and fabricate a product using the tools and skills learned in the workshop.

Suggested Text/Reference Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998. (v) Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.
4. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

B.Tech. I Year-II Semester

20MAT102 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

L	T	P	C
3	0	0	3

Course Prerequisite: 20MAT101

Course Description:

The course is an introduction to Linear Algebra and Differential Equations. Methods for solving system of linear equations, ordinary and partial differential equations are covered. Basics of matrices and its applications are highlighted. The methods of solving first and second order ordinary differential equations and partial differential equations have been introduced.

Course Objectives:

1. To solve the system of linear equations and find the eigenvalues and eigenvectors.
2. To formulate and solve first order ordinary differential equations.
3. To solve second order differential equations of various kinds to familiarize the knowledge of Laplace transform.
4. To introduce Fourier series and the classical methods for solving boundary value problems
5. To obtain the solutions of partial differential equations representing initial and boundary value problems in engineering.

Unit 1: Linear Algebra (9)

Introduction to matrices -Rank and inverse of a matrix - system of linear equations, Eigenvalues and Eigen vectors - Cayley-Hamilton theorem, diagonalization of matrices.

Unit 2: First order ordinary differential equations (9)

Introduction - General Remarks on Solutions, Families of Curves, Orthogonal Trajectories - Homogeneous Equations - Exact equation, Integrating Factors - Linear differential equations and Bernoulli's equation.

Unit 3: Second order ordinary differential equations (9)

Introduction of second order linear differential equations - General solution of the homogeneous equation, Wronskian, Homogeneous equation with constant coefficients - Euler's equi-dimensional equation - Method of variation of parameters - Operator methods for finding particular solutions.

Unit 4: Laplace Transforms (9)

Laplace Transform - Inverse Laplace transform - Convolution theorem - applications to solve Integral equations and ordinary differential equations.

Unit 5: Partial Differential Equations (9)

Definition and formulation of partial differential equations - Eigen values and Eigen functions-method of separation of variables, one dimensional wave equation; One dimensional heat flow, solution of the heat equation.

Course Outcomes:

At the end of the course the student should be able to

1. Solve the system of linear equations and analyze applications of matrices in various fields and obtain Eigen values and Eigenvectors.
2. Understand and solve first order ordinary differential equations.
3. Apply the knowledge of identifying, formulating and solving engineering problems represented by second order differential equations.
4. Analyze the Fourier series and apply partial differential equations for solving boundary value problems in engineering.
5. Represent the relevant engineering system into pertinent partial differential equation, solve it and interpret the results.

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42^{nd} Edition, 2012.
2. Simmons G.F., Differential Equations with Applications and Historical Notes, Tata McGraw Hill Edition 2003, Eighteenth reprint 2010.

Reference Books:

1. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
2. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press, Reprint 2005.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

20PHY101 ENGINEERING PHYSICS

L	T	P	C
3	1	0	4

Course Prerequisite: Plus two level physics course

Course Description: Engineering Physics for Civil and Mechanical Engineers is a physics course which provides fundamental knowledge to understand the concepts of mechanics, waves and oscillations, interference, diffraction, polarization, lasers and fiber optics.

Course Objectives:

1. Expose students to the fundamental principles and laws of mechanics in Physics to understand the types of motion.
2. Demonstrate the ability to identify and apply the appropriate analytic, numerical, and mathematical reasoning, to situations of the physical world.
3. Analyze the concepts of mechanics, oscillations, waves and optics to prepare the students for advanced level courses.
4. Expose students to theoretical and mathematical aspects of interference and diffraction of light for testing of materials.
5. Adaptability to new developments in science and technology.

UNIT I: MECHANICS OF PARTICLES

Vectors, Algebra of vectors Velocity and Acceleration, Motion in one dimension, several dimensions, formal solution of kinematical equations. Polar Co-ordinates, velocity and acceleration in polar coordinates. Newton's Laws, applications of Newton's laws (Constraint equations, Block on string, Conical Pendulum, Block and Wedge). **(11)**

UNIT II: MOMENTUM & WORK ENERGY

Momentum, law of conservation of linear momentum, flow of mass, Rocket Equation, Rocket in free space and in a gravitational field. Integrating equation of motion in one-dimension-work energy theorem, orbital velocity and escape velocity, Potential energy, Potential energy of a uniform force field, potential energy of an inverse square force, stability, conservation laws and particle collisions. **(12)**

UNIT III: WAVES AND OSCILLATIONS

Simple Harmonic Motion, damped harmonic oscillations, forced harmonic oscillations, resonance, and quality factor. Superposition of vibrations along same direction (equal frequency) and in perpendicular directions, Lissajous figures.

Transverse waves, solution of wave equation, velocity of a transverse wave along a stretched string, modes of vibration of stretched string, reflection and transmission waves at boundary, standing waves, standing wave ratio. **(12)**

UNIT IV: OPTICS

Superposition of waves, interference of light by division of wavefront - Young's double slit experiment, interference of light by division of amplitude- interference in thin film by reflection, Newton's rings experiment.

Diffraction, Farunhofer diffraction due to single slit, double slit and Diffraction grating (N-slit).

Polarization, Types of polarization, Polarization by reflection, refraction and double refraction, Nicol's prism. Half wave and Quarter wave plates **(13)**

UNIT V: LASERS & FIBER OPTICS

Introduction to lasers, characteristics of laser, spontaneous and stimulated emission, Einstein's coefficients; population inversion, excitation mechanisms, solid-state lasers – ruby laser, gas lasers - He-Ne Laser, applications of lasers.

Fiber Optics: Principle, Construction and working of optical fiber, Acceptance angle, Numerical aperture, Types of fiber, Fiber optic communication system. **(12)**

Course Outcomes:

Upon successful completion of this course, the students should be able to:

1. Describe and explain the fundamental physical principles and laws of Mechanics in Physics.
2. Explain the concepts conservation of momentum, energy, and predict the future state of a system based on its present state.
3. Apply the physical principles of waves together with logical and mathematical reasoning, to situations of the physical world of vibrations.
4. Define and evaluate the fundamentals of materials testing using Interference, Diffraction & Polarization techniques.
5. Acquire the basic knowledge of lasers and fiber optics.

Text Books:

1. An Introduction to Mechanics by D. Kleppner and R. Kolenkow, Tata McGraw-Hill Edition, 2007.
2. Engineering Physics by Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, S. Chand and Company
3. Engineering Physics by K. Thyagarajan, McGraw Hill Publishers

Reference Books:

1. Physics Vol I & II, Halliday/Resnick/Krane 5th Edition, John Wiley, 2003.
2. Concepts of Modern Physics by Arthur Beiser, 7th Edition, 2017
3. Engineering Mechanics, 2nd ed. — MK Harbola
4. Introduction to Mechanics — MK Verma
5. Theory of Vibrations with Applications — WT Thomson

Mode of Evaluation: Assignment, Mid term examinations, and External End Examination.

20EEE101 BASIC ELECTRICAL ENGINEERING

L	T	P	C
3	1	0	4

Course Prerequisite: Intermediate Physics

Course Description:

This course equips the students with a basic understanding of Electrical circuits and machines for specific applications. In specific, the course covers basic of DC circuit & its analysis, introduction to single-phase and three-phase AC Systems, magnetic materials, transformers, DC & AC electrical machines, basic converters and Components of LT Switchgear.

Course Objectives:

1. To learn the basics of the D.C. circuit analysis.
2. To have an idea about single-phase and three-phase A.C. electrical circuits.
3. To gain knowledge about basic magnetic material and transformers.
4. To learn the construction and operation of D.C. and A.C. machines.
5. To understand the operation of basic rectifiers and various components of LT Switchgear.

UNIT I: DC CIRCUIT ANALYSIS

Electrical circuit elements, voltage and current sources, Series and parallel resistive circuits, Kirchhoff's current and voltage laws, Nodal and Mesh analysis of simple circuits with dc excitation. Source Transformation, Star-Delta Transformation, Superposition Theorem.

(12)

UNIT II: AC CIRCUIT ANALYSIS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations. Three phase balanced circuits, voltage and current relations in star and delta connections.

(12)

UNIT III: MAGNETIC MATERIALS AND TRANSFORMERS

Magnetic materials, B-H characteristics, ideal and practical transformer, principle of operation, emf equation, equivalent circuit, losses in transformers, regulation and efficiency.

(12)

UNIT IV: DC AND AC MACHINES

Construction, working, emf equation of DC generator, methods of excitation, speed control of dc motor. Introduction to different types of AC motors, Three Phase Induction Motors - Generation of rotating magnetic fields, construction, working and starting methods: D.O.L, Autotransformer starter. Introduction to Alternators.

(12)

UNIT V: RECTIFIERS AND ELECTRICAL INSTALLATIONS

PN junction diode, half wave, full wave and bridge rectifiers. Components of LT Switchgear: switch fuse unit (SFU), MCB, ELCB, MCCB, types of wires and cables – Current carrying capability, Insulation Strength; Earthing.

(12)

Course Outcomes:

Upon successful completion of the course, students will be able to

1. To understand and analyze basic DC electric circuits.
2. To measure and analyze various electrical quantities of single phase and three AC electric circuits.
3. To understand magnetic materials and to analyze the transformers.
4. To study the working principles of electrical machines.
5. To create power converters for domestic applications with LT switchgear.

Text Books:

1. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
2. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
3. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
4. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
5. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

References:

1. Abhijit Chakrabarti, “Circuit Theory : Analysis and Synthesis”, Dhanpat Rai & Co., 2014
2. J.B. Gupta, “Theory & Performance of Electrical Machines”, S. K. Kataria & Sons, 2013.
3. John Bird, “Electrical Circuit Theory and Technology”, Fourth edition, Elsevier Ltd., 2010.

Mode of Evaluation: Assignments, Internal Mid Examinations, External End Examination.

20CSE102 C PROGRAMMING AND DATA STRUCTURES

Course Prerequisite: 20CSE101

L	T	P	C
3	**0**	**0**	**3**

Course Description:
This course includes C program basics, control structures, arrays, files, pointers and data structures.

Course Objectives:
1. To make the student understand fundamentals of C programming language and problem solving.
2. To understand the syntax and semantics of C programming language.
3. To develop algorithms for sorting, searching techniques.
4. To design and implement operations on stack, queue, and linked list.

UNIT I - INTRODUCTION TO C PROGRAMMING
Structure of C Program, C Tokens: Variables, Data types, Constants, Identifiers, key words and Operators, Expressions.
Control Structures: Conditional Statements (Simple if, if-else, Nested -if-else, Switch). Iterative Statements (for, While, Do-While), Jump Statements (break, Continue). **(9)**

UNIT II - FUNCTIONS & ARRAY
Functions Introduction, User defined function, Function prototype, Function Definition and Function Call, Storage classes, Recursion **Arrays**: Defining an array, processing an array, one dimensional arrays, two dimensional arrays. Passing array as an argument to function. **Sorting:** Bubble Sort, Insertion Sort, selection sort. **Searching:** Linear and binary search. **(9)**

UNIT III STRINGS & POINTERS
Strings: Declaring and defining a string, Initialization of strings, Strings Library functions.
Pointers: Fundamentals of pointer, Pointer Declarations, Parameter passing: Pass by value, Pass by reference, Dynamic memory allocation. **(9)**

UNIT IV - STRUCTURES & FILES
Structures: Defining a structure, processing a structure, Pointer to Structure, Unions. **Files**: Opening and closing a data file, Reading and Writing a data file, File I/O Functions. **(9)**

UNIT IV - DATA STRUCTURES
Stack: stack operations, stack implementations using arrays. **Queue**: queue operations, queue implementations using array, Applications of stack and queue. **Linked List**: Single linked list operations. **(9)**

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Understand fundamentals of C programming language and its constructs.
2. Design and implement applications using functions, arrays, sorting and searching techniques.
3. Design and implement applications using strings and pointers.
4. Design and implement applications using structures and File processing.

5. Choose appropriate linear data structure depending on the problem to be solved.

Text Books:

1. The C Programming Language, Brian W. Kernighan and Dennis M. Ritchie, 2nd Edition, Prentice Hall, India 1988.
2. Alfred V. Aho, John E. Hopcroft and Jeffry D. Ullman, Data Structures and Algorithms, Pearson Education, New Delhi, 2006.

References:

1. Let us C, Yashavant Kanetkar, 15th Edition, BPB Publications, 2016.
2. Problem Solving & Program Design in C, Hanly, Jeri R and Elliot. B Koffman, Pearson Education,5th edition, 20007.
3. K. N. King ,"C Programming ": A Modern Approach, 2nd Edition 2nd Edition
4. Byron Gottfried , Jitender Chhabra , Programming with C (Schaum's Outlines Series)

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20ENG201 ENGLISH FOR PROFESSIONAL PURPOSES LABORATORY
(Common to all branches)

L	T	P	C
0	0	2	1

Course Prerequisite: None

Course Description:

English language communication is a social phenomenon and students need to be able to function in the society at large as the communicators before entering the professional world. The present course equips the students with the basic functions of English language communication, which are required not only in their day-to-day lives but also profoundly significant for their future professional, academic training and their careers in the industry. The course mainly focuses on the achievement of communicative proficiency of the students coupled with the necessary linguistic inputs.

Course Objectives: This course enables the student to –

1. Get aquatinted with the basic communicative functions.
2. Engage effectively in learning various functions of English language communication.
3. Enhance their narration abilities in past experiences and future plans and goals /events.
4. Develop their abilities in expressing opinion.
5. Provide speaking practice in speech.

Course contents:

Greeting and Introductions (L & S)
- Greeting on different occasions and responding to greetings **(L & S)**
- Wishing on various occasions, taking leave and saying goodbye **(L & S)**
- Introducing oneself and others **(L & S)**
- Asking for introduction and responding to introduction **(L & S)**
- Developing a short personal profile **(R &W)**

Describing: (L, S, R & W)
- Using adjectives **(Vocab)**
- Degrees of comparison **(Grammar)**
- Common words, phrases, and expressions used for description **(Vocab)**
- Describing people, places and objects **(L, S, R & W)**
- Reading and writing descriptive paragraphs **(R &W)**

Narrating (L, S, R & W)
- Talking about past experiences and events **(L & S)**
- Talking about memorable incidents or events **(L & S)**
- Techniques of narration and narrative tenses **(Grammar)**
- Composing and narrating a story **(R &W)**

Planning and Predicting (L, S, R & W)
- Talking about future events **(L & S)**
- Making promises and giving assurances **(L & S)**
- Predicting future events **(L & S)**
- Writing and organising a short plan of an event **(R &W)**

Instructions and directions (L, S, R & W)

- Forming imperative sentences (Grammar)
- Reading and writing short instruction manuals **(R &W)**
- Writing a recipe/ procedure **(R &W)**
- Giving directions

Enquiring: (L, S, R & W)

- Open and closed ended questions **(Grammar)**
- Asking for information and giving information **(L & S)**
- Telephonic enquiry **(L & S)**
- Official enquiries through emails and letters **(R &W)**

Requesting: (L, S, R & W)

- Polite expressions
- Modal verbs and key phrases for requesting **(Grammar and vocab)**
- Official requests through emails and letters **(R &W)**

Comparing and contrasting: (L, S, R & W)

- Words and phrases used for comparison and contrast **(Vocab)**
- Comparing qualities/properties/quantities of people, places and objects **(L & S)**
- Composing comparison and contrast paragraphs **(R &W)**

Expressing opinion: (L, S, R & W)

- Language expressions used for expressing opinions **(Vocab)**
- Developing opinion based paragraphs **(R &W)**
- Discourse markers and linkers used in opinion based paragraphs **(R &W)**

Public Speaking: (L, S, R & W)

- Techniques and strategies required for public speaking **(L & S)**
- Developing and organising a short speech **(R &W)**
- Presentation skills required for public speaking **(L & S)**

Course Outcomes: At the end of the course, learners will be able to—

1. Develop their confidence while giving introduction, describing a place, & giving directions. (3,4,5)
2. Use various functions of English like asking for & giving information**,** inviting people for events/occasions, & requesting people. (3,4,5)
3. Narrate the past experiences and events in speaking and wring (3,4,5)
4. Express their views and opinions logically and appropriately in spoken and written format. (3,4,5, 6)
5. Deliver logically organized speeches and present them without hesitations. (3,4,5, 6)

Suggested Reading/Textbooks:

1. Leo Jones; Functions of English, Published by: Cambridge University Press.
2. Leo Jones; Let’s Talk Level 1, 2, 3, Published by: Cambridge University Press.
3. Adrian Doff, Craig Thaine, Herbert Puchta, et al; *Empower: Intermediate (B1+)*; Published by: Cambridge University Press.

References:

1. AJ Thomson & AV Martinet; *A Practical English Grammar*; Oxford University Press, 2015.
2. Raymond Murphy; *English Grammar in Use with CD*; Cambridge University Press, 2013.
3. K.S. Yadurajan; *Modern English Grammar*; Oxford University Press, 2014.
4. William Strunk Jr; *The Elements of Style*; ITHACA, N.Y.; W.P. HUMPHREY, 2006.

5. Joseph Devlin; *How to Speak and Write Correctly*; ITHACA, N.Y.; W.P. HUMPHREY, 2006
6. Anjana Agarwal; *Powerful Vocabulary Builder*; New Age Publishers, 2011.
7. *Writing Tutor*; Advanced English Learners' Dictionary; Oxford University Press, 2012.
8. *www.cambridgeenglish.org/in/*
9. https://learnenglish.britishcouncil.org/en/english-grammar
10. https://www.rong-chang.com/

Mode of Evaluation: External Lab Exam

20PHY201 PHYSICS LABORATORY

L	T	P	C
0	0	3	1.5

Course Description:

Physics Practical course is meant for making the students to gain practical knowledge to co relate with the theoretical studies. It covers experiments on Principles of Mechanics and Optics, Measurement of Magnetic field and studying Resonance using LCR Circuit.

Course Objectives:

1. Elucidate the concepts of Physics through involvement in the experiment by applying theoretical knowledge.
2. Illustrate the basics of mechanics, waves and optics to analyze the behavior and characteristics of various materials for its optimum utilization.
3. Develop an ability to apply the knowledge of physics experiments in the later studies.

LIST OF EXPERIMENTS: {Out of 17 experiments any 12 experiments (minimum 10) must be performed in a semester}

1. Spring constant - Coupled Pendulums.
2. Study of resonance effect in series and parallel LCR circuit.
3. Determination of radius of curvature of a curved surface - Newton's Rings.
4. Wavelength of a laser - Diffraction Grating
5. Wavelength of the spectral lines - Diffraction Grating.
6. Magnetic field along the axis of a current carrying coil - Stewart Gees' Apparatus
7. Thickness of a given wire - Wedge Method.
8. Dispersive power of prism – Spectrometer.
9. Frequency of the tuning fork - Melde's apparatus.
10. Determination of particle size using Laser.
11. Width of single slit - Diffraction due to Single Slit.
12. Torsional Pendulum.
13. Determination of the numerical aperture of a given optical fiber and hence to find its acceptance angle.
14. Measurement of *e/m* of electron (Thomson's method)
15. Energy gap of a material of p-n junction.
16. Determination of Planck's constant.
17. Ferroelectric hysteresis (B-H Curve).

Course Outcomes:

Upon successful completion of this course, the students should be able to:

1. Apply the scientific process in the conduct and reporting of experimental investigations.
2. Understand measurement technology, usage of new instruments and real time applications in engineering studies.

3. Verify the theoretical ideas and concepts covered in lecture by doing hands on in the experiments.
4. Know about the characteristics of various materials in a practical manner and gain knowledge about various optical technique methods.
5. Acquire and interpret experimental data to examine the physical laws.

Reference Books:

1. Physics Laboratory Manual
2. Optics, A. Ghatak, 4th Edition, Tata McGraw-Hill, New Delhi 2011.
3. Fundamentals of Optics, F. A. Jenkins and H. E. White, 4th edition, McGraw-Hill Inc., 1981.
4. Engineering Mechanics, 2nd ed. — MK Harbola
5. Introduction to Electrodynamics- David J Griffiths

Mode of Evaluation: Continuous Internal Evaluation, Practical End Examination.

20EEE201 ELECTRICAL ENGINEERING LABORATORY

L T P C
0 0 3 1.5

Course Prerequisite: None

Course Description:

The laboratory facilitates the students to deal with electrical instruments, which further strengthen the concepts & operation of various AC & DC circuits, and machines, and their characteristics. The lab also reinforce the concepts discussed in class with a hands-on approach which enable the students to gain significant experience with electrical instruments such as ammeter, voltmeter, digital multimeter, oscilloscopes, tachometer, switches, fuses and power supplies.

Course Objectives:

1. To provide hands on experience in setting up simple electrical circuits (DC and AC).
2. To get exposure to handle different electrical equipment's.
3. To measure various electrical parameters with different measuring instruments.
4. To get hands on experience in operating DC and AC machines.
5. To understand the operation of basic converters and various components of LT Switchgear.

LIST OF LABORATORY EXPERIMENTS/DEMONSTRATIONS:

DEMONSTRATIONS:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, wattmeter, multi-meter, oscilloscope. Study of passive components - resistors, capacitors and inductors.
2. Demonstration of voltage and current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). In star and delta connections.
3. Demonstration of cut-out sections of transformer and DC & AC machines.
4. Demonstration of induction machine. Motor operation and generator operation of an induction machine driven at super-synchronous speed.
5. Familiarization of (i) different types of cables/wires and switches and their uses, (ii) different types of fuses & fuse carriers; MCB, ELCB, MCCB their ratings and uses (components of LT switchgear).

EXPERIMENTS:

1. Wiring of a simple circuit for controlling (1) a lamp/fan point, (2) Staircase or Corridor Winding.
2. Wiring of a power circuit for controlling an electrical appliance (16A Socket).
3. Verification of Kirchhoff's current and voltage laws (KCL & KVL).
4. Verification of superposition theorem
5. Sinusoidal steady state response of R-L, and R-C circuits (impedance calculation and verification).
6. Measurement of voltage, current and power in a single-phase circuit using voltmeter, ammeter and wattmeter. Also, calculate the power factor of the circuit.
7. Measurement of active power for star and delta connected balanced loads (single wattmeter method).
8. Open-circuit and short-circuit test on a single-phase transformer.
9. Speed control of separately excited DC motor.

10. Wiring of a power distribution arrangement using single-phase MCB distribution board with ELCB, main switch and energy meter (or residential house wiring).
11. Regulated power supply for generating a constant DC Voltage.
12. Fabrication of a given electronic circuit on a PCB and test the same.

Course Outcomes:
Upon successful completion of the course, the students are expected to
1. Get an exposure to common electrical components and their ratings.
2. Make electrical connections by wires of appropriate ratings.
3. Understand the usage of common electrical measuring instruments.
4. Understand the basic characteristics of transformers and electrical machines.
5. Get an exposure to the working of various power electronic converters.

Mode of Evaluation: Continuous Internal Evaluation, Practical Examination

20CSE201 C PROGRAMMING AND DATA STRUCTURES LABORATORY

Course Prerequisite: 20CSE101

L	T	P	C
0	**0**	**3**	**1.5**

Course Description:
This course includes C program basics, control structures, arrays, files, pointers and data structures.

Course Objectives:
1. To make the student understand fundamentals of C programming language and problem solving.
2. To get hands-on practices with the syntax and semantics of C programming language.
3. To develop algorithms for sorting, searching techniques.
4. To design and implement operations on stacks, queues, and linked lists.

LIST OF EXPERIMENTS

1. a) Write a C program to swap the two numbers.
   b) Write a C Program to find the eligibility of admission for a Professional course based on the following criteria:
      i. Marks in Maths >=65
      ii. Marks in Physics >=55
      iii. Marks in Chemistry>=50
      OR
      iv. Total in all three subject >=180

2. a) Write a C program to compute the factorial of a given number.
   b) Write a program that reads numbers which are in the range 0 to 100, till it encounters -1. Print the sum of all the integers that you have read before you encountered -1.

3. a) Write a C program to accept a coordinate point in a XY coordinate system and determine in which quadrant the coordinate point lies.
   b) The digital root (also called repeated digital sum) of a number is a single digit value obtained by an iterative process of summing digits. Digital sum of 65536 is 7, because 6+5+5+3+6=25 and 2+5 = 7.Write a program that takes an integer as input and prints its digital root.

4. a) Write a C program to find the series of prime numbers in the given range.
   b) Write a C program to generate Tribonacci numbers in the given range.

5. a) Write a C program to find sum of digits, Decimal to Binary conversion, reversal of numbers using functions.
   b) Write a C program to find Factorial, Greatest Common Divisor, and Fibonacci using recursion.

6. Your program should take as input: dimension of a square matrix N, two matrices of size N x N with integer values, and one operator symbol (+, - ,*). It must perform the corresponding operation given below;
   a) Matrix Addition b) Matrix Subtraction c) Matrix Multiplication

7. Implement the following sorting techniques.
   a) Bubble sort b) Insertion sort c) Selection sort.

8. Implement the following searching techniques.
   a) Linear Search b) Binary Search

9. a) Write a program in C to find the frequency of characters in a string.
   b) Write a C program to implement all string operations (string length, string copy, string compare, string concatenation and string reverse) without using string library functions.
10. a) Write a C program to get *N* elements in an array and sort it using Pointer.
    b) Write a C program to swap two integers using pass by reference.
    c) Write a C program to find the largest element using Dynamic Memory Allocation.

11. a) Write a program in C to count the number of vowels, consonants, digits, special symbols, words in a string using a pointer.
    b) Write a C program to print all permutations of a given string using pointers.

12. a) Write a C program to add two distances in the inch-feet system using structures.
    b) Write a C program to calculate difference between Two Time Periods (in *Hours, Minutes, Seconds* format) using structures.

13. Develop an application to match parenthesis of a given expression using Stack.

14. Develop an application to identify Palindrome string using Stack and Queue.

15. Develop an application to add two Polynomial equations using Linked List.

Course Outcomes:
Upon successful completion of the course, students will be able to
1. Understand fundamentals of C programming language and its constructs.
2. Design applications using functions, arrays, sorting and searching techniques.
3. Design and implement solutions using strings and pointers.
4. Design and develop solutions using structures and File processing.
5. Design and develop applications on stack, queue, and linked list depending on the problems to be solved.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination.

B.Tech. II Year-I Semester

20HUM101 ECONOMICS AND FINANCIAL ACCOUNTING FOR ENGINEERS

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The Engineering Economics and Financial Accounting aims to provide an insight into production, cost analysis, market structure, Accounting Basic concepts and financial Statement Analysis. The course is designed to give emphasis on the application of real life examples on various fundamental issues of economics and accounts. This course introduces the accounting system, principles, types of accounts, and financial statements etc. The ratio analysis and financial analysis are useful to know the positions of financial statements are explained to know the analysis of financial matters.

Course Objectives

The course is intended to

1. Describe the nature of engineering economics in dealing with the issues of scarcity;
2. Know the supply, demand, production and cost analysis to analyze the impact of economic events on markets;
3. Explain the performance of firms under different market structures and Price determination in various market conditions.
4. Explain the accounting principles, types of accounting and preparation of final accounts; and
5. Describe the financial statement analysis and investment evaluation through ratios and capital budgeting techniques.

UNIT I

DEMAND ANALYSIS: Scope and Significance of Economics- Understanding the problem of scarcity and choice - Elements of market Economy: Demand, Supply and Market Equilibrium- Theory of Demand, Elasticity of Demand, Supply and Law of Supply. **(9)**

UNIT II

PRODUCTION AND COST ANALYSIS: Production Function - Production Function - Short-run and long - run production - Cost Analysis: Cost concepts - Cost Structure of Firms and output decision- Break-Even Analysis (BEA) - Managerial significance and limitations of BEA - Determination of Break Even Point (Simple Problems). **(9)**

UNIT III

MARKET STRUCTURE: Classification of Markets - Classification of Markets - General Equilibrium and efficiency of Perfect competition, Monopoly, Monopolistic, Oligopoly, Duopoly - Price determination under various market conditions- Pricing objectives- Methods. **(9)**

UNIT IV

BASICS OF ACCOUNTING: Uses of Accounting - Book Keeping Vs Accounting - Double Entry System - Accounting Principles - Classification Of Accounts - Rules Of Debit & Credit-Accounting Cycle: Journal, Ledger, Trial Balance. Final Accounts: Trading Account - Profit & Loss Account - Balance Sheet with Adjustments, (Simple Problems).. **(9)**

UNIT V

BASICS OF FINANCIAL ANALYSIS: Ratio Analysis - Liquidity, Leverage, Solvency, Activity and Profitability Ratios - Capital Budgeting. (Simple Problems). **(9)**

Course Outcomes

At the end of the course, students will be able to:

1. Understand Engineering economics basic concepts,
2. Analyze the concepts of demand, elasticity, supply, Production, Cost Analysis and its essence in floating of an organization,
3. Compare different market structures and identify suitable market,
4. Demonstrate an understanding and analyzing the accounting statements, and
5. Exhibit the ability to apply knowledge of ratio analysis and capital budgeting techniques in financial statement analysis and investment evaluation respectively.

Text Books

1. Case E. Karl & Ray C. Fair, “Principles of Economics”, Pearson Education, 8th Edition, 2007.
2. Financial Accounting, S.N.Maheshwari, Sultan Chand, 2009.
3. Financial Statement Analysis, Khan and Jain, PHI, 2009.
4. Financial Management, Prasanna Chandra, T.M.H, 2009.

Reference Books

1. Lipsey, R. G. & K. A. Chrystal , “Economics”, Oxford University Press, 11th Edition, 2007.
2. Samuelson P. A. & Nordhaus W. D. “Economics”, Tata McGraw-Hill 18th Edition, 2007.
3. Financial Management and Policy, Van Horne, James,C., Pearson ,2009.
4. Financial Management, I.M.Pandey, Vikas Publications.

Mode of Evaluation: Assignment, Seminar, Written Examination.

20MAT103 NUMERICAL METHODS

L	T	P	C
3	0	0	3

Course Prerequisites: 20MAT101, 20MAT102

Course Description

This course reviews and continues the study of computational techniques for solving system of algebraic and transcendental equations, interpolating the polynomials, evaluating the derivatives, integrals, ordinary differential equations and curve fitting. The course emphasizes on numerical and mathematical methods of solutions.

Course Objectives

1. To introduce computation methods of solving algebraic and transcendental equations.
2. To familiarize the knowledge of interpolation.
3. To avail the basics of numerical techniques in calculus
4. To use numerical methods for solving ordinary differential equations.
5. To introduce the empirical techniques for fitting the various curves.

UNIT I: SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

Introduction-Bisection method - Regula-falsi method - Iterative method - Newton Raphson method, System of Algebraic equations: Gauss Jordan method - Gauss Seidal method. **(9)**

UNIT II: FINITE DIFFERENCES AND INTERPOLATION

Finite differences, Newton's forward and backward interpolation formulae - Lagrange's and Newton's divided difference formulae - Gauss forward and backward formulae, Stirling's formula, Bessel's formula. **(9)**

UNIT III: NUMERICAL DIFFERENTIATION AND INTEGRATION

Formulae for derivatives, Maxima and minima of a tabulated function. Numerical Integration: Trapezoidal rule - Simpson's 1/3 Rule - Simpson's 3/8 Rule **(9)**

UNIT IV: NUMERICAL SOLUTIONS TO ORDINARY DIFFERENTIAL EQUATIONS

Picard's Method - Taylor's series method - Euler's method - Modified Euler's Method - Runge-Kutta Method. **(9)**

UNIT V: CURVE FITTING

Introduction - Graphical method - Principle of least squares - Method of least squares - Fitting of straight line and parabola - Fitting of exponential and power curves. **(9)**

Course Outcomes

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

1. Solve the system of algebraic and transcendental equations.
2. Interpolate the equal and unequal spaced arguments of function.
3. Apply the numerical techniques to find derivatives and integrals in the field of Engineering
4. Find the approximate numerical solutions to ordinary differential equations representing some Engineering problems.
5. Estimate the model parameters using the principles of least squares to a curve of best fit for the experimental observations.

Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42^{th} Edition, 2012.

Reference

1. Curtis F. Gerald, Patrich O. Wheatley, Applied Numerical Analysis, Pearson Education, 7^{th} Edition, 2003.
2. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4^{th} Edition, 2005Burden and Faires, Numerical Analysis 7^{th} ed., Thomson Learning, 2001.
3. Advanced Engineering Mathematics by E. Kreyszig, 10^{th} ed., Wiley, 2010.
4. M.K. Jain, S.R.K. Iyengar and R.K. Jain, Numerical Methods for Scientific and Engineering, New Age International Ltd., 5^{th} Edition, 2010.
5. Applied Numerical Methods with MATLAB for Engineers and Scientists by Steven C. Chapra, 3rd ed., Mc Graw Hill, 2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE101 FUNDAMENTALS OF ENGINEERING MECHANICS

L	T	P	C
2	1	0	3

Course Prerequisites: None

Course Objectives

The course is intended

1. To study the basics of statics of particles and rigid bodies.
2. To understand various support connections and loadings.
3. To analyze trusses for various loading conditions.
4. To study the problems involving ladder, wedge and belt friction.
5. To learn the geometric properties of the different shapes.
6. To study kinematics and kinetics of particles and rigid bodies.

UNIT I

STATICS OF PARTICLES Introduction to Mechanics - System of Units -Laws of mechanics - Lame's theorem - Parallelogram and triangular Law of forces -Resolution of coplanar forces - Free body diagram - Equilibrium of particles

STATICS OF RIGID BODY: Moment of a force - Varignon's theorem - Moments and Couples -Equivalent system of forces - Requirements of stable equilibrium - Equilibrium of Rigid bodies subjected to two, three and four force system. **(9)**

UNIT II: ANALYSIS OF PIN JOINTED TRUSSES

Classification of trusses -Reactions at supports and connections -Types of loading - Reaction for simply supported and over hanging beams - Analysis of Trusses using method of joints and methods of sections (Simply supported beams, cantilever beams) **(9)**

UNIT III: FRICTION

Classification of friction - Laws of friction - Angle of repose -Force required to move a body along horizontal and inclines planes - Analysis of ladder, wedge and belt friction. **(8)**

UNIT IV: CENTROIDS, CENTER OF GRAVITY AND MOMENTS OF INERTIA

Center of Gravity and Centroid - Area and polar moment of inertia - Radius of Gyration -Parallel and Perpendicular Axis Theorems -Mass Moment of inertia - Problems on centroid and area moment of inertia of plane figures and buildup sections. **(9)**

UNIT V: DYNAMICS OF RIGID BODIES

Displacements - Velocity and acceleration - their relationship, relative motion - Curvilinear motion - Kinetics of Particles - Linear and angular momentum - Equations of motion - Energy and momentum methods -Work and energy principle - Equilibrium of rigid bodies in plane motion- D'Alembert's Principle - Impulse momentum for rigid bodies in plane motion. **(10)**

Course Outcomes

At the end of this course, students should be able to

1. Identify force systems for a particle and rigid body under equilibrium, use free body diagram and resolve forces. .
2. Analyze pin jointed trusses.
3. Compute friction force acting at various planes.
4. Determine centroid, center of gravity and moment of inertia of various surfaces and solids.
5. Solve the problems involving kinematics and dynamics of rigid bodies.

Text Books

1. Ferdinand P. Beer, E. Russell Johnston (2010), Vector Mechanics for Engineers: Statics and Dynamics (9^{th} Edition), Tata McGraw-Hill International Edition.

References

1. S. S. Bhavikatti, (2008), Engineering Mechanics, New Age International.
2. Irving H. Shames, (2003), Engineering Mechanics - Statics and Dynamics, PrenticeHall of India Private limited.
3. S. Timoshenko D.H. Young J.V. Rao, SukumarPati, Engineering Mechanics, McGraw Hill Education; 5^{th} edition

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE102 MECHANICS OF FLUIDS

L	T	P	C
3	0	0	3

Course Prerequisites: 20MAT101, 20MAT102

Course Description

Properties of fluids; fundamental laws of fluids in motion; differential and integral expressions for conservation of mass, momentum and energy; applications of conservation laws to solve the transport phenomena involving mass, momentum and energy interactions in a given system, Dimensional analysis and similarity, Flow in pipes.

Course Objectives

1. To provide a basic understanding of the properties and behavior of matter (fluids) by means of analytical equations.
2. To develop an understanding about hydrostatic and dynamics law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
3. To measure the flow using Bernoulli equation, flow through pipes and flow past immersed bodies.
4. To provide a basic knowledge on the importance of dimensional analysis and similarity techniques.

UNIT I :

FLUID PROPERTIES The Concept of a Fluid - Physical Properties of Fluids (Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity: Dynamic and Kinematic Viscosity, Compressibility, Surface tension, Capillary Effect, Vapour Pressure and Cavitation), Newtons law of viscosity, Types of Fluids.

FLUID STATICS Types of Pressure, Pascal's Law, Hydrostatic Law, Pressure Measurement Devices, Pressure Head, Pressure Diagram, Centre of Pressure, Forces on Plane and Curved Surfaces, Buoyancy and Floatation: Archimedes's Principle, Metacentre, Stability of Submerged and Floating Bodies. **(10)**

UNIT II : FLUID KINEMATICS AND DYNAMICS

KINEMATICS: Types of Flows, Stream lines, Equipotential lines, Steak Line, Path Line, Stream Tube, Stream Bundle, Stream Function and Velocity Potential Function, Flow Net- (Properties and Uses), Continuity Equation (3-D Cartesian Form).

DYNAMICS: Forces Acting on Fluid in Motion, Euler's Equation along a Streamline, Bernoulli's Theorem, Limitations , Bernoulli's Applications: Venturimeter (Horizontal andVertical), Orificemeter, Orifices, Time required for Emptying the Tank, Concept of HGL and TEL. **(9)**

UNIT III: PIPE FLOW

Reynold's Experiment, Hazen Poisulle's Equation for Viscous Flow through Circular Pipes, Major and Minor Losses, Concept of Equivalent Pipe, Dupit's Equation , Pipes in Series, Parallel and Syphon **(8)**

UNIT IV : OPEN CHANNEL FLOW

Classification of Flows In Open Channel, Geometric Elements, Chezy's and Manning's Formula, Uniform Flow Computations, Hydraulically Efficient Section (Rectangular, Triangular, Trapezoidal), Depth Energy Relationship in OCF. **(9)**

UNIT V :

GVF: Classification of Channel Slopes, Dynamic Equation of GVF (Assumption and Derivation), Classification of GVF Profiles- Practical Examples, Direct Step Method of Computation of GVF Profiles
RVF: Hydraulic Jump, Conjugate Depth Relationship, Characteristics, Uses and Types of Hydraulic Jump, Hydraulic Jump as an Energy Dissipater.
DIMENSIONAL AND MODEL ANALYSIS: Buckingham's π theorem - model analysis - dimensionless number - scales ratios for distributed models. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Identify the important fluid properties and application of hydrostatic law to determine the forces on plane and curved surfaces.
2. Classify flows and determine the rate of flow through tanks / pipes using discharge measurement devices.
3. Compute the energy losses in pipe flow and understand the concept of equivalent pipe.
4. Identify the types of flows, energy-depth relationship in OCF and design hydraulically most efficient channel sections.
5. Analyze the GVF profiles and compute the energy loss in hydraulic jump and its efficiency as energy dissipating device.

Text Books

1. R.K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Machines (SI Units), Laxmi Publication
2. K Subramanya, "Flow in Open Channels," 5th Edition, McGraw Hill Education.

Reference Books

1. A.K. Jain "Fluid Mechanics" Khanna Publication.
2. Yunus A Cengel and John M Cimbala, "Fluid Mechanics Fundamentals and Applications" (SI Units), Tata McGraw-Hill Education, 3rd Edition, 2017.
3. Frank M White, "Fluid Mechanics", Tata McGraw-Hill, 7th Edition, 2012.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE103 SURVEYING

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

This course is designed to introduce the fundamental concepts of surveying. Different measurement methods such as chain, compass, plane table and leveling and also, the various advanced measuring methods like trigonometric levelling, traverse surveying, and curves is included. Furthermore, in this course introduction to advanced surveying methods like GPS, GIS, introduction to Geodetic Surveying and total station surveying is also included.

Course Objectives

1. To apply knowledge of mathematics, science, and engineering to understand the measurement
2. Techniques and equipment used in land surveying
3. To Prepare the student to plan and conduct field work and application of scientific methodology in handling field samples.
4. To equip the candidate with the art, science and technology of cartography and applications of GIS in Mapping Resources.
5. To develop the skills in surveying and thematic mapping.

UNIT I

INTRODUCTION TO SURVEYING: Definition- Classifications - Basic Principles-Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Errors in linear measurement and their corrections - Obstacles - Traversing – Plotting.
COMPASS AND PLANE TABLE SURVEYING: Compass – Basic principles - Types - Bearing - Systems and conversions- Sources of errors - Local attraction - Magnetic Declination-Dip-Traversing - Plotting - Adjustment of closing error – applications - Plane table and its accessories - Merits and demerits - Radiation - Intersection - Resection – Traversing- sources of errors – applications. **(9)**

UNIT II

LEVELLING: Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of levelling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling – Sources of Errors in levelling- Precise levelling - Types of instruments - Adjustments - Field procedure and it application. **(9)**

UNIT III

THEODOLITE SURVEYING: Theodolite - Types - Description - Horizontal and vertical angles - Temporary and permanent adjustments – Heights and distances– Tangential and Stadia Tacheometry – Subtense method - Stadia constants – Anallactic **(9)**

UNIT IV: CURVES

Elements of simple and compound curves; Method of settingout- Elements of Reverse curve; Transition curve - length of curve - Elements of transition curve; Vertical curves. **(9)**

UNIT V: MODERN FIELD SURVEY SYSTEMS

Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Total Station - Parts of a Total Station - Accessories -Advantages and Applications; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations - Introduction to GIS, different GIS software, basic data types and coordinate systems **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Apply the knowledge, techniques, skills, and applicable tools for surveying activities.
2. Determine the levels of real world boundaries and points.
3. Identify the different types of theodolite surveying at field.
4. Identify different types of curves setting at field.
5. Apply the basics of modern survey instrument for surveying and mapping purpose.

Text Books

1. Surveying and Levelling Parts 1 & 2 by T. P. Kanetkar and S. V. Kulkarni.
2. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House, 2015.

Reference Books

1. Elements of Geomatics by P.R. Wolf.
2. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
3. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011
4. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
5. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
6. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE201 CONSTRUCTION TECHNOLOGY LABORATORY

L	T	P	C
0	**0**	**3**	**1.5**

Course Prerequisites: None

Course Description

The course will provide knowledge and skills of construction material and technologies.

Course Objectives

1. Developing general manual and machining skills in the students.
2. Understand the basic properties of materials.
3. Development of dignity of labor.
4. Understand safety at work place and selection of tools.
5. Team work.

Experiments

1. Setting out of a building: The student should set out a building (single room only) as per the given building plan using tape and cross staff.
2. Construct a wall of height 50 cm and wall thickness 1½ bricks using English bond (No mortar required) - corner portion – length of side walls 60 cm.
3. Computation of Centre of gravity and Moment of inertia of a given rolled steel section by actual measurements.
4. Installation of plumbing and fixtures like Tap, T-Joint, Elbow, Bend, Threading etc;
5. Plastering and Finishing of wall.
6. Application of wall putty and painting a wall.
7. Application of base coat and laying of Tile flooring of one square meter.
8. Centering - materials and methods.
9. Shoring and underpinning - materials and methods
10. Preparation of soil cement blocks for masonry and testing for compressive strength.
11. Preparation of cover blocks for providing cover to reinforcement.
12. Preparation reinforcement details of slab.

Course Outcomes

1. Identify tools and equipment used and their respective functions.
2. Identify different types of materials and their basic properties.
3. Use and take measurements with the help of basic measuring tools/equipment.
4. Select proper tools for a particular operation.
5. Select materials and tools to make a job as per given specification/drawing.

Reference Books

1. Duggal, S.K., Building material, New Age International Publishers, Second Edition.
2. Punmia, B.C, Ashok Kumar Jain and Arun Kumar Jain., Building Construction - Laxmi Publications (P) ltd., New Delhi.
3. Varghese, P.C, Building Construction, Prentice-Hall of India private Ltd, New Delhi.
4. Arora, S.P. and Bindra, S.P., Building Construction, DhanpathiRai Publications.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20CE202 SURVEYING LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisites: Intermediate Mathematics, Physics

Course Description

This course covers practical usage of various surveying instruments for different field measurements like lengths, angles, areas, volumes and elevations.

Course Objectives

1. To Use different surveying instruments for field measurements and apply knowledge to resolve various field challenges through suitable techniques.
2. To understand the differences in the field and office works.
3. To represent field measurements into a document form
4. To Perform calculations in obtaining necessary requirements from the data obtained during field work

LIST OF EXERCISES

1. Survey of an area by chain survey (Closed traverse) & Plotting
2. Chaining across obstacles
3. Determination of distance between two inaccessible points with compass.
4. Surveying of a given area by prismatic compass (Closed traverse) and plotting after adjustment.
5. Radiation method methods by plane table survey
6. Two point and three point problems in plane table survey.
7. Traversing by plane table survey
8. Study of levels and leveling staff
9. Fly leveling (differential leveling)
10. An exercise of L.S. and C.S. and plotting.
11. Check leveling
12. Two exercises on contouring.

LIST OF MAJOR EQUIPMENT

1. Chains, tapes, Ranging rods (2M and 3M), cross staff, arrows
2. Compasses and Tripods, Optical square.
3. Plane tables, Alidade, Plumbing fork, trough compasses.
4. Leveling instruments.

Course Outcomes

The students after completing the course will be able to:

1. Perform surveying of area with various topography and characteristic through chain survey

2. Determine the distance between the two inaccessible points
3. Conduct the survey the given area by plain table
4. Use of leveling instruments for various differential levelling.
5. Draw the contour plot of given area.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

URLs

1. NPTEL `http://nptel.ac.in/courses/105107122/home.htm`
2. Video Lectures, IIT Kanpur
   Online Course `http://freevideolectures.com/Course/98/Surveying`
3. `http://www.aboutcivil.org/surveying-levelling%20II.html`

20CE203 MECHANICS OF FLUIDS LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisites: None

Course Description

The course includes Calibration of flow meters; Bernoulli's apparatus;performance of turbines andpumps; various losses through pipes.

Course Objectives

Students should be able to verify the principles studied in theory by performing the experiments in lab.

LIST OF EXPERIMENTS (any 10 experiments from the list)

1. Determination of Coefficient of discharge for Venturimeter
2. Determination of Coefficient of discharge for Orifice meter.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable headmethod.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Verification of Bernoulli's equation.
8. Impact of jet on vanes
9. Performance test on Pelton wheel turbine.
10. Performance test on Francis turbine
11. Efficiency test on centrifugal pump
12. Efficiency test on reciprocating pump

LIST OF EQUIPMENTS

1. Venturimeter setup
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Pelton wheel and Francis turbines.
10. Centrifugal and Reciprocating pumps.

Course Outcomes

The students after completing the course will be able to:

1. Use flow measurement instruments and notches.
2. Apply Bernoulli's equation to find the losses in pipe and discharge.
3. Perform the test on pumps and turbines to find their efficiency.
4. Prepare reports on the data collected and use graphical techniques to interpret the data.
5. Use pumps and turbines for supply of water and power generation for the benefit of society

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20HUM901 INDIAN CONSTITUTION

L	T	P	C
2	0	0	0

Course Prerequisites: None

Course Objectives

1. To know about Indian constitution;
2. To know about central and state government functionalities in India; and
3. To know about Indian society.

UNIT I: INTRODUCTION

Historical Background - Constituent Assembly of India - Philosophical foundations of the Indian Constitution - Preamble – Fundamental Rights – Directive Principles of State Policy - Fundamental Duties - Citizenship - Constitutional Remedies for citizens. **(6)**

UNIT II: STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT

Union Government - Structures of the Union Government and Functions - President - Vice President – Prime Minister - Cabinet - Parliament - Supreme Court of India - Judicial Review. **(6)**

UNIT III: STRUCTURE AND FUNCTION OF STATE GOVERNMENT

State Government - Structure and Functions - Governor - Chief Minister, Cabinet, State Legislature, Judicial System in States - High Courts and other Subordinate Courts. **(6)**

UNIT IV: CONSTITUTION FUNCTIONS

Indian Federal System, Center-State Relations, President's Rule - Constitutional Amendments –Constitutional Functionaries - Assessment of working of the Parliamentary System in India. **(6)**

UNIT V: INDIAN SOCIETY

Society: Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India Constitutional Remedies for citizens - Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections. **(6)**

Course Outcomes

The students after completing the course will be able to:

1. Understand the functions of the Indian government; and
2. Understand and abide the rules of the Indian constitution.

Text Books

1. Durga Das Basu, "Introduction to the Constitution of India ", Prentice Hall of India, New Delhi.
2. R.C.Agarwal, (1997) "Indian Political System", S.Chand and Company, New Delhi.
3. Maciver and Page, " Society: An Introduction Analysis ", Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, (1997) "Social Stratification in India: Issues and Themes", Jawaharlal Nehru University, New Delhi.

Reference Books

1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, "Indian Political System ", New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.

Mode of Evaluation: Assignments and Mid Term Tests

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B.Tech. II Year-II Semester

20MAT104 PROBABILITY AND STATISTICS FOR ENGINEERS

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20MAT101, 20MAT102

Course Description

This course provides an introduction to probability, distributions and statistics with applications. Topics include: Conditional probability, Random variables, Probability distributions, Joint densities, Bayesian inference, Hypothesis testing, Confidence intervals, Correlation and linear regression.

Course Objectives

1. To revise the elementary concepts of probability and random variables
2. To analyze and interpret basic summary and modeling techniques for Multi-variate data
3. To introduce new techniques for carrying out probability calculations and identifying probability distributions.
4. To understand the foundations for statistical inference involving confidence intervals and hypothesis testing.
5. To analyze the statistical experimental designs

UNIT I: PROBABILITY AND RANDOM VARIABLES

Introduction to Probability, sample space and events, Axioms of probability, theorems on probability, conditional probability, multiplication theorem and independence of events, Bayes theorem.
Random Variables - Types of Random Variables - Probability Mass Function - Probability Density Function- Distribution Function and its properties. Expectation - Properties of Expected Value - Variance - Moment generating function. **(9)**

UNIT II: PROBABILITY DISTRIBUTIONS

DISCRETE DISTRIBUTIONS: Bernoulli trail, Binomial distribution, Poisson approximation to the binomial distribution, Poisson distribution and Hyper geometric distribution - properties.
CONTINUOUS DISTRIBUTIONS: Uniform, Exponential distribution, Gamma distribution, Normal distribution. Normal probability rule and Chebyshev's inequality **(9)**

UNIT III: BI-JOINT DISTRIBUTIONS

Joint Densities and Independence - Marginal Distributions (discrete & continuous)- Expectation and Covariance, Correlation, Conditional densities and Regression, Curves of Regression. **(9)**

UNIT IV: HYPOTHESIS TESTING

Population, sampling, formulation of null hypothesis, alternative hypothesis, level of significance, types of errors and power of the test. Large Sample Tests: Test for single mean, single proportion, difference of means, difference of proportions, Confidence interval for parameters in one sample and two sample problems, t test for single mean, difference of means, test for ratio of variances. **(9)**

UNIT V: ANALYSIS OF VARIANCE AND DESIGN OF EXPERIMENTS

Analysis of Variance: One-way and two-way classifications. Principles experimental design, Randomized Block Design (RBD) and Latin Square Design. **(9)**

Course Outcomes

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

1. Understand the probability concepts and their importance in engineering.
2. Apply discrete and continuous probability distributions to solve various engineering problems.
3. Get an idea about joint density functions, distribution functions to the random variables and analyze the multivariate problems in engineering
4. Perform test of hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.
5. Analyse the statistical experimental designs for various engineering problems.

Text Books

1. J.S. Milton and J.C. Arnold, "Introduction to Probability and Statistics", 4^{th} edition, 2003 Tata McGraw-Hill Publications.
2. Dr.B.S.Grewal, "Higher Engineering Mathematics", Khanna Publications, 42^{nd} Edition.

Reference

1. Sheldon M. Ross: Introduction to Probability and Statistics for Engineers and Scientists, 4^{th} Edition, Elsevier, Academic Press, 2010.
2. Walpole, R.E., Myers R.H., Myer S.L., Ye. K: Probability and Statistics for Engineers and Scientists, 8^{th} ed., Pearson Education, 2008.
3. Johnson, R.A. Miller Freund's: Probability and Statistics, 7^{th} Edition, PHI, 2005.
4. Sheldon Ross: A First Course in Probability, 6^{th} Edition, Pearson Education, 2002.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE104 ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: 20CHE101, 20CE102

Course Description

The course covers demand, quality, treatment and distribution of water along with characterization, collection, low cost treatment of waste water and household drainage. Similarly, air pollution, noise pollution and solid waste management are also included. Further the course also covers basic laboratory

Course Objectives

1. To explain water quality standards, treatment, distribution of water and design of various water treatment units.
2. To analyze the characteristics of wastewater and design various units of sewage treatment system.
3. To design various low cost wastewater treatment system and sludge disposal units.
4. To explain various impacts of air and noise pollution and various methods to control them air and noise pollution
5. To describe about solid waste generation, characterization, impacts and various management techniques

UNIT I: WATER SUPPLY ENGINEERING

Water- Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demands, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs, water treatment plant layout and design of various treatment units. **(9)**

UNIT II: WASTEWATER ENGINEERING

Sewage- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage – quality requirements for various purposes. **(9)**

UNIT III: LOW COST WASTEWATER AND SLUDGE TREATMENT

Working principle of oxidation ponds, oxidation ditches, design of - septic tanks, soak pits and Imhoff tanks, Sludge characterization, sludge thickening, sludge digestion, factors affecting sludge digestion, Biogas recovery, various methods of sludge conditioning, dewatering and disposal. **(9)**

UNIT IV: AIR AND NOISE POLLUTION

Air - Composition and properties of air, urban air pollution, Air quality standards, Measures and major equipment for air pollution control, Noise - Basic concept, measurement and various noise control methods. **(9)**

UNIT V: SOLID WASTE MANAGEMENT

Solid waste management-Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Effects of solid waste on environment: effects on air, soil, water surface and ground, health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle, Disposal methods. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Estimate water demand and design various units of surface water treatment plant
2. Estimate sewage generation and perform basic design of the unit operations that are used in sewage treatment.
3. Explain various low cost wastewater and sludge treatment techniques
4. Describe the impacts of air and noise pollution and review various air and noise pollution control methods
5. Discuss about the impacts of solid waste and various solid waste management techniques

Text Books

1. Garg, S. K., Water Supply Engineering, Khanna Publishers, 2008.
2. Garg, S. K., Sewage Disposal and Air Pollution Engineering, Khanna Publishers, 2008.
3. Rao M and Rao H. V. N. Air Pollution, McGraw Hill Education, 2017.
4. Jagbir Singh and Ramanathan A. L., Solid Waste Management: Present and Future Challenges, I K International Publishing House Pvt. Ltd., 2009
5. Advanced Air and Noise Pollution Control

Reference Books

1. Birdie, G.S, Birdie, J.S., Water supply and sanitary Engineering, Including Environmental Engineering, Water and Air Pollution Laws and Ecology, Dhanpat Rai Publications, 1996.
2. Punmia, B.C, Ashok Kr Jain, Arun Kr Jain., Waste Water Engineering, Laxmi Publications, 1998.
3. Peavy, H., Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985
4. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
5. Metcalf & Eddy, Wastewater Engineering Treatment and Dispose, McGraw Hill Publication

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE105 ENGINEERING HYDROLOGY

L	T	P	C
3	0	0	3

Course Prerequisites: 20MAT104, 20CE102

Course Description

The course covers Hydrological cycle, Measurement of precipitation and various losses, Infiltration, Evaporation, Runoff and its measurement, Stream Flow Measurement, Hydrographs, Concept of Unit Hydrographs and its use in practical field, Estimation and Prediction of Floods, Wells and aquifers, well discharge.

Course Objectives

1. To introduce the basics/fundamentals of hydrological cycle, precipitation, runoff, evaporation and other losses,
2. To introduce the concepts of Hydrographs and their use.
3. To measure and predict runoff and flood
4. To understand the concepts in flood and well hydraulics

UNIT I: HYDROLOGIC CYCLE AND PRECIPITATION

Introduction - hydrologic cycle - watershed and water-budget equation - history of hydrology - world water balance - applications in engineering,
Precipitation - forms of precipitation - characteristics of precipitation in India - measurement of precipitation - rain gauge network - mean precipitation over an area - depth-area-duration relationships - maximum intensity/depth-duration-frequency relationship - Probable Maximum Precipitation (PMP) - rainfall data in India. **(9)**

UNIT II: ABSTRACTION FROM PRECIPITATION

Eaporation process - evaporimeters - evapotranspiration - measurement of evapotranspiration - evapotranspiration equations - potential evapotranspiration over India - actual evapotranspiration - interception - depression storage - infiltration - infiltration capacity - measurement of infiltration - modelling infiltration capacity - classification of infiltration capacities - infiltration indices. **(9)**

UNIT III

RUNOFF MEASUREMENT-Surface Runoff Models - SCS-CN method of estimating runoff volume - flow-duration curve - flow-mass curve,
STREAM FLOW MEASUREMENT: Measurement of Stage and Velocity - Direct and Indirect methods - Stage-Discharge relationships-Rating curve - Extrapolation of rating curve.
HYDROGRAPHS: hydrograph - factors affecting runoff hydrograph - components of hydrograph - base flow separation - effective rainfall - unit hydrograph - S-Curve - Instantaneous UH - Synthetic UH. **(9)**

UNIT IV: FLOODS

FLOOD ESTIMATION: Flood Estimation by Rational method - empirical method - Unit Hydrograph Method - Flood frequency studies: Gumbel's method - Log-Pearson Type III Distribution
FLOOD HYDRAULICS: Basic Equations - Flood Routing-Reservoir routing - Channel routing - Hydrologic Storage Routing - Attenuation - Hydrologic Channel Routing - Muskingum Method - Runge Kutta Method **(9)**

UNIT V: WELL HYDRAULICS

Well Hydraulics: Introduction-Forms of Subsurface water - Aquifer Properties - Compressibility - Equation of Motion - Wells - Steady flow into well - Unsteady flow in a confined aquifer - Well Losses - Specific capacity - Ground water recharge **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Estimate the areal average precipitation over the basin using the knowledge of hydrological cycle.
2. Identify losses and calculate runoff excluding the initial losses.
3. Measure runoff and stream flow, use hydrograph to estimate runoff.
4. Estimate flood using flood routing techniques.
5. Estimate ground water flow under various circumstances.

Text Books

1. V. T. Chow, D. R. Maidment, and L. W. Mays; Applied Hydrology, McGraw Hill International Editions

Reference Books

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc- Graw Hill.
3. G L Asawa, Irrigation Engineering, Wiley Eastern
4. L W Mays, Water Resources Engineering, Wiley.
5. J D Zimmerman, Irrigation, John Wiley & Sons
6. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE106 CONCRETE TECHNOLOGY

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

This course covers ingredients of concrete and admixtures,properties of fresh concrete and hardened concrete, testing of hardened concrete and mix design. The course further covers special concretes used in construction industry.

Course Objectives

1. The main aim of this course is to explain properties of ingredients of concrete admixtures and procedures for testing concrete ingredients.
2. To make the student to understand fresh and hardened characteristics of concrete and also to enable the students to identify different mix design procedures and produce concrete mix proportions.
3. To explains the characteristics of emerging concretes.

UNIT I

CEMENTS & ADMIXTURES: Portland cement - chemical composition - Hydration, Setting of cement - Structure of hydrate cement - Test on physical properties - Different grades of cement - Admixtures - Mineral and chemical admixtures.
AGGREGATES: Classification of aggregate - Particle shape & texture - Bond, strength & other mechanical properties of aggregate - Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate - Bulking of sand - Deleterious substance in aggregate - Soundness of aggregate - Alkali aggregate reaction - Thermal properties - Sieve analysis - Fineness modulus - Grading curves - Grading of fine & coarse Aggregates - Gap graded aggregate - Maximum aggregate size. **(9)**

UNIT II

FRESH CONCRETE: Workability - Factors affecting workability - Measurement of workability by different tests - Setting times of concrete - Effect of time and temperature on workability - Segregation & bleeding - Mixing and vibration of concrete - Steps in manufacture of concrete - Quality of mixing water.
HARDENED CONCRETE: Water / Cement ratio - Abram's Law - Gel space ratio - Nature of strength of concrete - Maturity concept - Strength in tension & compression - Factors affecting strength - Relation between compression & tensile strength - Curing.. **(9)**

UNIT III

TESTING OF HARDENED CONCRETE: Compression tests - Tension tests - Factors affecting strength - Flexure tests - Chemical analysis of hardened concrete.
ELASTICITY, CREEP & SHRINKAGE: Modulus of elasticity - Dynamic modulus of elasticity - Posisson's ratio - Creep of concrete - Factors influencing creep - Relation between creep & time -Nature of creep - Effects of creep - Shrinkage - types of shrinkage.. **(9)**

UNIT IV

MIX DESIGN: Factors in the choice of mix proportions - Durability of concrete - Quality Control of concrete - Statistical methods - Acceptance criteria - Proportioning of concrete mixes by various methods - methods of mix design.. **(9)**

UNIT V

SPECIAL CONCRETES: Light weight aggregates - Light weight aggregate concrete - Cellular concrete - No-fines concrete - High density concrete - Fibre reinforced concrete - Different types of fibers - Factors affecting properties of F.R.C - Applications - High performance concrete - Self consolidating concrete - SIFCON.. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Identify different properties of concrete ingredients and estimate the properties through various test procedures.
2. Explain the basic characteristics of fresh and hardened concrete
3. Test the mechanical properties of hardened concrete.
4. Design the concrete mix as per various international codes.
5. Explain the characteristic and applications of special concrete.

Text Books

1. Neville, A.M., Properties of Concrete, Low priced Edition, 4th edition.
2. Shetty, M.S., Concrete Technology, S.Chand & Co, 2004.

Reference Books

1. Gambhir, M.L., Concrete Technology, Tata Mc. Graw Hill Publishers, New Delhi.
2. Santha Kumar, A.R., Concrete Technology, Oxford university Press, New Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE107 STRENGTH OF MATERIALS

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101

Course Description

This course covers simple stresses and strains, shear force and bending moment for determinate beams, flexural and shear stresses. Furthermore, this course includes principal stresses and strains, torsion of circular shafts, direct and combined stresses, columns and struts.

Course Objectives

1. To understand the nature of stresses and strains developed in simple geometries
2. To understand the concepts of failure modes of columns and its strength
3. To understand concept of flexural and shear stresses
4. To understand the effect of torsion on shafts, combined stresses and strains
5. To understand the deflection of various types of beams subjected to different loading conditions

UNIT I : SIMPLE STRESSES AND STRAINS

Concept of stress and strain- Types of stresses and strains- St. Venant's principle, Elasticity and plasticity - Hooke's law - Stress - Strain diagram for mild steel - Working stress - Factor of safety - Lateral strain, Poisson's ratio and volumetric strain - Elastic moduli and the relationship between them - Bars of varying section - composite bars - Temperature stresses. Strain Energy - Resilience - Gradual, sudden, impact and shock loadings - simple applications. **(9)**

UNIT II : SHEAR FORCE AND BENDING MOMENT AND COLUMNS AND STRUTS

SHEAR FORCE AND BENDING MOMENT: Concept of Shear Force (SF) and Bending Moment (BM) - SF and BD diagrams for Cantilever and Simply supported and Overhanging beams (One side and both sides) under point load(s) (Vertical and Inclined), part and whole Uniformly Distributed Load(s), Uniformly Varying Load(s) and moment(s) -Calculation of maximum value and its location of SF and BM for all above load cases- Analyzing the basic problems from SF diagram.
COLUMNS AND STRUTS: Axially loaded compression members- Crushing load and Buckling load - Euler's theory for long columns- Rankine's theory- Analyzing the basic problems for Euler's and Rankine's theory. **(9)**.

UNIT III : FLEXURAL AND SHEAR STRESSES

BENDING STRESSES: Assumptions - Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis - Determination of bending stresses - Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle, Channel sections and built-up sections - Design of simple beam sections.
SHEAR STRESSES: Shear Stresses- Derivation of shear stress formula - Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections, Built-up sections. **(9)**

UNIT IV : TORSION AND COMPOUND STRESSES AND STRAINS

TORSION: Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion.
COMPOUND STRESSES AND STRAINS: Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress and their applications, Two dimensional stress-strain system, principal strains and principal axis of strain **(9)**

UNIT V : DEFLECTIONS OF BEAMS

Slope and deflection- Relationship between moment, slope and deflection, Determine slopes and deflections of the determinate beams (Simply supported and Cantilever) using Double integration method, Macaulay's method, Moment area method and Conjugate beam method. **(9)**

Course Outcomes

1. Analyse the simple stress and strain in mechanics of solids
2. Analyse the beams to find the max shear force and bending moment and analysis the columns to find crushing and buckling strength
3. Analyse bending and shear stresses for different types of beams with different sections
4. Analyse structural members subjected to torsion, compound stresses and strain.
5. Compute deflections of various beams

Text Books

1. S. Ramamrutham and R. Narayanan, Strength of Materials, Dhanpat Rai Publishing Company
2. R K Rajput, Strength of Material, S Chand Publications

Reference Books

1. Beer, F. P., Johnston, E. R. and DeWolf, J. T., Mechanics of Materials, Third Edition, McGraw- Hill International Edition, 2002.
2. Lardner, T. J, Archer, R. R., Mechanics of Solids, an introduction, International Edition, McGraw-Hill, 1994.
3. Shames, I. H., Introduction to Solid Mechanics, 2^{nd} Edition, Prentice Hall of India Private Ltd. New Delhi, 1980.
4. Vaidyanathan R., Perumal P. and Lingeswari S., Mechanics of Solids and Structures, Volume I, Laxmi Publications (P) Ltd., New Delhi II, First Ed. 2017.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE204 ADVANCED SURVEYING LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisites: None

Course Description

This course covers practical usage of various advanced surveying instruments for different field measurements like length, area and elevations.

Course Objectives

1. To Use different advance surveying instruments for field measurements and apply knowledge to resolve various field challenges through suitable techniques.
2. To explain the differences in the field and office works.
3. To represent field measurements into a document form
4. To perform calculations in obtaining necessary requirements from the data obtained during field work using advance surveying instruments

LIST OF EXERCISES

1. Study of theodolite in detail - practice for measurement of horizontal and vertical angles.
2. Measurement of horizontal angles by method of repetition and reiteration.
3. Trigonometric leveling - Heights and distance problem (Two Exercises)
4. Heights and distance using principles of tachometric surveying (Two Exercises) [one plane and two plane method]
5. Curve setting - different methods. (Two Exercises) [Only horizontal, circular, reverse, compound curves]
6. Setting out works for buildings.
7. Determine of area using total station
8. Traversing using total station
9. Contouring using total station
10. Determine remote height using total station
11. Distance and height between two inaccessible points using total stations

LIST OF MAJOR EQUIPMENT

1. Theodolites, and leveling staffs.
2. Digital Electronic Theodolites
3. Total station.

Course Outcomes

The students after completing the course will be able to:

1. Use the various instruments such as Theodolite and levelling staffs, Tachometer and Total station.

2. Measure the horizontal and vertical angles between the two points by using theodolite
3. Determine the height and distance between two points.
4. Conduct set-out works for building.
5. Use the total station for different surveying purposes

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

URLs

1. NPTEL `http://nptel.ac.in/courses/105107122/home.htm`
2. Video Lectures, IIT Kanpur
   Online Course `http://freevideolectures.com/Course/98/Surveying`
3. `http://www.aboutcivil.org/surveying-levelling%20II.html`

20CE205 STRENGTH OF MATERIALS LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisites: None

Course Description

This course covers the different tests that are necessary for any structure before construction. The materials to be tested in the laboratory are MS steel, HYSD steel, Wood, Concrete/Brick, springs.

Course Objectives

1. To understand the behavior of materials under different types of loading.
2. To find tensile strength, compressive strength, bending strength and shear strength of the supplied specimen.
3. To find the hardness of different materials
4. To find the modulus of elasticity and modulus of rigidity of the materials
5. To find the strain energy required to break the specimen.

LIST OF EXPERIMENTS

1. Tension test on HYSD bar.
2. Bending test on (Steel/Wood) Cantilever beam
3. Bending test on simply supported beam.
4. Torsion test
5. Hardness test (Rockwell/Brinell).
6. Compression test on wood or concrete.
7. Shear test
8. Impact test (Izod and Charpy)
9. Verification of Maxwell's Reciprocal theorem on beams.
10. Continuous beam - deflection test.
11. Spring test.
12. Use of electrical resistance strain gauges.

LIST OF EQUIPMENTS

1. UTM for conducting tension test on rods
2. Steel or Wooden beam for flexure test
3. Torsion testing machine
4. Brinell /Rock well hardness testing machine
5. Spring testing machine
6. Compression testing machine
7. Izod / Charpy Impact machine
8. Beam setup for Maxwell's theorem verification.
9. Electrical Resistance gauges
10. Continuous beam setup

Course Outcomes

The students after completing the course will be able to:

1. Determine the tensile and shear strength of various types and grades of ductile materials
2. Examine the compressive strength of various types of brittle materials
3. Analyse the deflections at various positions along the length of the beam for different types of beams/spring and correlate it with existing theorems
4. Determine the torsional properties of ductile materials
5. Examine the hardness and impact value for different kinds of metals

Text Books

1. Moondra, H. S., and Gupta R., Laboratory Manual for Civil Engineering, CBS Publication, 2013

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20CE206 ENVIRONMENTAL ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisites: None

Course Description

This course covers laboratory experiments to predict the water and wastewater quality. The experiments include determination of water quality and estimation of chemicals required to treat the wastewater.

Course Objectives

1. To conduct experiments to determine the concentrations of various contaminants in water and wastewater.
2. To determine the amount of coagulant required to treat surface water.

LIST OF EXPERIMENTS (Any 8 out of the total)

1. Determination of pH, Conductivity and Turbidity of water sample
2. Determination of alkalinity of water samples
3. Determination of hardness of water samples
4. Analysis of solids content of water: Dissolved, suspended, total, volatile, inorganic etc.
5. Determination of optimum coagulant dose by jar test apparatus.
6. Determination of Iron.
7. Determination of Chloride concentration
8. Determination of Dissolved Oxygen of water
9. Determination of Phosphates from wastewater
10. Determination of Biochemical Oxygen Demand of wastewater
11. Determination of Chemical Oxygen Demand
12. Determination of Break point Chlorination.

LIST OF EQUIPMENTS

1. pH meter,
2. Turbidity meter,
3. Conductivity meter,
4. Hot air oven,
5. Muffle furnace,
6. Dissolved Oxygen meter,
7. UV visible spectrophotometer,
8. COD Open Reflux Apparatus,
9. Jar Test Apparatus,
10. BOD incubator.

Course Outcomes

The students after completing the course will be able to:

1. Analyse the contaminants in water and wastewater quality and compare it with prescribed standards
2. Estimate the quantity of chemicals required to treat the water.
3. recommend for the suitability of water for drinking, construction, agriculture etc.
4. Demonstrate the knowledge of water treatment methods for safety of society
5. Treatment of wastewater generated from various activities such as domestic, industry, etc.

Text Books

1. Clair Sawyer, Perry McCarty and Gene Parkin "Chemistry for Environmental Engineering and Science" Mc GraHill, 2003.
2. Standard Methods for Analysis of Water and Wastewater - APHA.
3. Dr. Kotaiah, G. and Dr. KumaraSwamy, N., "Environmental Engineering Lab Manual", Charotar Publishers, Anand, 2004.

References

1. Virtual Lab: https://ee1-nitk.vlabs.ac.in/List%20of%20experiments.html
2. Virtual Lab: https://ee2-nitk.vlabs.ac.in/List%20of%20experiments.html
3. Relevant IS Codes.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20CHE901 ENVIRONMENTAL SCIENCE

L	T	P	C
2	0	0	0

Course Prerequisites: Basic knowledge about sciences up to intermediate or equivalent level.

Course Description

The course deals with basic concepts of environment, its impact on human, universe, consumption of energy sources, effects, controlling methods for pollution and the environmental ethics to be followed by human beings.

Course Objectives

1. To make the students aware about the environment and its inter-disciplinary nature and to emphasize the importance of the renewable energy sources.
2. To familiarize the concept of Ecosystem and their importance.
3. To bring the awareness among students about the importance of biodiversity and the need for its conservation.
4. To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
5. To introduce the environmental ethics and emphasize the urgency of rain water harvesting along with water shed management.

UNIT I: MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness. Renewable energy Resources: Solar energy - solar cells, wind energy, tidal energy. Non-renewable energy resources: LPG, water gas, producer gas. Overgrazing, effects of modern agriculture – fertilizer and pesticides. **(6)**

UNIT II: ECOSYSTEMS

Concept of an ecosystem. Structure – functions – Producers, Consumers and Decomposers – Ecological succession – Food chains, Food webs and Ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystems: Forest, Desert and Lake. **(6)**

UNIT III: BIODIVERSITY AND ITS CONSERVATION

Introduction, Definition: Value of biodiversity: consumptive use, productive use, social, ethical and aesthetic values. Biogeographical zones of India. Threats to biodiversity: habitat loss, poaching of wildlife, Endangered and Endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. **(6)**

UNIT IV: ENVIRONMENTAL POLLUTION

Definition, Cause, effects and control measures of pollution – Air, Water, Soil and Noise. Solid Waste Management: Effects and control measures of urban and industrial wastes. **(6)**

UNIT V: SOCIAL ISSUES AND THE ENVIRONMENT

Urban problems related to Water conservation, rain water harvesting and watershed management; Climate changes: global warming, acid rain, ozone layer depletion, nuclear accidents. Case Studies: Population growth, variation among nations and population explosion. **(6)**

Course Outcomes

The students after completing the course will be able to:

1. Recognize the natural environment, its relationship with human activities and need of the day to realize the importance of the renewable energy sources.
2. Identify of various ecosystems and their importance along with the concepts of food chains, food webs and ecological pyramids.
3. Familiarize with biodiversity, its importance and the measures for the conservation of biodiversity.
4. Identify the causes, effects and controlling methods for environmental pollution, along with disaster management and solid waste management.
5. Identify the problems arising due to the environmental disorders.

Text Books

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press, 2005.
2. Environmental Studies by R. J. Ranjith Daniels and Jagdish Krishnaswamy, (Wiley Re-print version 2014).
3. Chemistry for Environmental Engineering/C.N. Sawyer, P.L. McCarty, G.F. Parkin (TataMcGraw Hill, Fifth Edition, 2003).
4. Environmental Chemistry by B.K. Sharma, (Goel Publishing House, 2014).
5. Environmental Studies by Benny Joseph (TataMcGraw Hill, Second Edition, 2009).

Reference Books

1. Environmental Science & Engineering by Dr. A. Ravikrishnan, Hitech Publishing Company Pvt. Ltd. 2013.
2. Perspectives in Environmental Studies, Second edition, Anubha Koushik and C.P. Koushik, New Age International (P) Limited, Publishers, 2004.

Mode of Evaluation: Assignments and Mid Term Tests

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B.Tech. III Year-I Semester

20CE108 STRUCTURAL ANALYSIS

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20CE101, 20CE107

Course Description

This course includes the basics of Structural analysis including the idealizations of different types of structures, support conditions and its loadings, and analysing the determinate and indeterminate structures using different methods.

Course Objectives

1. To determine the whether a structure is determinate or indeterminate.
2. To analyse the beams and frames using slope deflection method.
3. To analyse the beams and frames using moment distribution method.
4. To analyse the beams and frames using Kani's method.
5. To analyse the continuous beams using three moment theorem.

UNIT I - INTRODUCTION TO INDETERMINATE STRUCTURES

Introduction - statically indeterminate structures - externally indeterminate structures - internally indeterminate structures - externally and internally redundant structures - degree of redundancy.**(9)**

UNIT II - THREE MOMENT EQUATION

Introduction - Moment Area Theorem - Three moment equation or Clapeyron's Theorem. **(9)**

UNIT III SLOPE DEFLECTION METHOD

Introduction - Assumption - Application of slope deflection method to continuous beams - Application of slope deflection method to frames having no side sway - Application of slope deflection method to frames having side sway. . **(9)**

UNIT IV MOMENT DISTRIBUTION METHOD

Introduction - Stiffness and carry over factors - Distribution factors - Application to Continuous Beams - Application to Continuous Beams having sinking supports - Application to frames having no side sway - Application to frames having side sway. **(9)**

UNIT V KANI'S METHOD

Introduction - Application of Kani's Method to Continuous beams - Application of Kani's Method to frames. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Determine the whether a structure is determinate or indeterminate
2. Analyse the continuous beams using three moment theorem.
3. Analyse the beams and frames using slope deflection method.
4. Analyse the beams and frames using moment distribution method.
5. Analyse the beams and frames using Kani's method.

Text Books

1. Ramamrutham, S., & Narayan, R.,Theory of Structures, Dhanpat Rai Publishing Co. (P.) Ltd., 2017.
2. Menon, D., Structural Analysis, Narosa publishers, 2008.

Reference Books

1. Ghali,A., Nevilee, A.M., & Brown, T.G., Structural Analysis, CRC Press, 2012
2. Wang, C. K., Intermediate Structural Analysis, McGraw Hill, 1989.
3. Reddy, C. S., Basic Structural Analysis, Tata McGraw Hill, 2007.
4. Hibbler, R. C., Structural Analysis, Pearson Education, 2006.
5. Negi, L. S., and Jangid R.S, Structural Analysis, Tata McGraw Hill, 2006

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE109 IRRIGATION ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101, 20CE102, 20CE105, 20CE107

Course Description

In this course introduction to irrigation engineering, different irrigation methods are included. Further, estimation of quantity of water required for various types of crops, analysis & design of gravity dams and earth dams, estimation of reservoir capacity, canal regulation and cross drainage works are emphasized. In addition to the above spillways and water power engineering are incorporated.

Course Objectives

1. To introduce the concepts of irrigation, its importance and various methods,
2. Learn various components of canal irrigation system e.g. regulation works, headworks, cross drainage works
3. To analyse and learn basic design gravity, earth dams and their components,
4. to understand various causes of failures
5. To know about the hydropower

UNIT I: IRRIGATION

Introduction-Irrigation methods, their merits and demerits-Duty, Delta, crop and crop seasons - consumptive use of water -evapo-transpiration , - Irrigation efficiencies, crop water requirements, Field Capacity, Permanent Wilting Point, Available Moisture, Irrigation Scheduling, irrigation water quality.
WATER LOGGING: causes, effects and remedial measures, land reclamation. **(9)**

UNIT II: CANALS

CANAL IRRIGATION SYSTEM: Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular, and modular outlets. Lining of canals, types of lining.
CANAL REGULATION WORKS: Canal falls: Necessity and location of falls - Types of falls - Classification of falls, Canal regulators, off-take alignment - head regulators and cross-regulators - outlets and escapes. **(9)**

UNIT III

HEADWORK: Barrage - components-description.
CROSS DRAINAGE WORKS: Introduction - types of cross drainage works - selection of suitable type of cross drainage work - classification of aqueducts and siphon aqueducts.
RESERVOIR PLANNING: Investigations for reservoir planning - selection of site for a reservoir - Zones of storage in a reservoir - Storage capacity, Catchment Yield and Reservoir Yield - mass

inflow curve and demand curve - Calculation of reservoir capacity for a specified yield from the mass inflow curve - Determination of safe yield from a reservoir of a given capacity - Sediment flow in streams: Reservoir Sedimentation - Life of reservoir. Reservoir sediment control, Reservoir Losses. **(9)**

UNIT IV: DAMS

Introduction - Types of dams - Site selection for a dam - Problems with dam construction.
GRAVITY DAMS: Introduction - Forces acting on a gravity dam - Combination of loading for design, Modes of failure, stability requirements - principal and shear stresses - Stability analysis, Elementary Profile of a Gravity dam - Practical profile of a gravity dam - Limiting height of a gravity dam- High and low gravity dams - Galleries - Stability analysis of non - overflow section of Gravity dam.
EARTH DAMS: Introduction - Types of earth dams - Causes of failure of earth dams - Criteria for safe design of earth dams - Section of an earth dam - Design to suit available materials - Seepage control measures - Slope protection. Seepage through earth dam.
SPILLWAYS: Types of Spillways - Types of Energy Dissipators. **(9)**

UNIT V: HYDROPOWER

Development of hydro power in India - Classification of hydel plants - run-off river plants, storage plants and pumped storage plants - low, medium and high head schemes - Investigation and planning - components of hydel schemes, Selection of suitable type of turbine - Power Potential Study - definition of gross head - operating head, effective head - Flow duration curve - Power duration curve - Load duration curve - Load curve - primary power and secondary power - installed capacity, dependable capacity - firm power, secondary power - power factor - load factor - capacity factor - utilization factor and Diversity factor, Hydropower Potential of India. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Calculate irrigation water demand and schedule irrigation.
2. Plan and design canal irrigation system.
3. Identify head works and various cross drainage works, Plan and fix reservoir capacity.
4. Analyse stability of gravity and earth dams
5. Identify components and operation of hydro power plant.

Text Books

1. S. K. Garg, Irrigation Engineering and Hydraulic Structures, Khanna Publishers

Reference Books

1. G L Asawa, Irrigation Engineering, Wiley Eastern
2. L W Mays, Water Resources Engineering, Wiley.
3. J D Zimmerman, Irrigation, John Wiley & Sons
4. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE110 DESIGN OF CONCRETE STRUCTURES

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101, 20CE107, 20CE108

Course Description

This course includes design philosophies of structural elements. Furthermore, it includes design of singly and doubly reinforced beams, flanged beams, shear and development length, slabs, columns, foundations and staircase as per IS 456-2000 and SP 16-1984 codes.

Course Objectives

1. To understand the fundamental principles and procedures of reinforced concrete design;
2. To apply the principles of reinforced concrete design to real world problems; and
3. Prepare students for entry level structural engineering employment.

UNIT I: BASICS OF STRUCTURAL DESIGN

Introduction to Methods of Design - Loads & Forces acting on structures - Stress-strain curve for concrete - Size effect - behaviour of concrete in tension - properties of Steel - Stress-strain curve for steel - A review on various design Philosophies - Types of Limit States - partial safety factors for materials and loads. **(9)**

UNIT II: FLEXURE

Assumptions and basic principles of Working Stress and Limit State method - Analysis and design of singly and doubly reinforced concrete beams- Limit State method, Analysis and Design of Flanged sections for various cases. **(9)**

UNIT III: SHEAR, TORSION AND BOND

Design bond strength - development length - check for development length in tension - Anchoring of reinforcing bars - bearing stress at bonds - reinforcement splicing - Design for bond - Development length - Curtailment of reinforcement - Lap splice. Modes of failure due to shear - shear strength of concrete - critical section for shear minimum shear reinforcement - Design of shear strength - check for shear at point of tension reinforcement curtailment - Design of beams for combined bending, shear and torsion.

LIMIT STATE OF SERVICEABILITY: Short term deflection calculation for beams - Deflection due to shrinkage and creep **(9)**

UNIT IV: SLABS AND STAIRCASE

Design shear strength of concrete in slabs - design consideration for slabs - design and reinforcement detailing of one way simply supported and continuous slabs - design and reinforcement detailing of two way slabs - Types of stair cases - components of staircase - structural system of stair cases - effective span - Design of stair cases spanning transversely and longitudinally. **(9)**

UNIT V: COLUMNS AND FOOTINGS

Classification of columns based on slenderness ratio, reinforcement & loading, Design of columns subjected to axial load,uni-axial bending and bi-axial bending.
Different Types of Footings - Design of isolated, square, rectangular and combined footings. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Explain the basic concepts of structural design methods and behavior of materials under loading.
2. Analyze and design R.C beam for flexure.
3. Apply the concept of strength and serviceability and design R.C. beams for shear, torsion, deflection.
4. Analyze and design slabs and staircase.
5. Analyze and design R.C. columns and footings.

Text Books

1. Bandhopadhyay, J. N., Design of Concrete Structures, Prentice-Hall of India, New Delhi, 2008.
2. Krishna Raju, N. and Pranesh, R.N. Reinforced Concrete Design, New age International Publishers, New Delhi, 2007.

Reference Books

1. IS 456-2000, Code of practice for Plain and Reinforced concrete, Bureau of Indian Standards, New Delhi.
2. Special Publication SP 16, Design aids for reinforced concrete to IS 456-2000, Bureau of Indian Standards, New Delhi.
3. Varghese, P. C., Limit State Design of Concrete, 2nd edition, PHI Pvt. Ltd., New Delhi, 2011.
4. Pillai, S.U. and Devdas Menon, Reinforced Concrete Design, 3rd Edition, TMH, New Delhi, 2009.
5. Jain, A.K., Reinforced Concrete: Limit State Design, 6th Edition, Nemchand & Bros, Roorkee, 2002.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE207 CONCRETE TECHNOLOGY LABORATORY

L	T	P	C
0	**0**	**3**	**1.5**

Course Prerequisites: 20CE201, 20CE106

Course Description

The course will provide knowledge and skills of concrete material testing.

Course Objectives

1. To gain experience regarding the determination of properties of different building materials.
2. To provide an opportunity to learn how to measure the parameters which governs the quality of the materials,
3. To learn the principles and procedures of testing concrete materials and to get hands on experience by conducting the tests and evolving inferences.

LIST OF EXPERIMENTS

Aggregate:

1. Specific Gravity and Water Absorption of aggregates.
2. Sieve analysis of coarse and fine aggregates
3. Bulk density for aggregates
4. Bulking of sand

Cement:

5. Normal Consistency of cement
6. Fineness of cement.
7. Initial setting time and final setting time of cement.
8. Specific gravity and soundness of cement.
9. Compressive strength of cement mortar cube.

Concrete:

10. Workability test on concrete by compaction factor, slump, Vee-bee and flow table.
11. Cube strength of concrete.
12. Young's modulus and compressive strength of concrete.
13. Non-Destructive testing on concrete (for demonstration)

Special concretes:

13. Tests on Self Compacting Concrete
14. Tests on Recycled aggregate concrete.

LIST OF EQUIPMENT

1. Pycnometers.
2. Vicat's apparatus
3. Specific gravity bottle.
4. Le-chatelier's apparatus.
5. Slump cone and compaction factor apparatus
6. Rebound hammer, Pulse velocity equipments.
7. CTM
8. Flow table

Course Outcomes

The students after completing the course will be able to:

1. Identify different properties of aggregates through various test procedures.
2. Apply different test method to check the physical and mechanical properties of cement.
3. Test the mechanical properties of fresh concrete
4. Test the mechanical properties of hardened concrete.
5. Test various types of special concrete.

References

1. Concrete Technology Laboratory Manual Prepared by MITS Staff.
2. Shetty.M.S (2002), Concrete Technology, S.Chand& Co., Ltd, Ramnagar.
3. IS: 10262 - 2009, Indian Standard specification for Methods of Mix design.
4. IS: 383 - 1987, Indian Standard specification for Test for Fine and Coarse aggregates.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20CE208 ADVANCED CIVIL ENGINEERING LABORATORY

L	T	P	C
0	**0**	**3**	**1.5**

Course Prerequisites: None

Course Description

The course includes transducer characteristics for acoustic, current, temperature, pressure, electric, magnetic, gravity, salinity, concentration of contaminants, velocity, heat flow, and optical devices; limitations on these devices imposed by building/structure/pavement environments; and signal conditioning and recording; noise, sensitivity, and sampling limitation

Course Objectives

1. The objective of this laboratory is to understand instrumentation, sensor theory and technology, data acquisition, digital signal processing, damage detection algorithm, life time analysis and decision making.
2. This laboratory introduces practical principles of design of sensor systems.
3. To Use Different Sensor instruments for field measurements and apply knowledge to resolve various field challenges through suitable techniques

LIST OF EXPERIMENTS (any 8)

1. Determination of angle of inclination or elevation using inclinometer
2. Measurement of an area using Planimeter.
3. Determination of embankment angles of elevation, slope, or incline using inclinometer
4. Determination of compressive strength of concrete structure using rebound hammer
5. Determination of strength and quality of concrete using ultrasonic testing equipment
6. Estimation of depth of cracks using ultrasonic testing equipment
7. Estimation of indoor air quality
8. Determination of strain in steel using strain gauges
9. Estimation of load on structure using load cell
10. Determination of field capacity and permanent wilting point of soil moisture using Tensiometer
11. Determination of Evapotranspiration by Soil moisture change method
12. Measurement of water flow velocity in a channel using current meter.

LIST OF EQUIPMENT

1. Inclinometer
2. Planimeter
3. Rebound hammer
4. Ultrasonic testing equipment
5. Air quality meter
6. Strain gauges

7. Load cell
8. Tensiometer
9. Current meter

Course Outcomes

The students after completing the course will be able to:

1. Measure area, angle of inclination using various equipment.
2. Use non destructive testing methods to find strength of concrete.
3. Measure air quality.
4. Use load cells to determine load on structure.
5. Use strain gauges to measure strain in steel.

Text Books

1. Vidivelli, B., Rehabilitation of concrete structures. Standard Publishers Distributors.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20HUM902*/20HUM102# UNIVERSAL HUMAN VALUES

L	T	P	C
2*/3#	**0**	**0**	**0*/3#**

Course Prerequisites: None. Universal Human Values 1 (desirable)

Course Description

This course discusses students' role in their family and briefly touches issues related to their role in the society and the nature.

Course Objectives

1. Understanding Happiness and Prosperity correctly and basic Human Aspirations
2. Understanding and Identifying the Harmony in the Human Being, differentiate between prosperity and accumulation
3. Visualize a universal harmonious order in society which leads to Undivided Society at Universal Order- from family to world family.
4. Understanding Harmony in the Nature and Existence - Whole existence as Coexistence
5. Implicate the UHV in professional ethics.

UNIT I: SELF-EXPLORATION AS THE PROCESS FOR VALUE EDUCATION

L1: Purpose and motivation for the course, recapitulation from Universal Human Values-I
L2: Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration
L3: Continuous Happiness and Prosperity- A look at basic Human Aspirations.
L4: Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
L5: Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
L6: Method to fulfil the above human aspirations: understanding and living in harmony at various levels.
T1 & T2: Discussion on natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking. **(6)**

UNIT II: UNDERSTANDING HARMONY IN THE HUMAN BEING - HARMONY IN MYSELF!

L7: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
L8: Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
L9: Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
L10: Understanding the characteristics and activities of 'I' and harmony in 'I'
L11: Understanding the harmony of I with the Body: Self-regulation and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
L12: Programs to ensure Self-regulation and Health.
T3 & T4: Discussion on the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease **(6)**

UNIT III: UNDERSTANDING HARMONY IN THE FAMILY AND SOCIETY

L13: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
L14: Understanding the meaning of Trust; Difference between intention and competence
L15: Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
L16: Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
L17: Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
T5 & T6: Reflection on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives **(6)**

UNIT IV: UNDERSTANDING HARMONY IN THE NATURE AND EXISTENCE

L18: Understanding the harmony in the Nature
L19: Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self- regulation in nature
L20: Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
L21: Holistic perception of harmony at all levels of existence.
T7 & T8: Discussion on human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc. **(6)**

UNIT V: IMPLICATIONS OF HOLISTIC UNDERSTANDING OF HARMONY ON PROFESSIONAL ETHICS

L22: Natural acceptance of human values
L23: Definitiveness of Ethical Human Conduct
L24: Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
L25; Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
L26: Case studies of typical holistic technologies, management models and production systems
L27: Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
L28: Sum up.
T9 & T12: Exercises and Case Studies For e.g. Individual discussion on the conduct as an engineer or scientist etc. **(6)**

Course Outcomes

The students after completing the course will be able to:

1. Understand natural acceptance in human being as the innate acceptance,
2. Be aware of themselves,
3. Maintain harmony with family and society by recognizing Harmony in Human-Human Relationship,
4. Try to get Harmony in the Nature and Existence by realizing existence as Coexistence
5. More responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind with better critical ability.

Text Books

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

References

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

B.Tech. III Year-II Semester

20CE111 GEOTECHNICAL ENGINEERING

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20MAT101, 20MAT102, 20CE101, 20CE102, 20CE107

Course Description

This course covers physical properties of soils, soil classification, soil structure, moisture effects; permeability and seepage, compressibility and consolidation; stress, deformation, Shear strength characteristics; stress distribution and analysis. Further the course also covers basic laboratory experiments.

Course Objectives

1. To establish and understanding of the fundamental concepts of mechanics of granular materials; including the behavior of multiphase materials and their constitutive behavior.
2. To provide students with exposure to the systematic methods for solving engineering problems in soil mechanics.
3. To discuss the basic mechanical principles underlying modern soil mechanics and to create an understanding of assumptions that are inherent to the solution of geotechnical problems.

UNIT I: SOIL FORMATION AND CLASSIFICATION

Soil formation - Types of soils -Three-phase system - phase relationships. Index properties of soils : Moisture content - Specific gravity - In-situ density - Relative density- Grain size analysis - Sieve and hydrometer methods - Plasticity of soils - Consistency limits and indices - I.S. Classification of soils - Sensitivity of soils. **(9)**

UNIT II: PERMEABILITY, EFFECTIVE STRESS AND STRESSES IN SOILS

Permeability of Soil - factors affecting permeability of soil - Determination of coefficient of permeability. Seepage through soils. Effective Stress - Introduction- effective stress principle-effect of water table. Fluctuations of effective stress-effective stress in soils saturated by capillary action- seepage pressure- quick sand condition.

Stresses in soils - Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area. Influence factor- Isobars- Boussinesq's equation-Newmark's Influence Chart. **(9)**

UNIT III: COMPACTION AND CONSOLIDATION OF SOIL

Compaction of Soil- theory of compaction- laboratory determination of optimum moisture content and maximum dry density. Compaction in field-compaction specifications and field control.

Consolidation of Soil - comparison between compaction and consolidation- primary & secondary consolidation-spring analogy for primary consolidation- interpretation of consolidation test results, Terzaghi's theory of consolidation- final settlement of soil deposits- computation of consolidation settlement and secondary consolidation. **(9)**

UNIT IV: SHEAR STRENGTH OF SOIL

Shear Strength - Mohr circle and its characteristics-principal planes- relation between major and minor principal stresses- Mohr-Coulomb theory- types of shear tests: direct shear test- merits of direct shear test-triaxial compression tests, behaviour of UU- CU and CD tests- pore-pressure measurement, computation of effective shear strength parameters. Unconfined compression test-vane shear test. **(9)**

UNIT V: INTRODUCTION TO FOUNDATION ENGINEERING

Earth pressure theories - Rankine and Coulomb - Types of Foundations - Location and depth of foundation - Bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's formula and BIS formula - Factors affecting bearing capacity - Bearing capacity from in-situ tests (SPT, SCPT and Plate Load). **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Discuss fundamental concepts of mechanics of granular materials; including the behavior of three phase materials.
2. Analyze Permeability of soil and estimate using various field methods and stresses of soil in various conditions.
3. Find compaction and onsolidation of soil using constant and variable head methods.
4. Analyze the shear strength behavior of soil.
5. Design of foudantion and determination of earth pressures.

Text Books

1. Arora, K.R., Soil Mechanics and Foundation Engg, 7th Edition, Standard Publishers and Distributors, Delhi.
2. Punmia B. C., Ashok Kumar and Arun Kumar., Soil Mechanics and Foundation. Laxmi Publications, 17th Ed.

Reference Books

1. Venkataramiah, C., Geotechnical Engineering, New Age International Pvt. Ltd, New Delhi, 2002
2. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
4. Principles of Foundation Engineering, by Braja M. Das, 7th Edition, Cengage Learning

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE112 TRANSPORTATION ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: 20MAT101, 20PHY101

Course Description

Course covers the basic understanding of traffic engineering and its components, planning and geometric design of highways; traffic characteristics and measurement; intersection design. Furthermore, this course covers highway material and properties; analysis and design of flexible and rigid pavements, importance of accessibility and safety in transportation systems, and introduction to different modules of transportation systems.

Course Objectives

1. To understand the principles and design of highway, traffic and railway engineering

UNIT I: BASICS OF TRANSPORTATION ENGINEERING

Introduction to Transportation Engineering; Role of transport; Types of transport systems; Evolution of transport modes; Transport problems and mobility issues; Urban form and Transport patterns; Classification of roads; Typical cross sections of roads in urban and rural area; Flexible and Rigid pavement; Geometric elements of road; Requirements of road alignment; Highway materials and testing. **(9)**

UNIT II: GEOMETRIC DESIGN OF HIGHWAYS

Importance of Geometric Design- Design controls and Criteria, pavement surface characteristics, camber and width requirements; Sight distances - over taking zone requirements and related problems; Design of horizontal alignment - speed - radius - super elevation - extra widening - transition curves- methods of attainment of super elevation - related problems; Design of vertical alignment - gradient and grade compensation - sight distance requirements on summit and valley curves -simple problems on design of vertical alignment; Design of flexible and rigid pavement. **(9)**

UNIT III:

TRAFFIC ENGINEERING: Traffic characteristics-various traffic studies and their applications, Basic Parameters of Traffic Volume, Speed and Density; Parking Studies and Parking characteristics; Traffic control devices- Traffic signs- markings- traffic signals and traffic islands; Principles of highway lighting; Design of Traffic Signals.

ROAD SAFETY: Road accidents - Causes and Preventive measures, Scientific Investigations and Data Collection; Ensuring Traffic Safety in new design, reconstruction and operation; Road safety audit; Traffic management techniques. **(9)**

UNIT IV:

URBAN TRANSPORTATION SYSTEMS: Importance of collective transportation v/s individual transportation, freight transportation, Physical system components of urban transportation, Overview of different type of urban transit system (Mass rapid transit, Light rail transit, Personal rapid transit, guided way systems, Para transit systems, Mono rail, bus rapid transit systems).
TRANSPORT ACCESSIBILITY: Design Standards and public policies for Barrier Free Transport; Universal Design Theory; Barrier Free Public Transportation; Access Audit; **(9)**

UNIT V

RAILWAY ENGINEERING: Geometric design elements; Alignment of railway lines, railway track gauge; Points and Crossings, Level Crossings, Signaling and Interlocking
AIRPORT ENGINEERING: Overview of air transportation, Runway orientation, Basic runway length and corrections required, Geometric design of runways, Complexities in airport planning, Elements of airport planning.
HARBOURS AND PORTS: Elements of harbour and port planning, Role of harbours and ports in transportation, National waterways, Characteristics. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Identify transport systems its components.
2. Design the various components of roads
3. Determine the planning and management aspects of various transportation systems.
4. Determine parameters of urban transport system and its accessibility.
5. Design various elements of railway, airport and harbors.

Text Books

1. Khanna, S. K, Justo, A and Veeraragavan, A., Highway Engineering, Nem Chand publications.
2. Kadiyali, L. R, Traffic Engineering and Transportation Planning, Khanna Publishers, New Delhi, 2003.

Reference Books

1. Horonjeff R. & McKelvy, F., Planning and Design of Airports, McGraw Hill, 5e, 2010
2. IRC: 37-2001, Guidelines for the Design of Flexible Pavements, IRC 2001, New Delhi
3. O' Flaherty, C.A (Ed.)., Transport Planning and Traffic Engineering, Elsevier, 1997

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE113 DESIGN OF STEEL STRUCTURES

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20CE101, 20CE107, 20CE108

Course Description

The course covers basic design concepts of steel structures, loads and stresses to be used as per Indian standards for steel design work. The course deals with designing of Steel structural elements subjected to axial tension, axial Compression and bending. Emphasis, will be also given to the special structures such as plate girders. In addition, analysis and design of various types of connections such as bolted and welded will be discussed. All design approaches will be based on Limit State of strengths and serviceability.

Course Objectives

1. To understand the concepts of Steel design.
2. To introduce the concept of limit state design of structural steel members subjected to compressive, tensile and bending loads, including connections.
3. Design of structural systems such as Plate girders, gantry girders as per provisions of current code of practice.

UNIT I: INTRODUCTION

Introduction-advantages and disadvantages of steel structures-loads and load combinations-Structural steel connections-Various types of connections in steel: Bolted & welded- advantages and disadvantages of bolted and welded connections. Design code and considerations-Limit state method (LSM) of Design-Failure criteria for steel- Structural steel connections-Various types of connections (Simple and Eccentric) in steel: Bolted & welded and applications. **(9)**

UNIT II: DESIGN OF TENSION MEMBERS AND BEAMS

Types of tension members-modes of failure- Net sectional area-Design of Lug Angles-Tension Splices-gussets. Theorems of plastic collapse-methods of plastic analysis-plastic designs of portal frames. Types and classification-Lateral stability of beams-shear strength-web buckling and crippling. Introduction to castellated beams. **(9)**

UNIT III: DESIGN OF COMPRESSION MEMBERS

Behaviour of compression members- possible failure modes-single angle struts-I section-design-built-up compression members-Lacings and Battens- column bases. **(9)**

UNIT IV: DESIGN OF PLATE GIRDERS

Design of web-flanges-curtailment of flanges-stiffeners- web and flange splices-economic depth of plate girders-Example problem. **(9)**

UNIT V: DESIGN OF GANTRY GIRDERS

Load and fatigue effects, selection and design of gantry girder-Example problem.. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Apply and use the concepts related to the basics of design of steel structures.
2. Analyse and Design of Tension members (Lug angles, tension splices, portal frames and beams)
3. Analyse and Design of compression members (Columns, Struts, built-up sections, column bases and caps)
4. Explain the concept of plate girder and design plate girder
5. Design of gantry girder.

Text Books

1. Duggal, S.K., Limit State Design of Steel Structures, TMH, 2011. 3rd Edition

References

1. Subramanian, N., Steel Structures Design and Practice, Oxford University Press, 2010.
2. IS 800:2007, Code of practice for General construction in steel, B.I.S.
3. IS 875:1987, Code of practice for design Loads.
4. Ramachandra, Design of Steel structures, Sai Ram Prints hall publications.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE209 GEOTECHNICAL ENGINEERING LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisites: None

Course Description

This course covers laboratory experiments to predict soil characteristics. The experiments include determination of Index and Engineering properties of soil.

Course Objectives

1. To understand different test methods based on soil type to characterize soil
2. To demonstrate tests in the laboratory to obtain different soil properties
3. To analyze the test data to obtain relationships among different properties of soil

LIST OF EXPERIMENTS

1. Specific gravity of Soils.
2. Differential Free Swell Index (DFSI) of Soils.
3. Field Density using Core Cutter method and Sand replacement method.
4. Grain size distribution by Sieve Analysis.
5. Liquid limit and Plastic limit.
6. Permeability test using Constant-head test method.
7. Permeability test using Falling-head method.
8. Compaction test: Standard Proctor test.
9. Unconfined Compression Strength Test
10. CBR Test.
11. Consolidation Test.
12. Triaxial Test (UU).
13. Vane shear test.
14. Direct Shear Test.
15. Swelling Pressure test

LIST OF EQUIPMENT

1. Pycnometers or density bottle
2. Casagrande's liquid limit apparatus.
3. Field Density apparatus for
4. Core cutter method
5. Sand Replacement method
6. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
7. Apparatus for Liquid and plastic and Shrinkage limits
8. Permeability Apparatus for
9. Constant Head test

10. Variable Head test
11. Universal Auto compactor for I.S light and heavy compaction tests.
12. Apparatus for CBR test
13. Sampling tubes and sample extractors.
14. 10 tons loading frame with proving rings of 5 tons and 10 tons capacity
15. One dimensional consolation test apparatus with all accessories.
16. Tri-axial cell with provision for accommodating 38 mm dia specimens.

Course Outcomes

The students after completing the course will be able to:

1. Determine index properties of soils
2. Classify soils
3. Determine engineering properties of soils
4. Perform various tests according to the standard procedure
5. Analyse the available test data to obtain related parameters

PROJECT BASED LEARNING

The students will be divided into groups and will be allotted places. The students are will be allowed to perform different test methods to determine the properties and characteristics of the soil in that particular place. The students are required to submit present those findings in documented form.

Text Books

1. Soil Mechanics and Foundation Engg.- Punmia B.C. (2005), 16^{th} Edition Laxmi Publications Co. , New Delhi.
2. BIS Codes of Practice: IS 2720

Reference Books

1. Manual of Soil Laboratory Testing- Head K.H., (1986)- Vol. I, II, III, Princeton Press, London.
2. Engineering Properties of Soil and Their Measurements- Bowles J.E. (1988), - Mc-Graw Hill Book Co. New York.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20CE210 DESIGN LABORATORY

L	T	P	C
0	0	3	1.5

Course Prerequisites: 20CE108, 20CE110

Course Description

The course covers structural analysis, design and drawings using commercial software's for concrete and steel structures normally encountered in civil engineering practice

Course Objectives

To acquire hands on experience in design and preparation of structural drawings for concrete and steel structures normally encountered in civil engineering practice

SOFTWARE

1. STAAD PRO
2. ETABS
3. AutoCAD

EXCERCISIES

1. 2-D Frame Analysis and Design
2. Steel Tubular Truss Analysis and Design
3. 3-D Frame Analysis and Design
4. Retaining Wall Analysis and Design
5. Simple tower Analysis and Design
6. One Way Slab Analysis & Design
7. Two Way Slab Analysis & Design
8. Column Analysis & Design
9. Structural detailing using CADD

Course Outcomes

The students after completing the course will be able to:

1. Apply the principles of structural analysis and design in an industry setting
2. Apply different code provisions simultaneously through a commercial software.
3. Design the structures from a holistic stand point
4. Use modern software in the design of structures.
5. Acquire hands on experience in design and preparation of structural drawings for concrete and steel structures normally encountered in civil engineering practice

Text Books

1. Dr. Sesha, M.N, Prakash and Dr. Suresh, C.S., Computer Aided Design Lab Manual.

References

1. SP 32
2. IS 456-2000

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20CE211 TRANSPORTATION ENGINEERING LABORATORY

L	T	P	C
0	**0**	**3**	**1.5**

Course Prerequisites: None

Course Description

The course will provide knowledge and skills of road/highway material testing to those in the field of road construction or who intend to join this field of specialization.

Course Objectives

To make the students to learn the principles and procedures of testing Highway materials and to get hands on experience by conducting the tests and evolving inferences.

LIST OF EXPERIMENTS

TEST ON BITUMEN

1. Softening point of Bitumen
2. Ductility test on Bitumen
3. Flash and fire point test
4. Stripping value test
5. Penetration test on bitumen

TESTS ON COARSE AGGREGATES

6. Aggregate crushing value test
7. Impact value test
8. Shape tests - Flakiness index and elongation index
9. Los angles abrasion test

TESTS ON MIXES

10. Marshall stability value

At least eight experiments shall be completed

LIST OF EQUIPMENTS

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Los angles Abrasion test machine
4. Length and elongation gauges
5. Bitumen Universal Penetrometer
6. Bitumen Ductility test setup
7. Ring and ball Softening Point apparatus
8. Penskey - Morten’s open cup flash and fire point apparatus
9. Marshall’s stability apparatus

Course Outcomes

The students after completing the course will be able to:

1. Perform various quality tests on aggregate and bitumen related to road and highway construction using various test methods.
2. Use and operate various tools and apparatus of road material testing.
3. Select the appropriate materials for the use in different layers of road construction through the test outcomes.
4. Evaluate the quality and performance of unbound and bound road materials.
5. Analyse the material requirements of road elements for road construction.

PROJECT BASED LEARNING

Students will be alotted a place where road has to be built. They will investigate the area, collect samples, perform various tests on them and make a report on those materials at the end.

Text Books

1. Khanna, S.K, Justo, A and Veeraragavan, A., Highway Materials and Pavement Testing, Nem Chand and Bros, Fifth Edition, 2009.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20CE901 DISASTER MANAGEMENT

L	T	P	C
2	**0**	**0**	**0**

Course Prerequisites: None

Course Description

The goal of this course is to expose the under graduate students regarding different types of disasters and preparedness needed to mitigate their effects. The course matrix will cover various natural, biological, chemical and emerging hazards and risks that may cause property, loss of lives, and livestock's. Thus, the future engineers will understand the social responsibility for the preparedness and mitigation of the damages caused by the disasters.

Course Objectives

1. To make aware the students about disasters and their impact on living beings.
2. To ensure the students for the understanding on vulnerability, disasters, disaster prevention and risk reduction.
3. To gain a preliminary understanding of approaches for the Disaster Risk Reduction (DRR)
4. To enhance awareness of institutional processes available in the country for the disaster risk mitigation.

UNIT I: INTRODUCTION

Introduction, Etymology of disaster, Concepts and definitions: disaster, hazard, vulnerability, risks, Resilience, prevention and mitigation. **(6)**

UNIT II: TYPES OF DISASTERS

Types of Disaster; natural disasters (earthquakes, volcanoes, forest fires and explosions, heat and cold waves, floods, draught, cyclones, tsunami, landslides, soil erosion); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.), hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility. **(6)**

UNIT III: DISASTER IMPACTS

Disaster Impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters. **(6)**

UNIT IV: DISASTER RISK MITIGATION MEASURES

Disaster Risk Reduction (DRR) - Disaster management- four phase approach;prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications), DRR programmers in India and the activities of National Disaster Management Authority. Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction. **(6)**

UNIT V: IMPACT OF DEVELOPMENTAL ACTIVITIES

Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, landuse changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods. **(6)**

Course Outcomes

The students after completing the course will be able to:

1. Explain various disaster concepts
2. Differentiate between categories of disasters
3. Analyze impact of various types of disasters
4. Select disaster risk mitigation measures
5. Identify the impact of development activities

Text Books

1. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Reference Books

1. `http://ndma.gov.in/` (Home page of National Disaster Management Authority)
2. `http://www.ndmindia.nic.in/` (National Disaster management in India, Ministry of Home affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
5. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
6. Inter Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

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OPEN ELECTIVES-II

20MAT302 ENGINEERING OPTIMIZATION

L	T	P	C
3	0	0	3

Pre-requisite: 20MAT101, 20MAT106, 20MAT104, 20MAT108, 20MAT109, 20MAT110.

Course Description:
Unconstrained and constrained optimization, Linear programming problem, transportation and assignment problems, dynamic programming problem, project management and queuing models.

Course Objectives:
1. Understand the optimization techniques for solving engineering problems.
2. Formulate and solve linear programming problem.
3. Obtain the optimal solution for transportation and assignment problems.
4. Avail knowledge to solve dynamic programming problem using recursive relations.
5. Analyze the techniques of project management and queuing models.

UNIT I CLASSICAL OPTIMIZATION 9 hours

Introduction to optimization, unconstrained optimization with single variable and multi variable. Constrained multivariable optimization with equality constraints- Lagrange multipliers method, constrained multivariable optimization with inequality constraints - Kuhn-Tucker conditions.

UNIT II LINEAR PROGRAMMING PROBLEM 9 hours
Linear Programming Problem (LPP), Mathematical formulation, graphical solution, simplex method. Artificial variable technique - Big M-method and two phase simplex method. Duality, dual Simplex method.

UNIT III TRANSPORTATION PROBLEM AND ASSIGNMENT PROBLEM 9 hours
Transportation problem: definition and algorithm, transshipment problem. Assignment problem, travelling salesman problem.

UNIT IV DYNAMIC PROGRAMMING 9 hours
Introduction, developing optimal decision policy, Dynamic Programming Problem (DPP) under certainty, DPP approach for solving LPP.

UNIT V PROJECT MANAGEMENT AND QUEUING MODELS 9 hours
Network analysis: Network representation, Critical Path Method (CPM) and Project Evolutionary and Review Technique (PERT). Introduction to queuing system, single server queuing models (M/M/1) : (∞/FCFS), (M/M/1): (N/FCFS).

Course Outcomes:
At the end of the course, students will be able to:
1. Understood the importance of unconstrained and constrained optimization to solve engineering problems.
2. Get an idea about the linear programming techniques.

3. Solve transportation and assignment problems in engineering situations.
4. Apply the Bellman principle of optimality to solve dynamic programming problem.
5. Analyze the problems of network analysis for project management and Queuing systems engineering & industry.

Text Books:

1. J K Sharma, Operations Research: Theory and Practice, Macmillan Publishers India Ltd, 5th edition,2013.
2. B.S. Grewal, Higher Engineering Mathematics, 43rd edition (2014), Khanna publishers.

Reference Books

1. Hamdy A Taha, Operations Research: An Introduction, Pearson Education, 9/E, 2011.
2. FS Hillier and GJ Lieberman, Introduction to Operations Research, TMH, 8/E, 2006.
3. JC Pant, Introduction to Optimization: Operations Research, Jain Brothers, New, 6/E, 2004.
4. A Ravindran, DT Philips and JJ Solberg, Operations Research: Principles and Practice, John Wiley& Sons, Singapore, 2ndedition.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20PHY301 OPTICAL PHYSICS AND ITS APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
The course will cover Geometrical optics, Aberrations, Physical Optics, Diffraction and Optical fibers.

Course Objectives:
Students will

1. Knowledge of basic principles and concepts in optics and the techniques used to deal with them.
2. Explain the limitations associated with spherical and chromatic aberration
3. Describe optical systems such as microscopes and telescopes with reference to parameters such as angular magnification and depth of field
4. Provide students with a working knowledge of optical physics, including interference, diffraction and physical optics.
5. Introduce construction and concepts of basic fiber optic communication system and to make the students learn about its important applications for societal needs.

UNIT I INTRODUCTION 9 hours
Corpuscular and wave theory, Fermat's principle, Matrices for translation, refraction and reflection, Unit and nodal planes, Eigenvalues and Eigenvectors.

UNIT II ABERRATIONS AND OPTICAL INSTRUMENTS 9 hours
Types of aberrations, Chromatic and monochromatic aberrations. Different types of monochromatic aberrations. Simple and Compound microscopes, Astronomical and Terrestrial telescopes. Ramsden's and Huygens' eye pieces.

UNIT III WAVE OPTICS & INTERFERENCE 9 hours
Huygens's principle, Superposition of waves, Fourier transforms, representation of slits and apertures, Two beam interference by Division of wave front. Applications of Interference, Nonlinear interaction of light with matter (self-study).

UNIT IV DIFFRACTION & POLARISATION 9 hours
Fraunhoffer diffraction, Diffraction from single slit, double slit & multiple slits, Fresnel half-period zones, Zone plate, Applications of diffraction, Polarization, Malus' law, double refraction. Applications of polarization.

UNIT V FIBER OPTICS 9 hours
Construction and working principle of optical fibers, Numerical aperture and acceptance angle, Types of optical fibers. Attenuation and losses in optical fibers, Analog and Digital optical fiber communication system. Applications of optical fibers in communications, sensors and medicine.

Course Outcomes:

At the end of the course, students will be able to:

1. Recollect the fundamental characteristics of light and their mathematical principles.
2. Learn the principles of superposition, Interference and Diffraction
3. Understand nonlinear optics and photonics phenomena.
4. Be exposed to the application of optical techniques in cutting edge research areas.
5. Describe the basic laser physics, working of lasers and principle of propagation of light in optical fibers.

Text Books:

1. Optics by Ghatak, 4th Edition, Tata McGraw Hill (2011).

Reference Books

1. Optics by Lipson, Lipson & Lipson, 4th Edition, Cambridge Univ Press (2010).
2. Optics by Hecht, 4th Edition, Addison-Wesley (2002).

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20PHY302 LASER PHYSICS AND ADVANCED LASER TECHNOLOGY

L	T	P	C
3	0	0	3

Pre-requisite: Basic knowledge of atomic structure at intermediate (10+2) level is sufficient

Course Description:
Laser usage is rampant in various technological applications. Several fields gaining attention in the usage of lasers. This course covers the introduction to the theory and mechanism of laser action, various types of lasers and their applications and future use.

Course Objectives:
1. Make the student to understand the detailed principles of various lasers.
2. Profound understanding of different variety of lasers will provide them to think of superior selection and usage of lasers in practical technological applications.
3. Students are aware of latest developments in certain areas of Laser technology which have important applications for societal needs.
4. Explain how material processing is accomplished with lasers. Estimate laser operation parameters for material processing.
5. Exposure about Lasers applications in engineering, communications, spectroscopy and material process etc.

UNIT I INTRODUCTION TO LASER TECHNOLOGY 9 hours

Laser characteristics, The Einstein Coefficients, Absorption and Emission Cross Sections, Spontaneous and Stimulated emission of radiation, Population inversion, Methods of Population Inversion, Laser Rate Equations, stable two minor optical resonators, Mode selection, Gain in the regenerative laser cavity.

UNIT II GASES AND LIQUIDS LASING MEDIUM 9 hours

Energy levels & Radiative properties of Atoms and molecules; Atomic lasers: He-Ne laser, Argon Ion laser; Molecular Lasers: Carbon dioxide laser, Liquid energy levels and their radiative properties, Organic Dye laser.

UNIT III SOLID STATE LASERS 9 hours

Energy Levels in solids-dielectric medium, Solid-state lasing materials, Narrow line width laser materials, broad band line width laser materials, solid state lasers: Nd:YAG, Nd:YLF; Ti:Sapphire (introduction only)
Energy Levels in solids-semiconductor medium, direct and indirect band gap semiconductors, Semiconductor diode laser, Quantum dot lasers (Introduction only);

UNIT IV PULSED OPERATION OF LASERS 9 hours

Nanosecond: Q-Switching, Techniques of Q-Switching: electro-optic, Acousto-Optic.

Femtosecond: Relationship between pulse duration and Spectral Width, Passive mode-locking, Active mode locking, Kerr lens mode locking, Amplification of femtosecond pulses.

UNIT V LASER APPLICATIONS 9 hours

Laser processing of materials: laser cutting, laser drilling, welding; Lasers in metrology- Accurate measurement of length, light wave communications; Laser spectroscopy: Laser fluorescence and Raman scattering.

Course Outcomes:

Upon completion of this course the students shall be able to:

1. Understand the principle of phenomenon of laser and identify the operating principle involved in various type of lasers.
2. Estimate stability requirements in producing laser light by different types of sources
3. Differentiate or list the various types of lasers and their means of excitation.
4. Assess (Identify) which laser would best meet the need for a particular industrial or research task.
5. Student can gain knowledge on latest technological developments in laser technology. Femtosecond laser etc.

Text Books:

1. Laser Fundamentals: William T Silfvast. Cambridge Publication.
2. Laser Theory and Applications: A.K. Ghatak and K. Thyagarajan, Springer
3. Femtosecond Laser Pulses Principles and Experiments: Claude Rulli`ere, Springer
4. Principles of Laser: O. Svelto
5. Laser Physics: Peter W Miloni, Joseph H Eberly.

Reference Books

1. Solid State Laser Engineering: Walter Koechner. Springer series in optical sciences.
2. Ultrafast Optics, Andrew M. Weiner
3. Laser spectroscopy: Demtroder
4. Laser Applications: Monte Ross

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CHE301 INTRODUCTION TO PETROLEUM INDUSTRY

L	T	P	C
3	0	0	3

Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description:
It deals with basic principles of petroleum engineering and the processes involved in petroleum industry.

Course Objectives:
Students will

1. To understand the basic concepts of crude oil, distillation process, internals, petroleum products and their properties, Instruments used for fuel testing.
2. To understand the type of chemicals and their application in petroleum industry.
3. To introduce the basic principles of hydroprocessing and fluid catalytic cracking and familiarize the processes involved there.
4. To familiarize the basic concepts of catalysis, bioprocesses in the refinery.
5. Health, environment, process safety and management in petroleum companies.

UNIT I BASIC PROCESSES IN PETROLEUM REFINING AND FUEL TESTING 9 hours

Source of Crude oils and types, Overview of refinery process, Atmospheric Distillation, Vacuum distillation, Desalter, Desulphurization, Cracking, catalysis, Effluent treatment plant. Density, viscosity, pour point, flashpoint, octane number, cetane number, Fire point, Chromatography, Ductility, Water content, Sulphur analysis, MCRT, SARA, HFRR, calorofic value etc.

UNIT II CHEMICALS AND THEIR IMPORTANCE IN PETROLEUM INDUSTRY 9 hours

Types of products in the refinery and their structural properties, Netralizing amines, Corrosion inhibitors, Multifunctional additives, viscosity improvers, drag reducing agents, antioxidants, Lubricity improvers, Antifoam additives, Oil spill absorbers, Dispersants and their applications, Types of Catalysts used in the refinery, Chemicals for ETP plant.

UNIT III ROLE OF HYDROPROCESSING AND FLUID CATALYTIC CRACKING IN PETROLEUM INDUSTRY 9 hours

Objectives, Hydrocracking Reactions, Hydrocracking feedstocks, Modes of Hydrocracking, Effects of process variables, Hydro treating process and catalysts Resid hydro processing, FCC Cracking, Catalyst coking and regeneration, Design concepts, New Designs for Fluidized-Bed Catalytic Cracking Units

UNIT IV ROLE OF CATALYSTS, BIOPROCESSES IN PETROLEUM INDUSTRY 9 hours

Types of catalyst and their importance, Design of catalyst, selection of catalyst, Catalytic processes. Introduction to biotechnology, oil recovery from reservoirs, refining of petroleum using biodesulphurisation, Bioremediation, commercial processes for bioethanol, propanol.

UNIT V HEALTH, ENVIRONMENT, PROCESS SAFETY AND MANAGEMENT IN PETROLEUM INDUSTRY 9 hours

Safety policy, Personal protective equipment, Different type of extinguishers, Types of gloves and their application, Hydrants and their role, Safety indicators, Safety contact, Environmental pollution, precaution and first aid, precautions safety, Occupational safety and management, different elements and their role.

Course Outcomes:

At the end of the course, students will be able to:

1. Be able to understand the overview of petroleum industry
2. Be able to understand the concepts of crude oil, types of crude oils, properties of fuels such as octane number, cetane number, viscosity, density etc. Instruments.
3. Be familiarized with importance and their use of chemicals involved in the petroleum industry.
4. Be familiarized with the processes involved in hydroprocessing and fluid catalytic cracking.
5. Be familiarized the types of catalysts and bioprocesses in the petroleum industry.
6. Understanding the PPE, different types of extinguishers, First aid, process safety and management in the petroleum industry.

Text Books:

1. Mohamed A. Fahim, Taher A. Al-Sahhaf, Amal Elkilani, Fundamentals of Petroleum Refining, Elsevier,2009
2. David T Day, Handbook of the Petroleum Industry, Volume 1, ISBN: 137595962X, CHIZINE PUBN, 2017
3. S. P. Srivastava Jenő Hancsók, *Fuels and fuel additives*, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.
4. Robert O. Anderson, *Fundamentals of the Petroleum Industry*–University of Oklahoma Pres, 1987.
5. James G.Speight, *Handbook of Petroleum Product Analysis,* John Wiley & Sons, Inc, 2015
6. Physical Chemistry by G.W. Castellan (Addison Wesley Publishing Company)

Reference Books

1. Sankara Papavinasam, Corrosion Control in the Oil and Gas Industry, Elsevier, 2013
2. Petroleum Engineering Handbook (Vol. 1 through VIII). Editor in Chief: Larry W. Lake, Society of Petroleum Engineers.
3. Srinivasan Chandrasekaran. Health, safety and Environmental Management for offshore and Petroleum Engineers, John Wiley and Sons, U.K., ISBN: 978-11-192-2184-5, 2016.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CHE302 GREEN CHEMISTRY AND CATALYSIS FOR SUSTAINABLE ENVIRONMENT

L	T	P	C
3	0	0	3

Pre-requisite: Basic Chemistry at Intermediate or equivalent level.

Course Description:
This course aims to introduce the interdisciplinary concept for engineering's to enhance their knowledge that they need to contribute with relevance and confidence in developing green technologies. This course covers feedstocks, green metrics and the design of safer, more efficient processes, as well as the role catalysts and solvents and green processes for Nanoscience.

Course Objectives:
Students will
1. Learn an interdisciplinary approach to the scientific and societal issues arising from industrial chemical production, including the facets of chemistry and environmental health sciences that can be integrated to promote green chemistry
2. Sensitize the students in redesigning of chemicals, industrial processes and products by means of catalysis.
3. Understand the use of alternatives assessments in using environmentally benign solvents.
4. Emphasize current emerging greener technologies and the need of alternative energies.
5. Learn to adopt green chemistry principles in practicing Nanoscience.

UNIT I PRINCIPLES AND CONCEPTS OF GREEN CHEMISTRY 9 hours

Introduction, Green chemistry Principles, sustainable development and green chemistry, atom economy, atom economic: Rearrangement and addition reactions and un-economic reactions: Substitution, elimination and Wittig reactions, Reducing Toxicity. Waste - problems and Prevention: Design for degradation.

UNIT II CATALYSIS AND GREEN CHEMISTRY 9 hours

Introduction to catalysis, Heterogeneous catalysts: Basics of Heterogeneous Catalysis, Zeolites: Catalytic cracking, ZSM-5 catalyst and high silica zeolites, TS1 Oxidation catalyst, Catalytic Converters, Homogeneous catalysis: Hydrogenation of alkenes using wilkinson's catalyst, Phase transfer catalysis: Hazard Reduction, C–C Bond Formation, Oxidation Using Hydrogen Peroxide.

UNIT III ORGANIC SOLVENTS: ENVIRONMENTALLY BENIGN SOLUTIONS 9 hours

Organic solvents and volatile organic compounds, solvent free systems, supercritical fluids: Super critical carbondioxide, super critical water and water as a reaction solvent: water based coatings, Ionic liquids as catalyst and solvent.

UNIT IV EMERGING GREENER TECHNOLOGIES AND ALTERNATIVE ENERGY SOURCES 9 hours

Biomass as renewable resource, Energy: Fossil Fuels, Energy from Biomass, Solar Power, Fuel Cells(Hydrogen—oxygen fuel cell), Photochemical Reactions: Advantages of and Challenges Faced by Photochemical Processes, Examples of Photochemical Reactions(caprolactum), Chemistry Using Microwaves: Microwave Heating, Microwave-assisted Reactions, Sonochemistry.

UNIT V GREEN PROCESSES FOR GREEN NANOSCIENCE 9 hours

Introduction and traditional methods in the nanomaterials synthesis, Translating green chemistry principles for practicing Green Nanoscience. Green Synthesis of Nanophase Inorganic Materials and Metal Oxide Nanoparticles: Hydrothermal Synthesis, Reflux Synthesis, Microwave-Assisted Synthesis, Other methods for Green synthesis of metal and metal oxide nanoparticles, Green chemistry applications of Inorganic nanomaterials

Course Outcomes:

Upon completion of this course the students should:

1. Recognize green chemistry concepts and apply these ideas to develop respect for the interconnectedness of our world and an ethic of environmental care and sustainability.
2. Understand and apply catalysis for developing eco-friendly processes.
3. Be in a position to use environmental benign solvents where ever possible.
4. Have knowledge of current trends in alternative energy sources.
5. Apply green chemistry principles in practicing green Nanoscience.

Text Books:

1. M. Lancaster, Green Chemistry an introductory text, Royal Society of Chemistry, 2002.

2. Paul T. Anastas and John C. Warner, Green Chemistry Theory and Practice, 4th Edition, Oxford University Press, USA

Reference Books

1. Edited by Alvise Perosa and Maurizio Selva , Hand Book of Green chemistry Volume 8: Green Nanoscience, wiley-VCH

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20ME301 MATERIAL SCIENCE FOR ENGINEERS

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Objectives:

1. To understand the relation between structure and properties of metallic materials.
2. To understand the strengthening mechanism of metals
3. To comprehend the various electrical and electronic properties of materials.
4. To understand origins and various types of magnetism and its applications.
5. To comprehend the transmission of light in various solids and study of photonic behavior.

UNIT I STRUCTURE OF MATERIALS 9 hours

Introduction: Historical prospective - importance of materials - Classification of Materials and its Properties. Bonding in solids: bonding forces and energies - primary and secondary bonding. Crystallography and Metallic structures: Unit cell - Crystallographic directions and planes, FCC, BCC, HCP, SC and other structure – miller indices, Linear and planar densities - close- packed crystal structures. Packing of atoms in solids. Packing factor

UNIT II CRYSTAL IMPERFECTIONS AND DIFFUSION 9 hours

Crystal Imperfections: Types, Vacancies and interstitials, Dislocations, and grain boundaries. Diffusion: Fick's Law of diffusion – Diffusion mechanism – Steady state and non-steady state, factors affecting diffusion.

UNIT III ELECTRICAL PROPERTIES OF MATERIALS 9 hours

Introduction and Electrical Conduction: Ohm's Law, Electrical Conductivity, Electronic and Ionic Conduction - Energy Band Structures in Solids, Electron Mobility - Electrical Resistivity of Metals Semi conductivity: Intrinsic and Extrinsic Semiconduction - Temperature Dependence of Carrier Concentration, Factors that Affect Carrier Mobility, The Hall Effect, Semiconductor Devices. Conduction in Ionic Materials, Electrical Properties of Polymers. Dielectric Materials: Capacitance, Ferroelectric Materials, Piezoelectric Materials.

UNIT IV MAGNETIC PROPERTIES OF MATERIALS 9 hours

Introduction and Basic Concepts, Diamagnetism, Paramagnetism, Ferromagnetism, Anti ferromagnetism, Ferrimagnetism, Influence of Temperature on Magnetic Behavior, Domains and Hysteresis, Magnetic Anisotropy, Soft and Hard Magnetic Materials, Magnetic Storage, Superconductivity.

UNIT V PHOTONIC MATERIALS 9 hours

Introduction, Electronic Radiation in Vacuum; Reflection, Refraction, and absorption in materials; Absorption and Chemical Bonding: Color, X-Ray absorption, Photon absorption Devices - Photon Emission: X-Ray Emission, Emission of electromagnetic radiation and devices: LED's, OLEDs and LASERs. Optical Fibers in communication

Course Outcomes:

At the end of the course students will be able:

1. To develop deep knowledge of crystal structure and effect of structure on the properties of the materials
2. To demonstrate knowledge of various imperfections in crystal, and diffusion mechanism in materials
3. To explain the origins of various electronic and electrical properties in the materials
4. To understand the concept of magnetism, its origin and types, while choosing the right material for the given application
5. To summarize various optical properties of the material and light's transmission behavior

Text Books:

1. W. Callister, "Materials Science and Engineering", Wiley, 7th Edition, 2007.
2. Charles M. Gilmore, "Materials Science and Engineering Properties", Cengage Learning, SI Edition, 2016

Reference Books

1. Donald R. Askeland, Pradeep P. Phule, "The Science and Engineering of Materials", Cengage Learning, 5th Edition, 2006.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20ME302 ELEMENTS OF MECHANICAL ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Objectives:
Students belonging to all branches of Engineering are made to learn following fundamental topics related to mechanical engineering:
1. To teach students the basic concepts of Thermodynamics.
2. To teach students the basic Classification and working principles of boilers and turbines.
3. To teach students about IC engines, Refrigeration, and Air-Conditioning systems.
4. To teach students about engineering materials and casting manufacturing processes.
5. To teach students and machines tools and manufacturing systems.

UNIT I THERMODYNAMICS 9 hours

Basic concepts of Thermodynamics: Introduction, Important terminologies used in thermodynamics, Specific heat capacity, First law of thermodynamics, Second law of thermodynamics, Reversible and irreversible processes, the Carnot cycle and the Clausius inequality.

UNIT II BOILERS, TURBINES AND PUMPS 9 hours

Boilers: Introduction to boilers, Classification of boilers, requirements of a good boiler, Cochran, Babcock, Locomotive, and Lancashire boilers.

Turbines: Hydraulic Turbines-Classification and specification, Principles, and operation of Pelton wheel turbine, Francis turbine, and Kaplan turbine (elementary treatment only).

Hydraulic Pumps: Introduction, Classification, and specification of pumps, reciprocating pump, and centrifugal pump.

UNIT III IC ENGINES AND REFRIGERATION SYSTEMS 9 hours

Internal Combustion Engines: Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines, Working principle of IC engines, Valve timing diagrams, Otto cycle, Diesel cycle, and Dual cycle. Refrigeration and Air conditioning Refrigeration – Introduction, Refrigerator, and Heat pump, Components of refrigeration system, Types of refrigeration system, and Type of refrigerants.

UNIT IV MATERIALS, CASTING AND TRANSMISSION 9 hours

Engineering Materials: Introduction, mechanical properties of engineering materials, mechanical testing of engineering materials, Impact test, and Classification of engineering materials.

Casting: Introduction to casting processes, Classification of casting processes, Sand casting, and special casting methods.

Power Transmission Devices: Introduction, belt drive, rope drive, Chain drive, Gear drive, Classification of gears.

UNIT V TOOLS AND MANUFACTURING SYSTEMS 9 hours

Machine Tools: Introduction, Mechanism of metal cutting, Geometry of single point cutting tool, Orthogonal and oblique metal cutting, Lathe, and Milling machines.

Manufacturing Systems Introduction, Computer Integrated Manufacturing, CAD/CAM, Numerical Control (NC), Computer Numerical Control, and Dynamics Numerical Control.

Course Outcomes:

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

1. State first, second and third law of thermodynamics.
2. Sketch components of boilers and turbines.
3. State working principle of IC engines and R& AC systems.
4. Fair understanding of application and usage of various engineering materials, Casting process, and different types of drives with applications.
5. Explain the role of Computers in manufacturing systems.

Text Books:

1. "Basic Mechanical Engineering" by Pravin Kumar, Pearson Edition ISBN: 9789332505759, 9789332505759.

Reference Books

1. George E Dieter, "Mechanical Metallurgy", 3rd Edition, McGraw Hill, 2017
2. S. Kalpakjian and S. R. Schmid, "Manufacturing Engg, and Technology", 7th Edition, Pearson, 2018
3. P K Nag, "Engineering Thermodynamics", 6th Edition, McGraw Hill, 2017

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20EEE301 INDUSTRIAL ELECTRICAL SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite: 20EEE101

Course Description:
This course deals with basics of electrical wiring systems for residential, commercial and industrial consumers, and its representation with standard symbols and drawings, various components of industrial electrical systems and its sizing and control aspects of industrial electrical system using PLC and SCADA.

Course Objectives:
1. To understand the electrical wiring systems for residential, commercial and industrial consumers.
2. To learn the representation of systems with standard symbols and drawings.
3. To understand the various components of industrial electrical systems.
4. To analyze and select the proper size of several electrical system components.
5. To study the control aspects of industrial electrical system using PLC and SCADA

UNIT I ELECTRICAL SYSTEM COMPONENTS 9 hours

LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

UNIT II RESIDENTIAL AND COMMERCIAL ELECTRICAL SYSTEMS 9 hours

Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT III ILLUMINATION SYSTEMS 9 hours

Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

UNIT IV INDUSTRIAL SUBSTATION SYSTEMS 9 hours

HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, SLD, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT V INDUSTRIAL SYSTEM AUTOMATION 9 hours

DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Discuss the various component representation involved in the design of electrical wiring for Low Tension.
2. Understand the guidelines for wiring of household and commercial buildings.
3. Understand the various components of illumination in industrial electrical systems.
4. Select the proper size of various electrical system components required for designing different electrical wiring systems.
5. Understand the control aspects of industrial electrical system using PLC and SCADA.

Text Books:

1. S. L. Uppal and G. C. Garg, "Electrical Wiring, Estimating & Costing", Khanna publishers, 2008
2. K. B. Raina, "Electrical Design, Estimating & Costing", New age International, 2007.

Reference Books

1. S. Singh and R. D. Singh, "Electrical estimating and costing", Dhanpat Rai and Co., 1997.
2. H. Joshi, "Residential Commercial and Industrial Systems", McGraw Hill Education, 2008.
3. https://www.bis.gov.in/

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20EEE302 INTRODUCTION TO MEMS

L	T	P	C
3	0	0	3

Pre-requisite: 20EEE101

Course Description:
This course describes about manufacturing, modeling and applications of MEMS.

Course Objectives:

1. To know the fundamentals of MEMS materials, their physical properties and Principles of operation of MEMS devices.
2. To know various MEMS microfabrication technologies.
3. To provide various MEMS technology for mechanical, optical, and chemical sensors and actuator

UNIT I INTRODUCTION 9 hours

Overview – History and industry perspectives – Working principles – Mechanics and dynamics — Scaling law

UNIT II MICRO SENSORS & ACTUATORS 9 hours
Micro sensors: Pressure sensors, accelerometers, gyroscopes-Micro actuators: comb drive actuators – Micro-electromechanical systems.

UNIT III MICRO MANUFACTURING 9 hours
Materials for MEMS and Microsystems- Micro fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation, Chemical Vapour Deposition- Physical Vapour Deposition, Micro manufacturing: Bulk micromachining, surface micromachining, LIGA Process- Packaging.

UNIT IV MODELING IN MEMS 9 hours
Micro system design: Finite Element Methods-– Modeling of simulation – piezoelectric, Gyroscope

UNIT V MEMS APPLICATIONS 9 hours
Micro fluids-sensors for turbulence measurement and control, micro-actuators for flow control, RFMEMS- filters, Oscillators and phase shifters, Optical MEMS, micro robotics – Case studies

Course Outcomes:
Upon successful completion of the course, students will be able to

1. Explain the fundamentals of MEMS materials, their physical properties and Principles of operation of MEMS devices.
2. Analyze the Micro sensors and actuators and its fabrication.
3. Explain the materials for MEMS and Microsystems.
4. Design MEMS using microfabrication techniques.
5. Explain the advantages of MEMS technology for mechanical, optical, and chemical sensors and actuator

Text Books:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2006
2. G.K. Ananthsuresh et al ,'Micro and Smart Systems', Wiley, India, 2010

Reference Books

1. NadimMaluf, "An introduction to Micro electro mechanical system design", ArtechHouse, 2000.
2. Mohamed Gad-el-Hak, editor, "The MEMS Handbook", CRC press Baco Raton, 2000.
3. James J.Allen, micro electro mechanical system design, CRC Press published in 2005
4. Stephen D. Senturia, Microsystem Design, Kluwer Academic Publishers, 2001

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20ECE301 BIO-MEDICAL ELECTRONICS

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This course provides the fundamental knowledge on applications of electronics in bio-medical signal measurements and processing, bio-medical instrumentation and imaging techniques.

Course Objectives:
This course enables students to

1. Acquire the basic knowledge on human physiology and biological transducers.
2. Learn about bio-electrodes and bio-amplifiers used in bio-signal acquisition.
3. Understand the working principle of bio-medical measuring instruments.
4. Study various types of imaging techniques used in medicine.
5. Learn the applications of medical instrumentation in designing artificial medical aids

UNIT I HUMAN PHYSIOLOGY AND BIOMEDICAL TRANSDUCERS 9 hours

Introduction to human physiology - Biomedical transducers for measuring displacement, velocity, force, acceleration, potential, dissolved ions and gases.

UNIT II BIO-ELECTRODES AND AMPLIFIERS 9 hours
Introduction to bio-potential, Bio-electrodes, Typical waveforms and characteristics of ECG, EMG and EEG, Bio-potential amplifiers for ECG, EMG and EEG – Lead systems and recording methods.

UNIT III BIOMEDICAL MEASURING INSTRUMENTS 9 hours
Measurement of blood pressure and temperature, Blood flow meter, Cardiac output measurement, Respiratory measurement, Blood cell counter, Impedance plethysmography.

UNIT IV MEDICAL IMAGING 9 hours
X-ray, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), Nuclear imaging, Ultrasonic Imaging.

UNIT V PROSTHESES AND AIDS 9 hours
Pacemakers, Defibrillators, Heart-lung machine, Artificial kidney, Aids for the handicapped, Safety aspects

Course Outcomes:
Upon successful completion of the course, students will be able to

1. Understand the applications of biological transducers in medical field.
2. Analyze the design of bio-electrodes and bio-amplifiers.
3. Apply suitable measuring instruments to measure various medical parameters.
4. Understand and test various imaging techniques used in bio-medical diagnosis.
5. Analyze the applications of artificial medical aids.

Text Books:

1. W.F. Ganong, Review of Medical Physiology, 26th Edition, Tata McGraw-Hill, New Delhi, 2019.

2. J.G. Websster, ed., Medical Instrumentation, 3rd Edition, Wiley India Pvt. Ltd. 2009

Reference Books

1. A.M. Cook and J.G. Webster, eds., Medical Devices and Human Engineering, Taylor & Francis, 2014
2. R.S.Khandpur, "Handbook of Biomedical Instrumentation", 2nd edition, Tata McGraw - Hill, New Delhi, 2005
3. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice-Hall, New Delhi, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20ECE302 VLSI DESIGN

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This course describes about various VLSI design methodologies, fundamentals of CMOS technology. It incorporates basics of MOSFET models, CMOS design rules, Design of VLSI Systems, combinational logic design, sequential logic design, logic families and VLSI Design flow.

Course Objectives:
This course enables students to

1. Study the fundamentals of CMOS circuits and its characteristics
2. Learn the design and realization of combinational digital circuits.
3. Learn the design and realization of sequential digital circuits.
4. Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed
5. Learn the different FPGA architectures and testability of VLSI circuits.

UNIT I INTRODUCTION TO MOS TRANSISTOR 9 hours

MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Non ideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II COMBINATIONAL MOS LOGIC CIRCUITS 9 hours

Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls.
Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT III SEQUENTIAL CIRCUIT DESIGN 9 hours

Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.
Timing Issues: Timing Classification Of Digital System, Synchronous Design.

UNIT IV DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM 9 hours

Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff.

Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry.

UNIT V IMPLEMENTATION STRATEGIES AND TESTING 9 hours

FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for Testability: Ad Hoc Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Realize the concepts of digital building blocks using MOS transistor.
2. Design combinational MOS circuits and power strategies
3. Design and construct Sequential Circuits and Timing systems.
4. Design arithmetic building blocks and memory subsystems.
5. Apply and implement FPGA design flow and testing.

Text Books:

1. Neil H.E. Weste, David Money Harris "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson , 2017.
2. Jan M. Rabaey ,Anantha Chandrakasan, Borivoje. Nikolic, "Digital Integrated Circuits:A Design perspective", Second Edition , Pearson , 2016.

Reference Books

1. Operating Systems - Internals and Design Principles. Stallings, 6th Edition2009. Pearson education.
2. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CST301 OPERATING SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite: 20CSE101, 20CSE102

Course Description:
Student will understand Modern Operating System and their principles. The course will cover theory as well as practice aspects of a subject through scheduled lectures and labs, course will cover details of processes, CPU scheduling, memory management, file system, storage subsystem, and input/output management.

Course Objectives:

6. To understand the basic concepts and functions of operating systems
7. To understand Processes and Threads
8. To analyze Scheduling algorithms
9. To understand the concept of Deadlocks
10. To analyze various memory management schemes
11. To understand I/O management and File systems

UNIT I OPERATING SYSTEMS OVERVIEW 9 hours

Operating system overview: Objectives – functions - Computer System Organization-Operating System Structure - Operating System Operations- System Calls, System Programs.

UNIT II PROCESS MANAGEMENT 9 hours

Processes: Process Concept - Process Scheduling - Operations on Processes – Inter process Communication. Process Synchronization: The Critical-Section Problem - Semaphores - Classic Problems of Synchronization – Monitors. Case Study: Windows 10 operating system

UNIT III SCHEDULING AND DEADLOCK MANAGEMENT 9 hours

CPU Scheduling: Scheduling Criteria - Scheduling Algorithms. Deadlocks: Deadlock Characterization - Methods for Handling Deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock Detection - Recovery from Deadlock. Case Study: MAC operating system

UNIT IV STORAGE MANAGEMENT 9 hours

Main Memory: Swapping - Contiguous Memory Allocation, Segmentation, Paging. Virtual Memory: Demand Paging - Page Replacement - Allocation of Frames - Thrashing. Case Study: Android operating system

UNIT V MASS STORAGE MANAGEMENT 9 hours

Mass Storage Structure: Disk Structure - Disk Scheduling - Disk Management. File-System Interface: File Concepts, Directory Structure - File Sharing – Protection. File System. Case Study: Linux operating system

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand operating system program, structures and operations with system calls.
2. Apply the process management concept for real time problems
3. Illustrate CPU scheduling algorithms and to handle the deadlock for the given situation.
4. Explain the concepts of various memory management techniques
5. Summarize the storage concepts of disk and file.

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 10th Edition, John Wiley and Sons Inc., 2020.
2. Richard Petersen, "Linux: The Complete Reference", 6th Edition, Tata McGraw-Hill, 2008

Reference Books

1. Operating Systems - Internals and Design Principles. Stallings, 6th Edition2009. Pearson education.
2. William Stallings, "Operating Systems – Internals and Design Principles", 7th Edition, Prentice Hall, 2011.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CSE301 JAVA PROGRAMMING

L	T	P	C
3	0	0	3

Pre-requisite: **None**

Course Description:
Basics of Object-Oriented Programming - objects, classes, polymorphism, inheritance, static and dynamic binding. Object Oriented Programming using Java-classes, interfaces, inheritance, polymorphism, method dispatch, features for encapsulation and modularity.

Course Objectives:
1. Understand object-oriented programming concepts, and apply them in solving problems.
2. Learn the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes.
3. To Introduce the implementation of packages and interfaces.
4. Learn the concepts of exception handling and multithreading.
5. Learn the design of Graphical User Interface using applets and swing controls.

UNIT I INTRODUCTION TO OOPS CONCEPTS AND CLASSES 9 hours

Introduction to Object Oriented Programming, Java buzzwords, Java Programming Basics, Sample programs, Data types and operators, Control statements.
Classes: Classes, Objects, Methods, Constructors, this and static keywords, Method and Constructor Overloading, Access modifiers, Polymorphism
Arrays: One Dimensional and multi-dimensional arrays.

UNIT II STRINGS, INHERITANCE, INTERFACES, AND PACKAGES 9 hours
Strings: Strings, String Handling - Inheritance: Basics, Usage of Super, Multi-level hierarchy, Method overriding, Abstract class, Final keyword. - Interfaces: Creating, Implementing, Using, Extending, and Nesting of interfaces - Packages: Defining, Finding and Importing packages, Member Access.

UNIT III EXCEPTION HANDLING &MULTI-THREADING 9 hours
Exception Handling: Fundamentals, Types, Multiple catch clauses, Nested try blocks, Thrown Class, Using Finally and Throws, Built-in exceptions, User-defined exceptions.
Multi-threading: Thread Class, Runnable interface, creating multiple threads, life cycle of thread, thread properties, synchronization, thread communication, suspending, resuming and stopping threads.

UNIT IV I/O STREAMS AND COLLECTION FRAME WORK CLASSES 9 hours
I/O Streams: Byte Stream Classes and Character Stream Classes.
Collection Frame work : Hierarchy of collection framework, Array-List, Linked-List, Vector, Stack, Queue, Priority Queue, Hash Set, Linked Hash Set, Tree Set.

UNIT V GUI PROGRAMMING AND EVENT HANDLING 9 hours
Swing – Introduction, limitations of AWT, MVC architecture, components, containers, Event Handling- Handling mouse and keyboard events, Exploring Swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables. JDBC: Connecting to Database, querying a database and processing the results, updating data with JDBC.

Course Outcomes:

At the end of the course, students will be able to:

1. Choose object-oriented programming concepts for problem solving.
2. Create and use packages and interfaces.
3. Develop multithreaded applications with synchronization.
4. Provide computed based solutions by using java collection framework and I/O classes.
5. Design GUI based applications.

Text Books:

1. Java The Complete Reference, Herbert Schildt, MC GRAW HILL Education, 9th Edition, 2016.

Reference Books

1. Core Java Volume I – Fundamentals, by Cay S. Horstmann, Gary Cornell Pearson Education Ninth Edition
2. "Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.
3. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.
4. "Thinking in Java", Bruce Eckel, Pearson Education.
5. Java and Object Orientation, an introduction, John Hunt, second edition, Springer.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CSE302 MULTIMEDIA TECHNOLOGIES

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This course aims to introduce the students to Multimedia technologies and their usage in real world applications. This course covers introduction to multimedia, different image, video and audio formats, image coding and compression techniques, I/O technologies, Multimedia network and Multimedia Security and Forensics.

Course Objectives:
1. To provide the foundation knowledge of multimedia technologies.
2. To provide the knowledge about media characteristics, compression standards, multimedia representation, data formats, multimedia technology development.
3. To understand Multimedia security and forensics.
4. To understand multimedia components efficiently
5. To develop integrated, collaborative multimedia systems

UNIT I INTRODUCTION 9 hours

Introduction to Multimedia: Multimedia Elements – Multimedia applications – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases, Multimedia Architecture – Multimedia Documents

UNIT II COMPRESSION, ANIMATION , FILE FORMATS 9 hours
Compression, Decompression, Binary Image Compression Schemes, Types of Compression, Image Compression, Video Compression, Audio Compression. Principles of animation, 2D, 3D animation.
File formats: Rich Text Format – TIFF File Format – Resource Interface File Format – MIDI File Format - JPEG DIB File Format.

UNIT III MULTIMEDIA TECHNOLOGIES 9 hours
Multimedia I/O Technologies: Image Scanners – Digital Voice and Audio – Digital Camera – Video Images – Full Motion Video -Video Motion Analysis.

UNIT IV MULTIMEDIA PROTOCOLS 9 hours
Protocol - QOS Issues - RTP, RTCP, RTSP, SIP - Media on demand –ITV - STB Broadcast Schemes for VoD Buffer Management- Multimedia over wireless networks.

UNIT V SECURITY ATTACKS 9 hours
Multimedia encryption - Digital Watermarking. Security Attacks- Digital Forensics taxonomy, goals/requirements - Forensic Data Acquisition -Forensics Analysis and Validation.

Course Outcomes:

Upon completion of this course, students should be able to

1. Understand the characteristics of different media and the representations of different multimedia data formats.
2. Understand the characteristics of Image, Audio and Video systems and takes into considerations in multimedia techniques design and implementation.
3. Describe different coding and compression principles and compare different compression techniques.
4. Design multimedia components efficiently
5. Develop integrated, collaborative multimedia system

Text Books:

1. Li, Ze-Nian and Mark S. Drew, “Fundamentals of Multimedia”, Prentice Hall of India, 2004.

2. Steinmetz Ralf and K. Nahrstedt “Multimedia: Computing, Communications & Applications”,Pearson Education, 1995.

Reference Books

1. Ralf Steinmetz and Klara, “Multimedia Computing, Communications and Applications”, Pearson Education, 2009
2. Chun-Shien Lu, “Multimedia Security : Steganography and Digital Watermarking techniques for Protection of Intellectual Property”, Springer Inc 2007

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

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OPEN ELECTIVES-IV

20PHY303 THIN FILM TECHNOLOGY AND ITS APPLICATIONS

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
Nucleation, crystallization, surface energy, various thin film coating processes including both physical vapour deposition such as evaporation, sputtering, pulsed laser deposition and chemical vapour deposition, spray coating, and other methods such as spin-coating, plasma polymerization, Langmuir Blodgett, transport phenomena in thin films, various properties of thin films, techniques and method to characterize thin films, current application of thin film, introduction to fabrication of thin film devices

Course Objectives:

1. To provide students with a comprehensive overview on the fundamentals of thin film preparation and characterization.
2. To enable the students to develop a thorough understanding of how core physics can be used to understand thin film deposition processes.
3. To establish the correlation between processing variables and materials characteristics and performance within the framework of key modern technologies.
4. To realize thin film applications to science and technology

UNIT I PHYSICS OF THIN FILMS 8 hours

Introduction - Role of thin films in devices - Thin film definition - Crystalline and amorphous films - Crystal defects - Nucleation and growth - film formation.

UNIT II THIN FILM DEPOSITION TECHNIQUES 10 hours

Physical methods of films deposition-evaporation, e-beam, sputter deposition, pulsed laser, molecular beam epitaxy. Chemical methods of film deposition -Deposition of Inorganic films from Solutions-Chemical vapour deposition - Electrolysis, Anodization, Spray pyrolysis, Other techniques: Langmuir Blodgett and Spin Coating.

UNIT III PROPERTIES OF THIN FILMS 8 hours

Structural-Optical-Electrical-Magnetic-Mechanical and Thermal properties of thin films.

UNIT IV CHARACTERIZATION OF THIN FILMS 10 hours

Imaging Techniques (SEM, AFM, TEM) - Structural Techniques (XRD, Raman)-Optical Techniques (UV-Vis-NIR, PL)-Electrical Techniques (Hall Effect, IV, CV)-Magnetic Techniques (EPR, H-V curve)-Mechanical Techniques (Hardness testing)-Thickness measurement (profilometer, ellipsometry).

UNIT V APPLICATIONS OF THIN FILMS 9 hours

Transparent conducting coating - Optical coating – Solar cells – Photocatalytic – Sensors - Superconductivity- Superhard coatings – Thin film transistors.

Course Outcomes:

At the end of the course, students will be able to:

1. Discuss the differences and similarities between different vacuum based deposition techniques, evaluate and use models for nucleating and growth of thin films.
2. Asses the relation between deposition technique, film structure, and film properties.
3. Know the typical thin film applications.
4. Motivate selection of deposition techniques for various applications.

Text Books:

1. Thin Film Deposition: Principles and Practice, Donald L. Smith, McGraw Hill, Singapore, 2001.
2. Maissel, L.I and Glang. R, "Handbook of thin film technology", McGraw Hill, 1970.

Reference Books:

1. Thin film phenomena / Kasturi L. Chopra, New York: McGraw-Hill, c1969.
2. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications" Imperial College Press, 2004.
3. G. Cao, "Nanostructures & Nanomaterials: Synthesis, Properties & Applications" Imperial College Press, 2004.
4. Thin film processes, John L Vossen, Werner Kehn editors, Academic Press, New York, 1978.
5. Thin film physics / O.S. Heavens, London: Methuen, c1970.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CHE303 INTRODUCTION TO NANO SCIENCE AND TECHNOLOGY

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:

This is primarily a lecture course which brings together relevant knowledge from the disciplines of physics and chemistry to give students a fundamental understanding of the integrated multidisciplinary nature of Nanotechnology.

Course Objectives:

1. To understand the emergence of nanoscience and technology through history.
2. The various process techniques available for nanostructured materials.
3. The role of nanotechnology in electronics how basic nano-systems work
4. To use physical reasoning to develop simple nanoscale models to interpret the behaviour of such physical systems

UNIT I MOLECULE TO MATERIALS: BASICS OF NANOTECHNOLOGY 8 hours

History & emergence (Feynman to present) of Nanoscience and Nanotechnology, Challenges in Nanotechnology. Atomic Structures: Rutherford and Bohr's model of atom. Bohr's model to Quantum: Wave function, Uncertainty principle, Orbital quantum numbers, Shape of the orbitals. Types of simple crystal structures, defects in crystals.

UNIT II TYPES AND SYNTHESIS OF NANOSTRUCTURES 10 hours

Definition of a Nano system - Zero Dimensional (OD), One Dimensional (1D) - Two Dimensional (2D) - Three Dimensional (3D) nanostructured materials. Nanoscale building blocks, Top-down and Bottom-up approaches. Synthesis of Nanomaterials – Physical & Chemical methods: Chemical Vapour Deposition (CVD), Atomic Layer Deposition (ALD), Chemical Reduction, Co-precipitation, Emulsion Polymerization (Polymer and Organic NPs), Sol-Gel, Green synthesis of Nanoparticle (NP).

UNIT III PROPERTIES OF NANOMATERIAL 8 hours

Thermal, Mechanical, Optical, Electrical and Magnetic properties of nanomaterials (Metal oxides, Ceramics, Nanocomposites, Semiconductors). Carbon age materials: CNTs, and other Carbon-based materials). Effect of size and shape on the properties of nanomaterials.

UNIT IV CHARACTERIZATION OF NANOMATERIALS 10 hours

Structure: Powder XRD (SAXS); Composition: XPS; Thermal: TG-DTA; Optical & Electron microscopes: Atomic force microscopes (AFM), Scanning electron microscope (SEM), Transmission electron microscope (TEM); Magnetic characterization (SQUID).

UNIT V APPLICATIONS OF NANOMATERIALS 9 hours

Molecular electronics and nano-electronics – LED applications, Quantum electronic devices - CNT based transistor and Field Emission Display – Biological (anti-bacterial, anti-fungal, anti-microbial) applications - Biochemical sensor - Membrane based water purification, Target based drug delivery system.

Course Outcomes:

At the end of the course, students will be able to:

1. Understand the correlation between atomic, molecular structures and nanomaterials
2. Classify the types and synthesis the nanomaterials based on the needs of the society and environment.
3. Infer and interpret the properties of nanomaterials
4. Apply the knowledge of characterization tools towards making the sustainable engineering products.
5. Illustrate the application of various nanomaterials in daily life, industry towards the sustainable development.

Text Books:

1. M. Wilson, K. Kannangara, G. Smith, M. Simmons, and B. Raguse, Nanotechnology: Basic science and Emerging technologies, Overseas Press India Pvt Ltd, New Delhi, First Edition, 2005.
2. C. N. R. Rao, A. Muller, and A. K. Cheetham (Eds), The chemistry of nanomaterials: Synthesis, properties and applications, Wiley VCH Verlag Gmbh & Co, Weinheim, 2004.
3. Kenneth J. Klabunde (Eds), Nanoscale Materials Science, John Wiley & Sons, InC, 2001.
4. C. S. S. R. Kumar, J. Hormes, and C. Leuschner, Nanofabrication towards biomedical applications, Wiley - VCH Verlag GmbH & Co, Weinheim, 2004.
5. T. Pradeep, Nano: The Essentials, Understanding Nanoscience and Nanotechnology, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.

Reference Books

1. W. Rainer, Nano Electronics and information Technology, Wiley, 2003.
2. K. E. Drexler, Nano systems, Wiley, 1992.
3. G. Cao, Nanostructures and Nanomaterials: Synthesis, properties and applications, Imperical College Press, 2004.
4. P. Yang, Chemistry of Nanostructured Materials, World Scientific Publishers, 2005.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CHE304 COMPUTATIONAL METHODS IN MATERIALS SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

Pre-requisite: Exposure to Introductory engineering mathematics, introductory materials science and introductory programming courses is preferred.

Course Description:
This course deals with various computational approach and mathematical methods to understanding and apply different concepts in materials science and engineering.

Course Objectives:
1. To get exposed to the basic concepts in Materials Science and Engineering.
2. To understand the basic concepts of Programming and Graphical plotting.
3. To introduce the basic concepts of Data types and handling of various data.
4. To familiarize the basic concepts of modelling and simulation.
5. To acquire and apply the current knowledge and trends in the field of Computational Materials Science.

UNIT I INTRODUCTION TO COMPUTATIONAL MATERIALS SCIENCE AND ENGINEERING **9 hours**
Concepts in materials science and engineering; use of computers and freely available open source software to: data handling; understand concepts and solve problems of engineering interest.

UNIT II PROGRAMMING AND PLOTTING **9 hours**
Introductions to the advanced concept C programming language; open source software for numerical computations and visualization (gnuplot, GNU Octave, Scilab); introduction to the LaTeX software for report preparation along with other miscellaneous software and programs.

UNIT III DATA TYPES AND HANDLING TECHNIQUES **9 hours**
Classification, and understanding of data properties, data handling - plotting, fitting, functional forms, interpolation, and integration.

UNIT IV COMPUTATIONAL MODELING AND SIMULATIONS **9 hours**
Understanding the materials properties; atomistic and electronic modelling of materials; concepts in molecular dynamics and its application using Quantum ESPRESSO.

UNIT V CURRENT TRENDS IN COMPUTATIONAL MATERIALS SCIENCE **9 hours**
Applied materials for various engineering field; research literature exploration; real-time application of computational methods in materials science and engineering, mini-project.

Course Outcomes:

At the end of the course, students will be able to:

1. Understand the importance and applications of computational methods in Materials Science and Engineering.
2. Be familiarized with the tools of the trade, namely programming and graphical plotting.
3. Be able to understand and access the various types of data sets and appropriately handle it to productively work with it.
4. Get the knowledge about handling various open source computational tools and their effective usage to do computational modeling and simulations.
5. Be familiarized with up to date trends in computational materials science by taking up real time research problems and provide solutions.

Text Books:

1. Computational Materials Science: An Introduction, Second Edition 2nd Edition, by June Gunn Lee, 2014
2. Materials science and engineering: an introduction, William D Callister, Sixth edition, John Wiley & Sons, 2013.
3. The C programming language, Brian W Kernighan and Dennis M Ritchie, Second edition, PHI Learning Private Limited, 2010.
4. Materials science and engineering: a first course, V Raghavan, Fifth edition, PHI Private Limited, 2008.
5. Physical metallurgy principles, Robert E. Reed-Hill, Second edition, Affiliated East-West Press Pvt. Limited, 2008.
6. An introduction to materials science and engineering, Kenneth M Ralls, Thomas H Courtney, and John Wulff, Wiley India Pvt. Ltd., 2011.

Reference Books

1. Materials Science and Engineering,V Raghavan,Prentice-Hall India, 2004
2. Advanced Engineering Mathematics, E Kreyzig, Wiley-India,1999.
3. A Review of Computational Methods in Materials Science, International Journal of Molecular Sciences 10(12):5135-216

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20ME303 TOTAL QUALITY MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
Total quality management (TQM) is a philosophy, methodology and system of tools aimed to create and maintain mechanism of organization's continuous improvement. It involves all departments and employees for the improvement of processes and products. TQM encompasses various principles, techniques, and tools for identifying and solving problems, fostering a culture of quality, promoting teamwork, and striving for excellence in all areas of the organization. The goal of TQM is to achieve sustainable and long-term success by consistently delivering high-quality products and services that meet or exceed customer expectations while improving overall organizational performance.

Course Objectives:
Students will

1. Study comprehensive knowledge about the principles, practices, tools and techniques of total quality management.
2. Gain knowledge on leadership, customer satisfaction, addressing customer complaints, team work, employee involvement, related to customer and supplier partnership.
3. Gather information on various tools and techniques, concept on Six Sigma, bench marking and Failure Mode Effective Analysis (FMEA).
4. Know the importance of Quality circle, Quality Function Deployment, Taguchi design and case studies related to TQM.
5. Facilitate the understanding of standards of quality.

UNIT I INTRODUCTION 9 hours
Introduction - Evolution of Quality - Historical Perspective, Basic Concepts of Quality – Quality control, Quality management and Quality Assurance - Definition of TQM – Basic concepts of TQM - TQM Framework - Contributions by Deming, Juran, Crosby and Feigenbaum – Dimensions of product and service quality

UNIT II TQM PRINCIPLES 9 hours
TQM principles - Strategic quality planning, Quality statements – Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention – Role of Leadership and Commitment in Quality Deployment, Team Building, Motivation and Rewards, Total Employee Empowerment, Performance appraisal - Continuous process improvement – Supplier partnership – Partnering, Supplier selection,

UNIT III TOOLS OF TQM 9 hours
The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – KAIZEN, 5S, JIT, Documentation – Failure mode and Effect Analysis (FMEA)

UNIT IV TQM TECHNIQUES 9 hours

Quality circles – Quality Function Deployment (QFD) – House of Quality – Design of Experiments – Taguchi quality engineering – Orthogonal Arrays – Signal to Noise Ratio – TPM – Concepts, improvement needs – Cost of Quality – Performance measures

UNIT V IMPELMENTATION OF TQM 9 hours

Introduction – Benefits of ISO Registration – ISO 9000 Series of Standards –Implementation – Environmental Management System: Introduction – ISO 14000 Series Standards – Concepts of ISO 14001 – Requirements of ISO 14001, Case studies on TQM principles followed by Indian Industries.

Course Outcomes:

At the end of the course, students will be able to:

1. Understand the various principles and practices of TQM to achieve quality.
2. Identify the various statistical approaches for Total Quality Control.
3. Demonstrate the TQM tools for continuous process improvement.
4. Adopt the importance of ISO and Quality systems.
5. Make use of the concepts of TQM to solve case studies

Text Books:

1. Dale H. Besterfield, et al., Total Quality Management, Pearson Education Asia, Third Edition, Indian Reprint (2003).

Reference Books

1. James R. Evans and William M. Lindsay, The Management and Control of Quality, (6th Edition), South-Western (Thomson Learning), 2005.
2. Oakland, J.S. TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition (2003).
3. Suganthi,L and Anand Samuel, Total Quality Management, Prentice Hall (India) Pvt. Ltd. (2006) Model.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20ME304 ENTREPRENEURSHIP

L	T	P	C
3	0	0	3

Pre-requisite: None

Course Description:
This course is designed to ignite the entrepreneurship idea into the young minds of engineers. This course gives the complete details to setup an enterprise which includes the generating business ideas, writing business plan and executing the plan successfully.

Course Objectives:
1. Understand the requirements of entrepreneurship as a profession.
2. Understand and develop the business plan.
3. Identify the various financial terms and conditions of new business venture.
4. Selection of plant location and choosing layout.
5. Analyse the market research for new ventures and small businesses.

UNIT I INTRODUCTION 9 hours

Introduction to Entrepreneurship, history of entrepreneurship development, social Entrepreneurship, Intrapreneurship, Definition of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision processes. Role of Entrepreneurship in Economic Development, Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad. Woman as Entrepreneur. Realities & Case studies about successful Entrepreneur

UNIT II CREATING AND STARTING THE VENTURE 9 hours
Sources of new Ideas, Methods of generating ideas. The Business Plan Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, implementation of business plans. Case studies of successful business plan, Marketing plan, financial plan, and organizational plan, Launching formalities. Developing business plan and evaluation with team.

UNIT III FINANCING AND MANAGING THE NEW VENTURE 9 hours
Sources of capital, venture capital, angel investment, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. Ecommerce and Entrepreneurship, Internet advertising. New venture Expansion Strategies and Issues, Features and evaluation of joint ventures, acquisitions, merges, franchising. Case studies about entrepreneur who success or failure in their business based on the financial control

UNIT IV PLANT LAYOUT 9 hours
Definition of plant layout and its types, Issues related to Selection of layout. Production and Marketing Management, Selection of production Techniques, plant utilization and maintenance. Case study about selection of site and plant layout for new business venture.

UNIT V MARKET ANALYSIS AND PROJECT MANAGEMENT 9 hours
Inventory control, material handling and quality control. Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing. Case studies on

market analysis on entrepreneur perspective. Project Organization- Project Planning, Monitoring, Control and Learning. Detailed life cycle and post-mortem analysis, Resource allocation, Risk and uncertainty, Budget constraints, Project feasibility.

Course Outcomes:

Upon completion of this course the students shall be able to:

1. Describe the sources of new business ideas, methods to develop new ideas and use the problem-solving techniques.
2. Write a business plan which includes financial plan, organizational plan and marketing plan.
3. Identify the financial sources for new business ventures.
4. Select a plant layout and draw a plant layout.
5. Design a workplace and analyse the market research for new business.

Text Books:

1. Entrepreneurship, Robert Hisrich, & Michael Peters, 5/e TMH.
2. Entrepreneurship, Dollinger, Pearson, 4/e, 2004.

Reference Books

1. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publ. House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Entrepreneurial Management, Robert J.Calvin, TMH, 2004.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20EEE303 ROBOTICS

L	T	P	C
3	0	0	3

Pre-requisite Nil 20EEE108

Course Description:

Robotics is an interdisciplinary area ranging from mechanical & electrical component design to advanced sensor technology, incorporating computer systems and Artificial Intelligence (AI). With advances in AI-techniques & computational power in recent years, it has become one of the most interesting areas for multidisciplinary research, with lots of commercial applications already in market.

Course Objectives:

This course enables students to

6. To know the fundamentals of Robotics & its applications.
7. To know about sensors and make them to handle the selection of sensors for robot design.
8. To know about kinetic and Jacobian modelling.
9. To know about robot programming and implementation.

UNIT I INTRODUCTION, TRANSFORMATION AND MAPPING 9 hours

Evolution of Robots and Robotics, Laws of Robotics, Advancement in Robots, Robot Anatomy, Human Arm Characteristics, Design and Control Issues, Manipulation and Control, Sensors and Vision, Robotic Programming and Future Prospects. Coordinate Frames, Object Description in Space, Transformation of Vectors, Inverting a homogenous transform, Fundamental Rotation Matrices.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 9 hours

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers. Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION 9 hours

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors, binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data-Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Serving and Navigation.

UNIT IV ROBOT KINEMATICS 9 hours

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems.

UNIT V ROBOT PROGRAMMING, IMPLEMENTATION AND ECONOMICS 9 hours

Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs. RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

Course Outcomes:

After completing this Unit, students will be able to

1. Understand the fundamentals of Robotics.
2. Analyze the robot drive system.
3. Understand the various sensors and actuators.
4. Analyze the mechanical structure and notations kinematic model.
5. Implement the basic commands for robots.

Text Book(s)

1. Mittal, R. K. and Nagrath, I.J., Robotic and Control, Tata McGraw Hill, New Delhi, 2003.
2. Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands-On Approach, Universities Press, 2015. ISBN: 978-8173719547

Reference Books

1. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G., Robotics Control, Sensing, Vision and Intelligence, McGraw Hill, 1988.
2. Craig, J.J., Introduction to Robotics: Mechanism & Control. Addison Wesley, 1986.
3. Paul, R.P., Robot Manipulator: Mathematics Programming & Control. MIT Press, 1981.
4. Pugh, A., Robot Sensors, Vision Vol.-I. Springer Verlag, 1986.
5. Groover, M.P., Industrial Robotics Technology, programming & Application, McGraw Hill,

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20EEE304 ELECTRICAL SAFETY

L	T	P	C
3	0	0	3

Pre-requisite Nil 20EEE101

Course Description:

To provide a comprehensive exposure to electrical hazards, various grounding techniques, safety procedures and various electrical maintenance techniques.

Course Objectives:

This course enables students to

1. To impart knowledge on electrical hazards and safety equipment.
2. To analyze and apply various grounding and bonding techniques.
3. To select appropriate safety method for low, medium and high voltage equipment.
4. To understand how to participate in a safety team.
5. To carry out proper maintenance of electrical equipment by understanding various standards.

UNIT I ELECTRICAL HAZARDS 9 hours

Primary and secondary hazards- arc, blast, shocks-causes and effects-safety equipment- flash and thermal protection, head and eye protection-rubber insulating equipment, hot sticks, insulated tools, barriers and signs, safety tags, Classification of insulating materials, locking devices-voltage measuring instruments- proximity and contact testers-safety electrical one-line diagram-electrician's safety kit.

UNIT II GROUNDING AND BONDING 9 hours

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 Ground resistance measurement using megger.

UNIT III SAFETY METHODS 9 hours

The six step safety methods- pre job briefings- hot -work decision tree-safe switching of 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 IV SAFETY TEAM 9 hours

Electrical safety programme structure, development- company safety team- safety policy-programme implementation- employee electrical safety teams- safety meetings- safety audit-accident prevention-first aid- rescue techniques-accident investigation.

UNIT V MAINTENANCE OF ELECTRICAL EQUIPMENT 9 hours

Safety related case for electrical maintenance- reliability centred maintenance (RCM) - eight-step maintenance programme- frequency of maintenance- maintenance requirement for specific equipment and location- regulatory bodies- national electrical safety code- Indian standard for electrical safety in work place- occupational safety and health administration standards.

Course Outcomes:

After completing this Unit, students will be able to

1. Understand various types of dielectric materials, their properties in various conditions.
2. Analyze and apply various grounding and bonding techniques.
3. Select appropriate safety method for low, medium and high voltage equipment.
4. Participate in a safety team.
5. Carry out proper maintenance of electrical equipment by understanding various standards.

Text Book(s)

1. Dennis Neitzel, Al Winfield, 'Electrical Safety Handbook', McGraw-Hill Education, 4th Edition,2012.

Reference Books

1. John Cadick, 'Electrical Safety Handbook', McGraw-Hill School Education Group, 1994.

2. The Institution of Electric Engineers, 1994.

3. Ray A. Jones, Jane G. Jones, 'Electrical safety in the workplace', Jones & Bartlett Learning, 2000.

4. Tareev, 'Electrical Engineering Materials', Verlag Technik, Berlin

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20ECE303 EMBEDDED SYSTEMS

L	T	P	C
3	0	0	3

Pre-requisite None

Course Description:
The course will provide strong foundation on embedded system design. The course covers theory and logic to develop programming expertise. Student will understand application of embedded microcontrollers ARM.

Course Objectives:
This course enables students to

1. To provide knowledge on the basics, building blocks of Embedded System.
2. To provide basic of operating system and Real time programming languages
3. To teach automation using scheduling algorithms and Real time operating system.
4. To understand firmware design and Architectural Support for Operating Systems for various applications
5. To discuss on different Phases & Modeling of a new embedded product.

UNIT I THE CONCEPT OF EMBEDDED SYSTEMS 9 hours

Embedded System Design, Introduction to Embedded Hardware Elements, Sensors and Actuators, Embedded Processors, Memory Architectures. Embedded System vs. General Purpose computing systems, Examples of embedded systems, Embedded memories, Embedded microcontroller cores

UNIT II SOFTWARE ASPECTS OF EMBEDDED SYSTEMS – I 9 hours

Operating System Basics, types of Operating Systems, Task and Task States, Semaphores and shared Data, RTOS services and design using RTOS, Tasks, Process and Threads, Multiprocessing and Multitasking, Real time programming languages.

UNIT III SOFTWARE ASPECTS OF EMBEDDED SYSTEMS- II 9 hours

Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication Synchronization Issues, Task Synchronization Techniques, Device Drivers, how to Choose an RTOS, Integrated Development Environment (IDE).

UNIT IV FIRMWARE AND ARCHITECTURAL SUPPORT FOR OPERATING SYSTEMS 9 hours

Firmware and Bootloader, an introduction to operating systems, The ARM system control coprocessor Embedded ARM Applications, CP15 protection unit registers, CP15 MMU registers, ARM MMU architecture, Synchronization, Context switching, Input/Output, Example and exercises, The ARM7500 and ARM7500FE.

UNIT V MODELLING WITH HARDWARE/SOFTWARE DESIGN APPROACHES 9 hours

Modelling embedded systems- embedded software development approach -Overview of UML modelling with UML, UML Diagrams-Hardware/Software Partitioning, Co-Design Approaches for System Specification and modelling- Co-Synthesis- features comparing Single-processor Architectures & Multi-Processor Architectures-design approach on parallelism in uniprocessors & Multiprocessors.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. To understand the functionalities of processor internal blocks, with their requirement
2. Understand the basics of operating systems and then to learn the programming language used for real time operating system.
3. systems and related terms.
4. Understand the role and features of RT operating system, that makes multitask execution possible by processors.
5. Understand that using multiple CPU based on either hard-core or softcore helps data overhead management with processing.

Text Book(s)

1. M.A. Mazdi & J.G. Mazdi, The 8051 Microcontroller and Embedded System, Pearson Education India , 2013
2. Andrew N. Sloss & Dominic Symes, ARM System Developer's Guide Designing and Optimizing System Software, Morgan Kaufmann Publisher, 2004.

Reference Books

1. Steve Furber, Arm System-On-Chip Architecture, 2000.
2. J.K. Peckol, Embedded Systems A contemporary Design Tool, Wiley Student Edition , 2008
3. K J Ayala, The 8051 Microcontroller Architecture, Programming and Application, Penram International Publishing (India)
4. S. Heath, Embedded Systems Design, Elsevier, 2009

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20ECE304 DSP ARCHITECTURE

L	T	P	C
3	0	0	3

Pre-requisite 20ECE110

Course Description:

The course will provide an insight into the architectures of DSP processors for handling the bottlenecks in executing DSP algorithms. On the application side the students can develop FPGA based DSP Systems and can understand the concept of multicore DSP as HPC infrastructure

Course Objectives:

This course enables students to

1. Understand the programmable digital signal processing hardware.
2. study the architecture of TMS320CX processor and block diagram
3. Know syntax and write the assembly language programming for digital signal processors.
4. Study the architecture of FPGA based DSP for various applications.
5. Study about High-Performance Computing using P-DSP.

UNIT I PROGRAMMABLE DSP HARDWARE 9 hours

Introduction: Digital signal-processing system, discrete Fourier Transform (DFT) and fast Fourier transform (FFT), differences between DSP and other microprocessor architectures. Processing Architectures (von Neumann, Harvard), DSP core algorithms (FIR, IIR, Convolution, Correlation, FFT), IEEE standard for Fixed and Floating-Point Computations, Special Architectures, Modules used in Digital Signal Processors (like MAC unit, Barrel shifters), On-Chip peripherals, DSP benchmarking.

UNIT II STRUCTURAL AND ARCHITECTURAL CONSIDERATIONS 9 hours

Parallelism in DSP processing, Commercial digital Signal-processing Devices, Basics of TMS320C54x and C55x Families in respect of Architecture improvements and new applications fields, Data Addressing Modes of TMS32OC54xx., TMS320C5416 DSP Architecture, Memory Map, Interrupt System, Peripheral Devices, Illustrative Examples for assembly coding.

UNIT III VLIW ARCHITECTURE 9 hours

Current DSP Architectures, GPUs as an alternative to DSP Processors, TMS320C6X Family, Addressing Modes, Optimizations, Heuristics. Replacement of MAC unit by ILP, Detailed study of ISA, Assembly Language Programming, Code Composer Studio, Mixed C and Assembly Language programming, On-chip peripherals, Simple application developments as an embedded environment.

UNIT IV FPGA BASED DSP SYSTEMS 9 hours

Limitations of P-DSPs, FPGA based signal processing design-case study of a complete design of DSP processor.

UNIT V HIGH PERFORMANCE COMPUTING USING P-DSP 9 hours

Modified bus structures and memory access in PDSPs, special addressing modes in PDSPs, Preliminaries of HPC, MPI, OpenMP, multicore DSP as HPC infrastructure.

Course Outcomes:

After completing this Unit, students will be able to
1. Identify and formalize architectural level characterization of DSP hardware.
2. Design and test various digital signal processors.
3. Write assembly language programming for various digital signal processors.
4. Utilize FPGA based DSP hardware for Control, Audio and Video Signal processing applications.
5. Understand the High-Performance Computing using P-DSP.

Text Book(s)

1. B. Venkataramani, M. Bhaskar, "Digital Signal Processors: Architecture, Programming and Applications", Tata McGraw-Hill Education Private Limited, 2011.

2. Phil Lapsley; Jeff Bier; Amit Shoham; Edward A. Lee, "DSP Processor Fundamentals: Architectures and Features", Wiley-IEEE Press, 1997.

Reference Books

1. Emmanuel C. Ifeachor, Barrie W. Jervis, "Digital Signal Processing: A practical approach", Pearson-Education, PHI, 2002.

2. Sen M. Kuo, Woon-Seng S. Gan, "Digital Signal Processors: Architectures, Implementations, And Applications", Pearson/Prentice Hall, 2005.

3. Peter Pirsch, "Architectures for Digital Signal Processing", John Wiley & Sons, 2009

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20CSE303 MOBILE APPLICATION DEVELOPMENT

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

This course is concerned with the development of applications on Android platform. Android is used as a basis for the development of mobile applications. This course starts with the basic concepts of Java, history of android and architecture. It introduces the major building blocks that are used to develop an android application with examples. It also covers the development of applications using widgets, events, networking. It provides ideas on sensors, their types and writing programs based on sensor classes for application development.

Course Objectives:

This course enables students to

1. Understand Android history and its fundamentals and know the building blocks of android
2. Get idea on the creation of android user interface and its testing mechanisms
3. Identify the usage of threads, broadcast receivers, indents, services and their working methodology
4. Know about the storage mechanism in android using SQLite and the usage of content providers
5. Recognize the usage of android widgets and sensors in android based applications

UNIT I INTRODUCTION AND INSTALLATION OF ANDROID TOOLS — 9 hours

Android Overview – History – Android Versions - Android Flavors. Android Stack: Linux, Native Layer and Hardware Abstraction Layer (HAL) – ART - Application Framework: Native C++ Library – Applications: System and User Applications - Installation and Use of Android Tools: Installing the Android SDK - Anatomy of an Android Project - Drawable Resources – XML Introduction - Creating user interface using XML – Overview of Android Building Blocks – Logging Messages in Android

UNIT II USER INTERACTION — 9 hours

Example. Input Components – Text View – Image View – List View and Alert Dialogues – Menus: Popup, Options and Context Menus – Screen Navigation through App Bar – Recycler View – Material Design – Testing the User Interface: Expresso – Screen Navigation using Intents: Definition – Usage of Intends – Creation of Indents with example program – Lists and Adapters – Types of Adapters – Examples using Adapters

UNIT III THREADS, LOADERS AND ASYNCTASK LOADER, BROADCAST RECEIVERS, SERVICES — 9 hours

Threading in Android – AsyncTask – Loaders – AsyncTask Loader – Connecting to Internet: JSON - HTTP API, Apache HTTP Client, HTTP URL Connection - Broadcast Receivers: Custom Broadcasts – Broadcasting Intends and their related API - Boot Receiver - Alarms and system services – Examples on alarms and services – Services: Services Life Cycle – Intent Service – Implementing Intent Service – Notifications: Managing Notifications

UNIT IV SAVING, RETRIEVING AND LOADING DATA — 9 hours

Android File systems and Files - Action Bar: Preferences and Action Bar - Shared Preferences –

App Settings - Databases on Android - SQLite - Status Contract Class, Update Refresh Service – Cursors – Backups - Content Providers: Overview – Role of Content Providers - - Content Provider Example Program – Content Resolver

UNIT V APPLICATIONS WIDGETS, INTERACTION AND SENSORS 9 hours

App Widgets: Creation of Application Widgets - Interaction and Animation: Live Wallpaper and Handlers - Sensors: Sensor API in Android - Motion Sensor, Position Sensor, Environmental Sensor, Sensor Values, Sensor Manager Class, Sensor Class, Sensor Event class, Sensor Event Listener interface, Compass Accelerometer and orientation Sensors, Sensor Examples.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Work on android basic components and Install android
2. Create User Interfaces with various Layouts and views using android building blocks
3. Work with Broadcast Receivers and Services
4. Create Database in Android, Store and Retrieve data using SQLite and Content Providers
5. Develop widgets, Wall papers for an android application and write programs based on Sensors

Text Book(s)

1. Android Programming-The Big Nerd Ranch Guide, Bill Philips, Christ Stewart, Kristin Mariscano, Big Nerd Ranch publishers, 3rd Edition
2. Android Programming for Beginners, John Horton, PACKT publishers
3. Learning Android , By Marko Gargenta & Masumi Nakamura, O'Reilly, II Edition
4. Android Application Development All in One for Dummies, Barry Burd, Wiley, 2nd Edition

Reference Books

1. Android application Development-Black Book, Pradeep Kothari, dreamtech
2. Android Programming - Unleashed, B.M.Harwani, Pearson Education, 2013
3. Head First Android Development: A Brain-Friendly Guide, Dawn Griffiths and David Griffiths, O’Reilly, 2nd Edition
4. Android System Programming, Roger Ye, PACKT publishers
5. Programming Android, By Zigurd Mednieks, Laird Dornin, G.Blake Meike & Masumi Nakamura, O'Reilly

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20CSE304 SOFTWARE PROJECT MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite 20CSE115

Course Description:

Software Project Management is generally seen as a key component of successful software projects. Together with software techniques it can produce software of high quality. This course deals with the decisions and actions related to planning, organizing, leading, and controlling programs and projects. Students are expected to gain a comprehensive understanding of Strategy, organization and leadership in managing projects and understanding of Processes, methods and systems used to plan, schedule and monitor projects.

Course Objectives:

This course enables students to

1. To understand the basic concepts and issues of software project management.
2. To understand successful software projects that support organization's strategic goals.
3. Develop the skills for tracking and controlling software deliverables.
4. Understand and assess the cost of risk involved in a project management
5. Understand the various software management tools.

UNIT I SPM CONCEPTS 9 hours

Definition – components of SPM – challenges and opportunities – tools and techniques – managing human resource and technical resource – costing and pricing of projects – training and development – project management techniques.

Agile Methodology: Theories for Agile Management-Agile Software Development-Traditional Model Vs Agile Model-Classification of Agile Methods-Lean Production-SCRUM.

UNIT II SOFTWARE MEASUREMENTS 9 hours

Monitoring & measurement of Software development – cost, size and time metrics – methods and tools for metrics – issues of metrics in multiple projects.

UNIT III SOFTWARE QUALITY 9 hours

Quality in Software development – quality assurance – quality standards and certifications – the process and issues in obtaining certifications – the benefits and implications for the organization and its customers – change management.

UNIT IV RISK ISSUES 9 hours

The risk issues in Software development and implementation – identification of risks – resolving and avoiding risks – tools and methods for identifying risk management.

UNIT V SPM TOOLS 9 hours

Software project management using Primavera & Redmine - Case study on SPM tools.

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Maintain software projects and monitor software project process
2. Design and develop project modules and assign resources
3. Understand software quality and project management techniques
4. Comprehend, assess, and calculates the cost of risk involved in a project management
5. Use Primavera & Redmine software management tools.

Text Book(s)

1. Richard H. Thayer, "Software Engineering Project Management", John Wiley & Sons, 2nd Edition-2001

2. Royce, Walker, "Software Project Management", Pearson Education, 2002 4. Kelker, S. A., "Software Project Management", Prentice Hall, 2003

Reference Books

1. Software Project Management, Bob huges, Mike cotterell, Tata McGraw Hill, New Delhi,2002.

2. Software Project Management: A Concise Study, S. A. Kelkar, PHI.

3. Software Project Management, Joel Henry, Pearson Education.

4. Software Project Management in practice, Pankaj Jalote, Pearson Education.

5. David J. Anderson and Eli Schragenheim, **—**Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20CST302 CLOUD COMPUTING

L	T	P	C
3	0	0	3

Pre-requisite -

Course Description:

This course will cover a top-down view of cloud computing, from applications and administration to programming and infrastructure. The aim is to provide skills and knowledge about operations and management in cloud technologies and design cloud infrastructure to meet the business needs.

Course Objectives:

1. To learn the design and development process involved in creating a cloud-based application.
2. To implement and use parallel programming using various tools.
3. To learn Various service models such as IaaS and PaaS and deployment models such as private, public, hybrid, and community.
4. To provide skills to design suitable cloud infrastructure that meets the business services and customer needs.
5. To identify various security and privacy issues in cloud.

UNIT I INTRODUCTION TO CLOUD COMPUTING 9 hours

Inception and need for cloud computing: Motivations from distributed computing predecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures – Advanced Cloud Architectures - Specialized Cloud Architectures

UNIT II SERVICE DELIVERY AND DEPLOYMENT MODELS 9 hours

Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) – Software as a Service(SaaS) - Deployment Models: Types of cloud - Public cloud - Private cloud – Hybrid cloud – Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management.

UNIT III VIRTUALIZATION 9 hours

Virtualization as Foundation of Cloud – Understanding Hypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations

UNIT IV CLOUD COMPUTING: APPLICATIONS AND PARADIGMS 9 hours

Existing Cloud Applications and Opportunities for New Applications - Architectural Styles for Cloud Applications - Workflows: Coordination of Multiple Activities - Coordination Based on a State Machine Model: The ZooKeeper - The Map Reduce Programming Model - A Case Study: The GrepTheWeb Application

UNIT V CLOUD PLATFORMS AND SECURITY 9 hours

Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and cost models. Cloud application development using third party APIs, Working with EC2. Security Clouds

Course Outcomes:

Upon successful completion of the course, students will be able to

1. Understand the evolution, principles, and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.
2. Decide a suitable model to capture the business needs by interpreting different service delivery and deployment models.
3. Understand virtualization foundations to cater the needs of elasticity, portability and resilience by cloud service providers.
4. Infer architectural style, workflow of real-world applications and to implement the cloud applications using map reduce programming models.
5. Design a cloud framework with appropriate resource management policies and mechanism

Text Books:

1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Dongarra, Jack, Fox, Geoffrey, Hwang, Kai,"Distributed and Cloud Computing",.1st Edition, Morgan Kaufmann, 2013.
3. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.

Reference Books:

1. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

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OPEN ELECTIVES-V

20HUM301 PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

Pre-requisite NIL

Course Description:

The course provides students with a practical and concrete explanation of management concepts and techniques they will need to manage today's and tomorrow's organizations. The course will follow the "planning, organizing, leading, controlling" format of managerial functions while putting together many small pictures presented by individual modules into one bigger meaningful picture in which managerial knowledge would apply. At the end of the course students are expected to understand role of components of bigger picture and interactions between and among components.

Course Objectives:

The course is intended to:

1. Describe the concepts of Management theories, approaches and their application with organizations around us;

2. Know the concepts of planning and management;

3. Explain the basic concepts of organization, types and structure of organization;

4. Make the students know leading, good communication, theories of motivation; and

5. Explain controlling, operations management, value chain management and management audit.

UNIT I INTRODUCTION 9 hours

Introduction to Management and Organizations- Management definition, skills, roles, goals and functions of a manager, organization, value of studying management - Managing in a Global Environment- Global Perspective, Understanding global environment, - Social Responsibility and Managerial Ethics.

UNIT II PLANNING 9 hours

Decision-making process, Types of decisions and decision making conditions, styles, biases and errors, Planning: Meaning of planning, establishing goals and developing plans, contemporary issues in planning - Strategic Management-Importance of strategic management, strategic management process, types of organizational strategies, current issues in strategic management.

UNIT III ORGANIZING 9 hours

Organizational structures - HRM process, Contemporary issues in HRM – Departmentation – decentralization – delegation of Authority - Managing Change and Innovations.

UNIT IV COMMUNICATION, MOTIVATION AND LEADING 9 hours

Functions of communication, Inter-personal communication, Barriers of Communication – Understanding Information Technology- Motivation**:** Theories of motivation and current issues in motivation. Leading: Leaders and Leadership, Leadership theories - Leadership issues in twenty first century

UNIT V CONTROLLING **9 hours**

Process of Control – Problems of Control Process-Types of Control – Techniques of Control-Essential conditions for effective control- Contemporary issues in control – Strategic role of Operations Management - Value Chain Management.
Management Audit: Objectives-Importance-Activities of Management Auditor.

Course Outcomes:

At the end of the course, students will be able to:

1. Understand the various concepts, approaches and theories of management in the real situation,

2. Analyze the concept of planning and apply on the decisions in strategic management,

3. Compare organization structure designs and chart diligently with theoretical learning concepts,

4. Apply communication and theories of motivation in an organization, and

5. Understand various tools for controlling organizational performance, management audit and apply to
achieve the corporate objectives.

Text Book(s)

1. Stephen P. Robbins, Mary Coulter "Management", Pearson Education, 2010, 10th edition.

2. P. Subba Rao "Management and Organizational Behavior", Himalaya Publishing House.

Reference Books

1. Gary Dessler, "Management", Prentice Hall, Inc., 1998, 1st edition.

2 Daft Richard L. 'Management' Thomson South Western, 5th edition.

3 Koontz H. and Weihrich H., "Essentials of Management", McGraw Hill Int. ed., 2004, 6th edition.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20HUM302 HUMAN RESOURCE DEVELOPMENT

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

The course content includes: Introduction to HRM, strategic human resource challenges, work flows, job analysis, managing diversity, concepts, goals, mechanism and system of HRD, recruitment and selection, downsizing and outplacement, appraising and managing employee performance, training, career development, managing compensation, rewarding performance, designing benefit plans, employee relation and employee discipline, and workplace safety and health.

Course Objectives:

The course is intended to:

1. Explain the nature and scope of HRM, its functions, policies and strategies;
2. Describe the human resource planning, work analysis and importance in designing jobs;
3. Know the recruitment, selection and the process of performance appraisal;
4. Make the student to learn about training and development, compensation management and
5. Explain the trade unions, industrial relations and grievance.

UNIT I INTRODUCTION 9 hours

Understanding the nature and scope of Human Resource Management- Definition, Evolution of HRD, Functions - objectives, organization of department. Human Resource Management v/s Personnel Management, Role and responsibility of HRM.

UNIT II HUMAN RESOURCE PLANNING 9 hours

Human Resource Planning- Factors affecting HRP, the planning process, managerial succession planning. Job Analysis, Methods of collecting job data, Competency based Job Analysis, Job design approach, contemporary issues in Job Description.

UNIT III RECRUITMENT, SELECTION AND PERFORMANCE APPRAISAL 9 hours

Recruiting and selecting employees-, Selection process, Barriers, selection in India. Performance Management, Process of Performance Appraisal, Methods of Performance Appraisal - Errors in Performance Appraisal.

UNIT IV TRAINING AND DEVELOPMENT 9 hours

Meaning – importance and benefits of Training and Development, Training v/s Development – Training Methods - challenges in training - Career development: Definition-objectives—importance of career development – Reward Management – Compensation Management: Nature-Objectives-Components of Compensation- Theories of Compensation-Factors influencing employee compensation.

UNIT V INDUSTRIAL RELATIONS, TRADE UNIONS 9 hours

Trade Unions: Importance-Objectives- Functions and Structure of the Trade Unions- Trade Union movement in India- Industrial Relations: Nature--Importance- Approaches-essential conditions for sound IR. Industrial Disputes: Meaning – Types- Causes-Industrial disputes settlement machinery. Grievance: Sources and Process of Redressal,

Course Outcomes:

At the end of the course, students will be able to:

1. Understand the concept of HRM, its nature, scope, functions, policies and strategies;
2. Analyse human resource planning and apply in designing jobs;
3. Evaluate the recruitment, selection and the process of performance appraisal;
4. Understand the importance of training and development activities, compensation management and
5. Examine the trade unions, industrial relations and grievance.

Text Book(s)

1. Aswathappa K., Human Resource Management- Text and Cases, Tata McGraw Hill, 6th Edition, 2010
2. Gomez-Mejia, L.R., Balkin, D.B., & Cardy, R.L. Managing Human Resource Management 6th edition, Pearson Edu. 2007.
3 VSP Rao, Human Resource Management-Text & Cases, Excel Books.

Reference Books

1. Garry Dessler, BijuVarkkey , Human Resource Management ,11th Edition, Pearson Education, 2009.
2 R. Wayne Mondy, Human Resource Management, 10th Edition, 2010
Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20HUM303 SOFT SKILLS

L	T	P	C
3	0	0	3

Pre-requisite **NIL**

Course Description:

Soft skills are the personal attributes that make a student a valuable employee and a wholesome personality. They include aspects like communication, teamwork, problem-solving, and time management. Employers are increasingly looking for employees with strong soft skills, as they are essential for success in the workplace. This course will help students analyze themselves and build soft skills needed for their personal and career success.

Course Objectives:

The course is intended to:

1. Analyze their strengths and skills, and build confidence in presenting themselves
2. Work seamlessly as a team and negotiate for solutions
3. Think laterally and critically to evaluate a situation and present it with clarity
4. Write business emails effectively
5. Prepare holistically for a job interview

UNIT I SELF ANALYSIS AND DEVELOPMENT 10 hours

Personal ethics (politeness, empathy, and honesty); self-motivation / building confidence and assertiveness; identifying one’s unique selling points (USPs) through skills introspection and recognizing strengths and weaknesses; nurturing strengths and fixing weaknesses; self-introduction.

UNIT II TEAM WORKING AND DYNAMICS 12 hours

Brainstorming techniques, team building, collaboration, and negotiation skills; team role plays (involving negotiation and decision making); group discussion etiquette (greetings and body language), idea generation, and common GD phrases; group discussion practice

UNIT III THINKING AND REASONING SKILLS 6 hours

Lateral thinking, critical thinking and logical reasoning through texts, images, and videos; Speaking activities (e.g. JAM) involving lateral thinking and reasoning through thought-provoking pictures, videos, cartoons, comic strips or articles.

UNIT IV PRESENTATION SKILLS 7 hours

Presentation etiquette; slides design; and presentation practice.

UNIT V INTERVIEW SKILLS 10 hours

Preparing resume and cover letter for job interviews; interview etiquette: dress code, body language, tone, and greeting; HR interviews: answering common interview questions, practice for HR interviews.

Course Outcomes:

At the end of the course, students will be able to:

1. Understand and express themselves with confidence
2. Work as an active team member
3. Think and express their views logically and speak on varied topics without hesitations.
4. Prepare business presentations and emails effectively
5. Attend job interviews with confidence

Text Book(s)

1. Sabina Pillai and Agna Fernandez; Soft Skills and Employability Skills; Cambridge University Press, 2018.
2. Archana Ram, PlaceMentor, 2018, Oxford University Press

Reference Books

1. Karen Kindrachuk, Introspection, 2010, 1st Edition

2 Karen Hough, The Improvisation Edge: Secrets to Building Trust and Radical Collaboration at work, 2011, Berrett-Koehler Publishers

3. Colin Swatridge, Oxford Guide to Effective Argument and Critical Thinking 1st Edition, Oxford University Press

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination.

20HUM304 NATIONAL CADET CORPS

L	T	P	C
3	0	0	3

Pre-requisite: NCC B-Certificate

Course Description:
The main aim of this course is to mould the youth into responsible citizens of the nation. It helps to improve character and leadership qualities towards nation building. This course also motivates the youth to offer Selfless service to the society and nation. The course comprises Common subjects, Service subjects of NCC, societal aspects and basic organization of Indian Armed Forces.

Course Objectives:
This course enables the student to –

1. Get aware of NCC organization and general structure of Defence Forces.
2. Learn leadership and national integration.
3. Motivate towards to maintain Health and hygiene, personality development.
4. Learn elementary characteristics of disaster management, Field craft and Battle craft.
5. Acknowledge the Social activities, Communication and Military History.

UNIT I **10 hours**

INTRODUCTION TO NCC
Introduction, History of NCC , NCC Motto, NCC Flag, Aims of NCC, Cardinal points of NCC, Organization of defence forces in general, Organizational structure of Indian Army(Armed forces), Organizational structure of NCC, NCC Song, Incentives of NCC, Ranks in Army, Navy and Air Force, current representatives – Certificate Examination in NCC– Honours and Awards.

FOOT DRILL BASICS
Aims of Drill, Word of Commands, Attention, Stand at Ease, Turning Left, Right and Inclining at the Halt. Sizing, Forming up in three Ranks and Numbering, Open and Close March Order, Dressing the Squad, Saluting at the Halt, Getting on Parade, Falling Out and Dismissing, Marching, Guard of Honour.

UNIT II **10 hours**

LEADERSHIP
Meaning, Leadership Traits, Types of Leadership, Discipline & Duty of an Indian Citizen, Motivation, Code of Ethics, Perception, Communication, Customs of Services, Importance of Team Work, leaders(swami Vivekananda).

NATIONAL INTEGRATION
Meaning and Importance, Unity in Diversity, Indian History and Culture, Religion and Customs of India, India and its Neighbours, Contribution of Youth in Nation Building, Contribution of leaders in nation unification .

UNIT III **12 hours**

HEALTH AND HYGIENE
Structure and Function of Human Body, Hygiene and Sanitation, Preventable Diseases, First Aid, Yoga: Introduction and Exercises, Physical and Mental Health, Fractures: Types and Treatment.

PERSONALITY DEVELOPMENT

Introduction to personality development, Physical and social factors influencing / shaping personality, psychological and philosophical factors influencing / shaping personality, Self-awareness, SWOT analysis, mind set, interpersonal relationship and communication, effective communication, barriers of communication.

ENVIRONMENT AND ECOLOGY

Environment: Meaning, Global Warming, Acid Rain, Depletion of Ozone Layer, Conservation of Environment. Ecology: Introduction, Component of Ecological System, Forest Ecology, Wild Life, Pollution Control.

UNIT IV **10 hours**

DEFENCE AND DISASTER MANAGEMENT

Civil Defence: Meaning, Organization and its Duties, Civil Defence Services, Fire Fighting : Meaning, Mode of Fire, Fire Fighting Parties, Fire Fighting Equipment. Introduction, Classification of Disaster: Natural Disaster & Man Made Disaster, Disaster Management During Flood, Cyclone and Earth Quake, Assistance in Removal of Debris, Collection and Distribution of Aid Material, Message Services.

SOCIAL SERVICE ACTIVITIES (Social Service And Community Development)

Basics of Social Service, Weaker Sections in the Society and its Identification, Contribution of Youth towards Social Welfare, NGOs and their Role and Contribution , Social Evils, Drug Abuse, Family Planning, Corruption, Counter Terrorism, Eradication of Illiteracy – Aids Awareness programme – Cancer Awareness Programme.

UNIT V **10 hours**

COMMUNICATION

Types of communication, characteristics of wireless technology, Walkie/talkie, Basic RT procedure, Latest trends and development(Multimedia, video conferencing, IT)

MILITARY HISTORY

Biography of Indian Historical Leaders: Chatrapati Shivaji, Maharana Pratap, Akbar Famous Battles / Wars of India: Indo – Pak War 1971(all wars), Kargil War.(Categorise: before/ After independence)
Biography of Successful Leaders: General Patton, General Mac. Arthur, Field Marshal Sam Maneksha.

Course Outcomes:

At the end of the course, students will be able to:

1. Analyse the NCC structure and different ranks in Indian Armed Forces along with foot drill.
2. Notify the leadership traits and the need of national integrity towards nation building.
3. Instill respect and responsibility towards personal health and hygiene, develop dynamic personality with adequate qualities.
4. Identify different disasters and judging measurements on the ground.
5. Recognise various communication devices, analyse the Military Organization.

Text Books:

1. HAND BOOK OF NCC – “SANJAY KUMAR MISHRA, MAJOR RC MISHRA”, published by Kanti prakashan-2020.
2. NCC HAND BOOK - “SHASHI RANJAN & ASHISH KUMAR”, published by Goodwin Publications-2021.

Reference Books:

1. NCC Hand book – "R.Gupta's", Ramesh Publishing House-2021.
2 NCC (ARMY WING)- "R.Guptas's",RPH Editorial Board-2021
3 Hand Book Of N.C.C. – "Ashok Pandey", Kanti Publications-2017

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

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PROFESSIONAL ELECTIVES-I

20CE401 ENGINEERING GEOLOGY

L	T	P	C
3	0	0	3

Course Prerequisites: 20PHY101

Course Description

This course explores the fundamentals of geology applied to civil engineering problems. Topics include rock and mineral types, soil properties, rock mechanics, geologic structures, active tectonics and earthquake hazards, slope stability and landslides, groundwater, rivers and flood hazards.

Course Objectives

1. To understand the internal structure and composition of the earth.
2. To comprehend the properties, occurrence and uses of minerals in various industries.
3. To learn about geo-morphological altering agents such as river, wind, sea waves, and their implications in implementing civil engineering projects.
4. To gain knowledge about the structures of the rocks and their considerations in the selection of site for dams, tunnels, bridges and highways

UNIT I: INTRODUCTION AND MINERALOGY

Introduction-Branches of geology useful to civil engineering- scope of geological studies in various civil engineering projects. Department dealing with this subject in India and their scope of work-GSI- Granite Dimension Stone Cell-NIRM. Mineralogy-Mineral properties- composition and their use in the manufacture of construction materials. **(9)**

UNIT II: PETROLOGY

Rock Formation, Classification and Engineering Properties. Specific gravity of rocks. Deformation of rocks- Development of Joints-Folds- Faults and Unconformities. Classification of Igneous rocks on the basis of Chemical composition. Igneous Rocks -Sedimentary rocks Metamorphic rocks. **(9)**

UNIT III: PHYSICAL GEOLOGY

Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Rock weathering- types and its effects on Civil Engineering Projects. Origin of soils; Properties of Soil - Soil Classification- Geotechnical importance. **(9)**

UNIT IV: ROCK INSTABILITY AND SLOPE MOVEMENT

Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. Hydrological cycle, Occurrence of Groundwater in different terrains -Weathered, Hard and Stratified rocks; Determination of Quality aspects - SAR, RSC and TH of Groundwater. Groundwater Pollution, Groundwater Exploration- Electrical Resistivity and Seismic methods. **(9)**

UNIT V: STRENGTH BEHAVIOR OF ROCKS AND BASICS OF EARTHQUAKES

Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Earthquake - Causes and Effects, Seismic waves, engineering problems related to Earthquakes, Earthquake intensity, Richter scale, Seismograph, Seismic zones- World and India, Tsunami - causes and effects. Early warning system. Reservoir Induced Seismicity; Landslides - causes and their control. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Explain the importance of geological studies in civil engineering
2. Analyze Rock Formation and Engineering Properties
3. Analyze Weathering civil engineering practices.
4. Analyze the natural disasters and their mitigation.
5. Assess various strength behavior of rocks and Seimic effects for solving civil engineering problems.

Text Books

1. Parbin Singh, "Engineering and General Geology", 8^{th} Edition, S K Kataria & Sons
2. P. K. Mukerjee, "A Text Book of Geology", World Press Pvt., Ltd. Kolkata.

Reference Books

1. Engineering Geology by N. Chennkesavulu, Mac-Millan, Publishers 2nd Edition India Ltd. 2010.
2. S.K Duggal, H.K Pandey and N Rawal, "Engineering Geology", McGraw Hill Education (India) Pvt, Ltd. New Delhi.
3. Earthquake Tips - Learning Earthquake Design and Construction - C V R Murthy Published by National Information Centre of Earthquake Engineering, Indian Institute of Technology, Kanpur.
4. Dimitri P Krynine and William R Judd, "Principles of Engineering Geology and Geotechnics", CBS Publishers and Distributors, New Delhi.
5. K V G K Gokhale, "Principles of Engineering Geology", BS Publications, Hyderabad.
6. M Anji Reddy, "Text book of Remote Sensing and Geographical Information System", BS Publications, Hyderabad.
7. D. Venkata Reddy, "Engineering Geology", New Age International Publications, New Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE402 CONSTRUCTION PLANNING AND MANAGEMENT

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course covers fundamentals of construction technology, different construction equipment, project management, Time estimates and computations, CPM, PERT and network analysis

Course Objectives

1. To make the students to learn about planning of construction projects, scheduling procedures and techniques, cost and quality control projects and use of project information as decision making tool.

UNIT I: CONSTRUCTION PLANNING

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. **(9)**

UNIT II: SCHEDULING PROCEDURES AND TECHNIQUES

Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling; Use of PERT - Time estimates -Mean, variance and standard deviation - Probability distribution - Expected time Problems - Earliest expected time -Combined tabular computations for TE and TL problems. **(9)**

UNIT III: IT IN CIVIL ENGINEERING PROJECT MANAGEMENT

IT in Construction -Database management systems - spatial data management - Communication and Computer network. **(9)**

UNIT IV: QUALITY CONTROL AND SAFETY DURING CONSTRUCTION

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. **(9)**

UNIT V: ORGANIZATION AND USE OF PROJECT INFORMATION

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. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Plan construction projects, schedule the activities using network drawing and coding
2. Design the construction schedules using CPM and PERT methods.
3. Explain the use of information technology in project management.
4. Identify the quality control and safety measures during construction.
5. Identify and use project data information for successful project management.

Text Books

1. Chitkara, K.K. "Construction Project Management Planning", Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2005.
2. Srinath,L.S., "PERT and CPM Principles and Applications", Affiliated East West Press, 2001.

Reference Books

1. Chris Hendrickson and Tung Au, "Project Management for Construction - Fundamentals Concepts for Owners", Engineers, Architects and Builders, Prentice Hall, Pitsburgh, 2000.
2. Moder.J., Phillips. C. and Davis E, "Project Management with CPM", PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1985.
3. Willis., E.M., "Scheduling Construction projects", John Wiley and Sons, 1986.
4. Halpin,D.W., "Financial and Cost Concepts for Construction Management", John Wiley and Sons, New York, 1985.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE403 REMOTE SENSING AND GIS

L	T	P	C
3	0	0	3

Course Prerequisites: 20PHY101

Course Description

The topic covers Aerial photogrammetric; remote sensing: GPS; geographic information system: data representation, spatial analysis; computational algorithms, Strategies for development and implementation-applications of GIS

Course Objectives

1. The main objective of the course is to promote a good foundation in GIS and working knowledge of fields strongly related to GIS in the computing perspective.
2. To discuss different algorithms for spatial analysis illustrated with case studies.
3. The course will also guide the students through projects and to apply concepts and ideas in various application areas and to establish a motivation towards research in thrust areas related to GIS.

UNIT I: INTRODUCTION TO GIS

Introduction to GIS - GIS-definition and terminology - GIS categories - Components of GIS - fundamental operations of GIS - Land surveying - Global positioning system - Introduction of GIS modules - GIS Functionality: Interfaces of different GIS software: ArcGIS - QGIS - Map Window GIS. **(9)**

UNIT II: TYPES OF DATA REPRESENTATION

Introduction to different Co-ordinate System: Geographic Coordinate System - Projected Coordinate System. Introduction to Data Model: Raster Data Models - Vector Data Models - Different Types of Resolution for data models: Spatial - Temporal - Spectral - and Radiometric. Image Digitalization: Geo-referencing - Map Projection - Digitization - Encoding - and Structuring of data. **(9)**

UNIT III: COMPUTATIONAL ALGORITHMS

Triangulation - DEM - TIN - terrain mapping and Network analysis - Geocoding - Path analysis and network applications - Basics of spatial database- Deterministic and Statistical spatial interpolation. **(9)**

UNIT IV: REMOTE SENSING

Principle of Remote Sensing: Introduction - concept of remote sensing - definition - element of remote sensing - types of remote sensing: active and passive - electromagnetic radiation: Plank's - Stephen Boltzsmann and Wein's displacement law - electromagnetic spectrum - Atmospheric window - spectral signature.

Data Acquisition: Introduction to Different Types of remote Sensors: Landsat - MODIS - Cartosat - Sentinel etc - Flight planning and UAVs - Basics of Global Positioning System (GPS)- RADAR - TM and Multispectral Sensing - Radar - Sonar: basics and application. **(9)**

UNIT V: APPLICATION AND CASE STUDIES

Catchment area delineation, Computation of Morphometric Parameters - GIS application for Surveying: traversing - Cut and Fill (volume of earth work Computation) - Calculation of different indices: NDVI - EVI - SVI - SWVI - Calculation of radiance and reflectance from DN (digital Number) - Calculation of Land surface temperature (LST). **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Apply the GIS Plate forms for surveying and mapping
2. Analyze the types of data and data models
3. Evaluate the suitability of different vector and raster data interpolation method.
4. Analyze the capacity of different remote sensing data acquisition systems.
5. Derive the different indices for water-environment management.

Text Books

1. Qihao Weng, Remote Sensing and GIS IntegrationTheories, Methods, and Applications, McGraw Hill, 2010,

Reference Books

1. Rajiv Gupta & Mukesh Kumar Rohil, Computing Aspects of Geographical Information Systems, EDD Notes, BITS Pilani, 2001, 1st. Ed.
2. Kang-tsung Chang; "Introduction to Geographic Information Systems", Tata McGraw-Hill, 4th Ed.
3. Thomas M Lillesand, and Ralph W Kiefer; "Remote sensing and Image Interpretation", John Wiley & Sons, 1994, 3rded.
4. Michael F. Worboys, "GIS: A Computing Perspective", Taylor & Francis Ltd; 1995.
5. Thomas et al., Remote Sensing and Image Interpretation, Wiley Publication 2004 (4th Edition)

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE404 GREEN BUILDINGS AND ENERGY CONSERVATION

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course covers various aspects of bioclimatic architecture like climate sensitive design, passive solar architecture, Water management, green building materials and construction techniques.

Course Objectives

1. The course introduces concepts of sustainability and bioclimatic design in planning, construction and life of buildings.
2. This course intends to equip students with technical knowledge of energy-efficient green buildings
3. This course guide students, through projects, to apply concepts and ideas for the design of a green building by introducing them to green initiatives and ratings.
4. This course also initiates students in basics of functional design and drawing of the various buildings using the above concepts.

UNIT I : GREEN BUILDING CONCEPTS

Introduction to bioclimatic architecture - Sustainability in building science and Functional planning - Orientation - Elements of building design and drawing - Building regulations and bylaws - Traditional and VernacularArchitecture - Climate zones - Design Charts - sun path diagram - Solar angles - Indices of thermal comfort - Vernacular buildings in different climate zones. **(9)**

UNIT II : CLIMATE RESPONSIVE SCIENTIFIC PROCESS OF DESIGN

Introduction - various steps in Site planning - Plan form Building envelope Land form -Topography - vegetation - water bodies; Orientation - S/V ratio - P/A ratio - Walls, Fenestration - Roof and floors - Active and passive solar strategies - Passive solar architecture. **(9)**

UNIT III : THERMAL FLOW IN BUILDINGS

Calculation of thermal conductance - Heat flow through different building elements - Ventilation and day lighting- Design and placement of openings- Water management in buildings- Techniques to recycle, reuse and harvest water. **(9)**

UNIT IV : GREEN BUILDING MATERIALS AND CONSTRUCTION

Material properties - Energy efficiency using various materials - emerging new materials Construction techniques- Techniques for roof, wall and foundations. **(9)**

UNIT V : ECONOMY OF GREEN BUILDING

Cost of building - operation and maintenance - Green building rating system - Evaluation criteria of LEED - TERI GRIHA case studies - Case studies in different climate zones. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Use various regulations and by laws for green building construction0.
2. Do site planning for Green Building.
3. Compute thermal flow through different building elements
4. Identify energy efficient building materials
5. Compute cost of building/operation and maintenance

Text Books

1. Krishnan, A., Baker, N., Yannas, S., & Szokolay, S. (Eds.). (2001). Climate responsive architecture, a design handbook for energy efficient buildings. New Delhi: Tata McGraw-Hill Publishing Company.
2. TERI & ICAEN (InstitutCatalad'Energia). (2004). Sustainable building design manual (Vol. II). New Delhi: The Energy and Resources Institute(TERI) Press.

Reference Books

1. Bureau of Indian Standards. (1995). SP:41, Handbook on functional requirements of buildings (other than industrial buildings) (First reprint ed.). New Delhi: Bureau of Indian Standards.
2. Indian Green Building Council, LEED-India. (2011). LEED 2011 for India- Green building rating system, abridged reference guide for new construction and major renovations (LEED India NC). Hyderabad: Indian Green Building Council.
3. Koenigsberger, O., ingersoll, T. G., Mayhew, A., & Skozolay, S. V. (2011). Manual of Tropical Housing and Building. Hyderabad: Universities Press.
4. Prabhu, Balagopal T S, K Vincent Paul, and C Vijayan. Building Design and Drawing. Calicut: Spades Publishers, 2008.
5. Szokolay, S. V. (2008). Introduction to Architectural Science - The Basis of sustainable Design (Second ed.). Architectural Press/Elsevier.
6. The Energy and Resources Institute (TERI). (2011). Green Rating for Integrated Habitat Assessment (GRIHA) manual. New Delhi: TERI press.
7. Journals: Energy and Buildings, Building and Environment, Other relevant publications.
8. National Building Code, Bureau of Indian Standards: New Delhi. 2005; Building Bye laws and building rules of selected Indian urban and rural areas
9. Swamy, N. K., & Rao, A. K. (2013). Building planning and Drawing,New Delhi, CharotharPublishing House

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE405 AIR POLLUTION AND SOLID WASTE MANAGEMENT

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course covers various air pollution impacts, legislation and control techniques. Also, it discusses about municipal solid waste, hazardous waste, electronic waste and construction and demolition waste management.

Course Objectives

1. To explain the various air pollutants, their impact and control legislations.
2. To describe various air pollution control equipment and design of dust control equipment
3. To discuss about the quantity and characteristics of municipal solid waste and various treatment and disposal techniques.
4. To explain hazardous waste characteristics and management methods.
5. To discuss about generation and management of construction and demolition waste and electronic waste.

UNIT I: URBAN AIR POLLUTION AND LEGISLATION

Air - Composition and properties of air, source and impacts of air pollution-on human, vegetation and strucutres, types of air pollutants various air pollution control laws, National Ambient Air Quality Standards, Air Quality Index, Air pollution meteorology and dispersion. **(9)**

UNIT II :AIR POLLUTION CONTROL TECHNIQUES

Measures for air pollution control policies, Principles and working of various air pollution control equipments - PM and gaseous pollutant, design of PM control equipment- gravity settling chamber, cyclone separators, fabric filters and electrostatic precipitators. **(9)**

UNIT III: MUNICIPAL SOLID WASTE MANAGEMENT

Municipal Solid Waste-Characteristics and Quantities, MSW Rules, Municipal Solid Waste Collection, Transportation, Segregation and Processing, Energy Recovery from Municipal Solid Waste, recycling, disposal- landfilling and incineration. **(9)**

UNIT IV: HAZARDOUS WASTE MANAGEMENT

Hazardous Waste- definition, sources and characterisation, Hazardous Waste Rules, Storage and Transport, various Hazardous Waste disposal techniques. . **(9)**

UNIT V: Construction and Demolition Waste and Electronic Waste Management

C&D Waste - Regulation, Beneficial Reuse of C&D Waste Materials; E-Waste Generation, E-Waste Rules, Techniques for Recycling and Recovery - glass, plastics, ferrous and non-ferrious materials. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Explain the impacts of air pollution and various legislations related to air pollution control
2. Plan strategies and design equipment to control air pollution.
3. Select the most appropriate technique for the management of solid waste
4. Discuss about various sources of hazardous waste and its management processes
5. Explain the impacts and beneficial reuse of construction and demolition waste and electronic waste

Text Books

1. Rao M and Rao H.V.N. Air Pollution, McGraw Hill Education, 2017.
2. Sudha Goel, Advances in Solid and Hazardous Waste Management, Springer International Publishing

Reference Books

1. Peavy, H., Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw - Hill International Editions, New York 1985
2. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
3. M.N. Rao, Razia Sultana, Sri Harsha Kota, Solid And Hazardous Waste Management, BS Publications
4. Metcalf & Eddy, Wastewater Engineering Treatment and Dispose, McGraw Hill Publication

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE406 BUILDING MATERIALS AND CONSTRUCTION

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

This course is designed to introduce various materials such as stones, wood, lime, cement and finishes used in civil engineering construction. Further the course includes different components of buildings and their construction planning also.

Course Objectives

1. To introduce various materials commonly used in Civil Engineering construction and their properties.
2. To introduce the different components involved in building and their construction.
3. To study the NBC Code practice need for better planning

UNIT I : REQUIREMENTS OF BUILDINGS AND ITS COMPONENTS

Introduction to building and its components, strength, dimensional stability, damp prevention, fire protection, lighting and ventilation. Properties of materials: physical and mechanical properties. **(9)**

UNIT II : STONES AND BRICKS, TILES

Building Stones - Classification and quarrying - properties - structural requirements - dressing Bricks - Composition of Brick earth - Manufacture and Structural requirements. Wood, aluminium, glass and paints-Wood - Structure - Types and Properties - Seasoning - defects; alternate materials for wood - GI/fiber - reinforced glass bricks, steel and aluminum. **(9)**

UNIT III: LIME, CEMENT AND FINISHES

Various ingredients of lime - Constituents of lime stone - classification of lime - various methods of manufacture of lime.Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of Cement concrete and their importance Proofing Damp and water proofing- materials used. Plastering, pointing, white washing and distempering - Painting - Constituents of a paint - Types of paints - Painting of new/old Wood -Varnish - Form work and scaffolding. **(9)**

UNIT IV: BUILDING CONSTRUCTION

Site investigation and sub-soil exploration, Foundations-functions and types of foundations. Stone Masonry- Rubble and Ashlar masonry. Brick masonry - basic terminology, types of bonds, walls load bearing, cavity and partition walls. Doors and windows. **(9)**

UNIT V:BUILDING PLANNING

Principles of Building Planning, Classification of buildings and Building by laws. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. To be familiarized with various building parts and components
2. To introduce various materials commonly used in Building Construction along with their tests and properties
3. To know various methods of manufacturing Lime, Metals and Finishes along with their properties and uses
4. To understand the basic terminologies used in building construction, like Site investigation, Sub-soil exploration, Types of Foundations, Masonry work, Walls, Doors and windows
5. To introduce building planning and bye laws.

Text Books

1. Duggal, S.K., Building material, New Age International Publishers, Second Edition
2. Punmia, B.C, Ashok Kumar Jain and Arun Kumar Jain., Building Construction - Laxmi Publications (P) ltd., New Delhi.

Reference Books

1. Varghese, P.C, Building Construction, Prentice-Hall of India private Ltd, New Delhi.
2. Arora, S.P. and Bindra, S.P., Building Construction, Dhanpath Rai Publications

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

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PROFESSIONAL ELECTIVES-III

20CE407 ADVANCED STRENGTH OF MATERIAL

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101, 20CE107

Course Description

The course covers the concepts of shear stress and shear centre - unsymmetrical bending - Bending stress and deflection in Curved Beams - Theories of failure - Contact stresses - Cyclic loading

Course Objectives

1. To study effect of the shear stress and shear center on various unsymmetrical sections.
2. To analyse the stresses in the members under unsymmetrical bending.
3. To analyse the stresses in curved beams using different available methods.
4. To investigate the different theories of failures.
5. To evaluate contact stresses, fatigue, cycling loading, stress concentration etc.,

UNIT I :SHEAR CENTRE

Concepts - definitions - shear stress in thin walled sections - sections not symmetrical about one axis - shear centre - significance of shear centre - Various unsymmetrical sections. **(9)**

UNIT II :UNSYMMETRICAL BENDING

Introduction - Principal axes of inertia - Product of inertia - assumptions made in the determination of stresses in members subjected to unsymmetrical bending - bending stress and deflections - neutral axis - bending stresses in beams subjected to unsymmetrical bending. **(9)**

UNIT III :CURVED BEAMS

Introduction - Winkler Bach formula - Stresses in curved beams - Bending stress equation by Seely and Smith method - Finding Z for a rectangle, circular section, triangular section and for a trapezium - Application of Winkler Bach formula - closed Rings. **(9)**

UNIT IV : THEORIES OF FAILURE

Introduction - uni axial tension - different theories of failure - Factor of safety- Comparison of failure theories. **(9)**

UNIT V : SPECIAL TOPICS

Contact stresses - evaluating contact stresses - fatigue - cycling loading - fatigue tests - S-N curves - Goodman diagram -fracture - stress concentration - Griffiths theory - Limitations. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Investigate the shear stresses and shear centre in thin walled open sections and unsymmetrical sections.
2. Analysis of stresses and deflections due to unsymmetrical bending.
3. Analyse the location and magnitude of maximum stresses in curved beams.
4. Determine the safe dimensions of structural components under combined stresses due to various loads and their investigation.
5. Investigate contact stresses and stress concentration of different sections under different loading conditions.

Text Books

1. Popov E.P, Engineering Mechanics of Solids, prentice. Hall of India, New Delhi, Fourth Edition, 1998.
2. Vaidyanathan R., Perumal P. and Lingeswari S., Mechanics of Solids and Structures, Volume II, Laxmi Publications (P) Ltd., New Delhic
3. S. Ramamrutham and R. Narayanan, Strength of Materials, Dhanpat Rai Publishing Company.

Reference Books

1. Srinath L.S, Advanced Mechanics of Solids, MC Graw Hill Education India (Pvt) Ltd, New Delhi, Third Edition, 2016.
2. Willian Nash, Theory and problems of strength of materials, Schaum's outline series,McGrowHill International Edition, Delhi, 1987
3. Rajput R.K., Strength of materials, S.Chand & company Ltd, New Delhi,2007

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE408 ADVANCED GEOTECHNICAL ENGINEERING - FOUNDATIONS

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20CE101, 20CE107, 20CE111

Course Description

The main goal of this course is to provide an in-depth understanding regarding different types of foundation systems for buildings, bridges substructure, industrial complexes, ports, harbors, water tanks, and big storage tanks of industrial structure, transmission line towers, and machines subjected to static and dynamic loads. Complete analysis of foundation systems (spread footing, combined footing, raft foundation, ring foundation, pile foundations, machine foundations, retaining structures etc.) considering all geotechnical aspects will be covered

Course Objectives

1. Understand the fundamental principles and procedures of foundation analysis and design;
2. Students learn to apply the principles of foundation engineering to real world problems
3. Prepare students for entry level geotechnical engineering employment

UNIT I

SUB SURFACE INVESTIGATION: Introduction- scope - drilling bore holes -sampling - plate load test - standard penetration - cone penetration tests. Preparation of soil investigation report.
EARTH SLOPE STABILITY: Infinite and finite earth slopes - types of failures - factor of safety of infinite slopes - Stability analysis - Stability of slopes of earth dams under different conditions. **(9)**

UNIT II: EARTH PRESSURE THEORIES

Introduction- Rankine's theory of earth pressure -earth pressures in layered soils - Coulomb's earth pressure theory -Rebhann's and Culmann's graphical method. Types of retaining walls - stability of retaining walls. **(9)**

UNIT III: SHALLOW FOUNDATIONS

Types - choice of foundation - Location of depth - Safe Bearing Capacity - Terzaghi's, Meyerhoff's and Skempton's Methods. Safe bearing pressure based on N- value - allowable bearing pressure; safe bearing capacity and settlement from plate load test - allowable settlements of structures - Settlement Analysis. **(9)**

UNIT IV: DEEP FOUNDATIONS

Introduction - types of piles - dynamic and static formulae- load capacity of piles in sands and clays - pile load test - negative skin friction. **(9)**

UNIT V: WELL FOUNDATIONS

Introduction -Types - Different shapes of wells - Components of wells - functions and Design Criteria - Sinking of wells - Tilts and shifts. Machine foundations: General requirements and design criteria - Stiffness and damping parameters. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Select suitable site investigation methods andAnalyze the stability of slopes.
2. Calculte the earth pressures
3. Design shallow foundations using different methods.
4. Analyse different types deep foundations under different soil conditions.
5. Apply the design criteria of well foundation systems.

Text Books

1. Murthy, V. N. S. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering, CRC Press, Taylor & Francis Group, New Delhi, 2010
2. Punmia B. C., Ashok Kumar and Arun Kumar., Soil Mechanics and Foundation. Laxmi Publications, 17^{th} Ed.

Reference Books

1. Principles of Geotechnical Engineering, by Braja M. Das, 6^{th} Edition, Cengage Learning
2. Principles of Foundation Engineering, by Braja M. Das, 7^{th} Edition ,Cengage Learning
3. Relevant BIS, IRC codes and International code of practice

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE409 HYDRAULICS AND HYDRAULIC MACHINES

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20CE102

Course Description

In this course boundary layer theory, drag force on plates, impact of jets, turbines, pumps will be discussed.

Course Objectives

1. To understand the concept of boundary layer
2. To calculate force exerted by jets
3. To introduce various types of turbines
4. To calculate various parameters of centrifugal and reciprocating pumps

UNIT I

BOUNDARY LAYER THEORY: Boundary layer (BL) - concepts - drag force on plate due to BL - Turbulent Boundary layers - BL separation - control of boundary layer - flow around submerged objects - Drag and Lift - Magnus effect. **(9)**

UNIT II

IMPACT OF JETS: Force exerted by the jet on a stationary vertical plate: - flat and curved plates - Force exerted by the jet on a stationary hinged plate

Force exerted by the jet on moving plates: plate (flat and curved) moving in the direction of jet - Force exerted by the jet on unsymmetrical moving curved when jet strikes tangentially at one of the tips - Force exerted by the jet on a series of vanes **(9)**

UNIT III

HYDRAULIC MACHINES -TURBINES: Turbines - classification of Hydraulic Turbines - Pelton wheel - Radial flow reaction turbines - Francis Turbines - Axial flow reaction turbines - draft tube - specific speed - unit quantities - characteristic curves of Hydraulic turbines. **(9)**

UNIT IV

CENTRAIFUGAL PUMPS: Main parts - work done by centrifugal pump - minimum speed - specific speed - priming - cavitation - minimum suction lift - net positive suction head. **(9)**

UNIT V

RECIPROCATING PUMPS: Main parts - work done by centrifugal pump - slip of Reciprocating pump - classification - variation of velocity and acceleration - effect of variation of velocity on friction - indicator diagram - air vessels. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Calculate drag force on plates and around submerged objects
2. Determine forces exerted by jet on plates or vanes
3. Classify turbines
4. Calculate various parameters of centrifugal pumps
5. Calculate various parameters of reciprocating pumps

Text Books

1. Hydraulics and Hydraulic Machines, M. M. Das, Mimi Das Saikia, B. M. Das, PHI Learning
2. Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines, Khurmi R. S., S. Chand Publishers.
3. R. K. Bansal, "A Textbook of Fluid Mechanics", Laxmi Publications.

Reference Books

1. Charles Hirsch "Numerical Computation of Internal and External Flows. Volume 1: Fundamentals of Computational Fluid Dynamics, Second edition"

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE410 FINITE ELEMENT ANALYSIS

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101, 20CE107, 20CE108

Course Description

Principles of Analysis of Stress and Strain - Finite Element Method for the analysis of one and two dimensional problems - stress and strain parameters and their inter relations of the continuum.

Course Objectives

1. To provide an overview and basic fundamentals of Finite Element Analysis.
2. To introduce basic aspects of finite element theory, including domain discretization, interpolation, application of boundary conditions, assembly of global arrays, and solution of the resulting algebraic systems.
3. Formulate simple structural problems in finite elements.

UNIT I: BASICS OF THEORY OF ELASTICITY

Basic principles of structural mechanics - equations of equilibrium -strain displacement relations -stress strain relations - plane stress and plane strain problems - virtual work - principles of minimum potential energy -basic steps of finite element analysis - discretization - basic element shapes - displacement function - element properties - node numbering procedure - stiffness matrix - Nodal load vector - assemblage -boundary conditions -primary unknowns - secondary unknowns - convergence requirements. **(9)**

UNIT II

ONE DIMENSIONAL ELEMENTS: Shape functions for one dimensional structures - formulation of element stiffness matrix - formulation of element nodal load vector .
TWO DIMENSIONAL ELEMENTS: Plane stress - plane strain - 3,6 noded triangular elements - rectangular elements -Lagrange and Serendipity elements - Isoparametric elements - shape functions, element stiffness matrix - load vector formulations - gauss quadrature rule. **(9)**

UNIT III

INTRODUCTION TO ISOPARAMETRIC ELEMENTS: Concept of sub - iso - super parametric elements - gauss quadrature - Isoparametric Formulation of the Bar Element Stiffness Matrix – Isoparametric Formulation of the Plane Element Stiffness Matrix **(9)**

UNIT IV: AXISYMMETRIC ELEMENTS

Introduction to Axisymmetric Elements – Derivation of the Stiffness Matrix **(9)**

UNIT V: THREE DIMENSIONAL FEM

Different 3-D elements, 3D strain - displacement relationship - Formulation of hexahedral and Isoparametric solid elements. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Solve the problems using the principles of elasticity.
2. Perform one dimensional and two dimensional analysis.
3. Solve the problems using Isoparamteric Elements.
4. Solve the problems using Axisymmetric Elements.
5. Analyse and solve various 3D problems using Finite Element Method.

Text Books

1. T.N. Seshu," Finite element analysis - Theory and programming", Second edition, Tata McGraw Hill publishing co.,1994.
2. Tirupati.R, Chandrupatla and Ashok DBelgundu.," Introductionto finite elements in engineering", Third edition, 2005.
3. Bhavikatti S.S, Finite Element Analysis, New Age International Publishers New Delhi, Third Edition, 2018.

Reference Books

1. Olek C Zienkiewicz, R. L. Taylor, The Finite Element Method: Its Basis and Fundamentals, 7th Edition - August 22, 2013, Butterworth-Heinemann publishing.
2. Cook Robert D., Concept and Application of Finite Element Analysis, John Wiley and Sons INC, 1995.
3. Rajasekaran S., Finite Element Analysis in Engineering Design, S. Chand and Co. Ltd.,2008.
4. Desai C.S and Abel J.F. Introduction to the Finite Element Method, Affiliated East West Press, 1972.
5. Krishnamoorthy C.S, Finite Element Analysis, Tata MC Graw -Hill, NewDelhi, Second Edition, 2011
6. Rao S.S., The Finite Element Methods in Engineering, Pergaman press Edition, 2003.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE411 ENVIRONMENTAL IMPACT ASSESSMENT

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course will focus on Basic concept of Environmental Impact Assessment (EIA), EIA Methodologies, Impactof Developmental Activities and Land use in soil, water, and vegetation, Environmental Audit, Post Audit activities, The Environmental pollution Acts.

Course Objectives

1. To impart knowledge on Environmental management and Environmental Impact Assessment.
2. To give the student the brief knowledge about various legislations and audit protocols.
3. To give student knowledge about the framing of environmental audit through case studies.

UNIT I: CONCEPTS AND METHODOLOGIES IN EIA

Introduction - Elements of EIA - Factor affecting EIA -Impact evaluation and analysis - Preparation of Environmental Base map - Classification of environmental parameters. Criteria for the selection of EIA Methodology - EIA methods: Ad-hoc methods - matrix methods - Network method - Environmental Media Quality Index Method -overlay methods - cost/benefit Analysis - Steps of EIA process- Screening, Scoping, Prediction and mitigation, Management and monitoring and Audit **(9)**

UNIT II: IMPACT OF DEVELOPMENTAL ACTIVITIES

Introduction and Methodology for the assessment of soil and ground water - Delineation of study area - Identification of actives.Procurement of relevant soil quality - Impact prediction - Assessment of Impact significance -Identification and Incorporation of mitigation measures. EIA in surface water - Air and Biologicalenvironment. **(9)**

UNIT III: IMPACT ON VEGETATION AND WILD LIFE

Assessment of Impact of development Activities on Vegetation and wildlife - environmental Impact ofDeforestation - Causes and effects of deforestation. **(9)**

UNIT IV: ENVIRONMENTAL AUDIT

Environmental Audit & Environmental legislation objectives of Environmental Audit - Types of environmental Audit - Audit protocol - stages of Environmental Audit - onsite activities - evaluation of audit data and preparation of audit report - Post Audit activities. **(9)**

UNIT V: ENVIRONMENTAL POLLUTION ACTS

The water Act-1974 - The Air Act-1981 (Prevention & Controlof pollution Act.) - Wild life Act-1972 - Indian Forest Conservation Act-1980 -National Green Tribunal Act –2010 - Biological Diversity Act-2002. Environmental protection Act, 1986, The Indian Forest Act, 1927. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Develop a base map and classify environmental parameters for impact evaluation and analysis using different EIA methods such as ad-hoc, matrix, network, overlay, and cost/benefit analysis.
2. Assess the significance of impact and identify and incorporate appropriate mitigation measures for developmental activities on different environmental media, including soil, groundwater, surface water, air, and biological environment.
3. Evaluate the impact of deforestation on vegetation and wildlife and analyze the causes and effects of deforestation.
4. Apply the principles and practices of environmental audit, including onsite activities, evaluation of audit data, preparation of audit reports, and post-audit activities, for compliance with environmental legislation.
5. Interpret and evaluate the provisions of environmental pollution acts, including the Water Act-1974, Air Act-1981, Wild Life Act-1972, Indian Forest Conservation Act-1980, National Green Tribunal Act-2010, and Biological Diversity Act-2002, to control environmental pollution.

Text Books

1. Larry W Canter, Environmental Impact Assessment, McGraw-Hill, 1996
2. Anjaneyulu, Y., Environmental Impact Assessment Methodologies, B.S. Publication, Sultan Bazar,Kakinada.

Reference Books

1. Glynn, J. and Gary W. Hein Ke., Environmental Science and Engineering, Prentice Hall Publishers
2. Suresh K. Dhaneja Environmental Science and Engineering, S.K., Katania& Sons Publication,New Delhi.
3. Dr. Bhatia, H.S., Environmental Pollution and Control, Galgotia Publication (P) Ltd, Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE412 TRAFFIC ENGINEERING AND MANAGEMENT

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE112

Course Description

The course introduces the concepts of characterizing traffic, various modeling approaches, and design of facilities to control and manage traffic.

Course Objectives

To give an overview of traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well

UNIT I: Elements of Transportation Engineering

vehicle characteristics like weight- size- turning radius- concept of design vehicle. Human and Driver characteristics - PIEV theory- comfort- concept of design driver. Road characteristics surface conditions- slopes and curves. Control mechanisms. Terminal facilities. **(9)**

UNIT II: Highway geometric design

Introduction- Road cross section parameters. Curves- channelization design. Fundamentals of traffic flow- uninterrupted traffic flow- Interrupted traffic flow- speed studies and analysis- Highway capacity studies and analysis. **(9)**

UNIT III: Traffic Signal

Fixed and vehicle actuated signals - Optimum cycle length - Warrants for signals - Saturation flow - Signal co-ordination - Area traffic control - Design of signalized and un-signalized intersections. Design of interchanges- Design of roundabouts. Road signs- test of the sign. Lettering and placement of signals. **(9)**

UNIT IV: Traffic Regulation and Safety

Regulation of speed - Vehicle and road users- Parking regulations - Parking and Traffic Control : Parking studies - Design of parking lots - Traffic signs - Road markings at different locations - Speed breaker Accident investigation - Accident data analysis. **(9)**

UNIT V: Traffic Management

Legislation enforcement and education for traffic safety- Cost of road accidents- Measures for accident reduction Segregation of traffic- Tidal flow operation- Exclusive bus lane- one-way streets- Street lighting- Noise barrier. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Explain fundamentals concepts of Traffic flow theory
2. Introduce various road geometric design elements
3. Design and analyze Intersections and Interchanges
4. Understand traffic regulations and safety
5. Acknowledge Traffic Management Systems

Text Books

1. Kadiyali,L.R., Traffic and Transportation Engineering, Khanna Technical Publications, Delhi, 2003.
2. Khanna, K and Jussto C.E.G., Highway Engineering, Khanna Publishers,Roorkee , 2006.

Reference Books

1. Worfgang.S., Hamburger, Transportation and Traffic Engineering Hand Book,Prentice-Hallo,New Jersey, 2002.
2. Louis, J Pignataro, Traffic Engineering - Theory and Practice, Prentice-Hall Inc., New Jersey, 2003.
3. James.L. Pline, Traffic Engineering Hand Book, Prentice Hall, New Jersey, 2002
4. Salter. S. A. Highway Traffic analysis and design, Prentice Hall, New Jersey,2003
5. Partha Chakroborthy and Animesh Das, "Principles of Transportation Engineering", Prentice Hall of India Pvt. Ltd., New Delhi - 110001, 2003 Publishers, New Delhi, 2007.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE413 RAILWAYS ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE112

Course Objectives

1. To have an overall knowledge of the design and construction of railway tracks.
2. To understand the function of different components of railway signalling and tunnelling.

UNIT I

GENERAL
Components of Railway Engineering:Permanent way components – Railway Track Gauge -Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings –Creep of Rails- Adzing of Sleepers- Sleeperdensity – Rail joints. **(9)**

UNIT II

DESIGN CONCEPTS OF RAILWAY TRACK
Engineering surveys - construction of new lines - tracks - types of track - stresses in tracks - subgrade formation - rack fittings - Ballast quality - classifications. **(9)**

UNIT III

GEOMETRIC DESIGN OF TRACKS
Introdcution to geometric design - basic terminologies - curves- types of curve - superelevation - points and crossings - track junction - track layout (simple). **(9)**

UNIT IV

MAINTENANCE OF TRACKS
Rail joints and welding of rails - track maintenance - track drainage - modern methods of track maintenance - rehabilitation and renewal of track. **(9)**

UNIT V

RAILWAY STATIONS, YARDS & TUNNELING
Railway stations and yards - tractive resistance and power - railway tunneling - signaling and interlocking - maintenance of railways and high speed trains. **(9)**

Course Outcomes

After successful completion of the course, student will be able to

1. Idetify the requirements of railway, railway tracks and basic terminologies in Railway Engineering
2. Design the railway tracks (structural).
3. Design the railway tracks (geometric).
4. Plan maintenance of railway tracks.
5. Explain the basic concepts of tunnelling in railway routes.

Text Books

1. Railway Engineering by B.C Rangwala, Charotar Publishing.
2. Railway Engineering by Satish Chandra & M.M. Agarwal, Oxford Publishing.

Reference Books

1. Bridge, Tunnel and Railway Engineering by S.P. Bhindra, Dhanpat Rai Publication

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

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PROFESSIONAL ELECTIVES-IV

20CE414 GEOTECHNICAL EXPLORATION

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20CE111

Course Description

This course covers importance of soil exploration, methods of subsurface exploration, different drilling techniques, borings, and sampling. Further the course also covers various field test.

Course Objectives

1. To provide a basic understanding the importance of Geotechnical exploration
2. To provide students with exposure to the different techniques like sampling, boring and drilling etc.
3. To build the necessary field background for selection of soil to design and construction of civil engineering structures

UNIT I: INTRODUCTION OF GEOTECHNICAL EXPLORATION

SOIL EXPLORATION Necessity and Importance of soil exploration-method of sub surface exploration Test pits- Wash boring- Percussion drilling- Rotary drilling. Factors affecting the selection of a suitable method of boring. Extent of boring, Factors controlling spacing and depth of bore holes- Spacing and depth of various Civil engineering structures
ROCK EXPLORATION Objective of rock exploration, methods of rock exploration; by direct penetration, by geophysical processing. Rock and Rock mass classification, Geological petro graphic, Index properties of rocks, Physical and Mechanical properties. **(9)**

UNIT II: INDIRECT METHODS OF EXPLORATION

Indirect method of exploration: Seismic method- Electrical resistivity,-Resistivity sounding and profiling-, Qualitative and quantitative interpretation of test results- Comparison of resistivity and seismic surveys. **(9)**

UNIT III: STABILIZATION OF BORE HOLES AND GROUND WATER OBSERVATION

Stabilization of bore holes: Different method of stabilization of the bore holes- their relative merits and demerits. Ground water Observation: Different method of ground water observation: Time lag in observation- sampling of ground water. **(9)**

UNIT IV: SAMPLING METHODS

Source of disturbance and their influence. Type of sampler, Principle of design of sampler, Representative and undisturbed sampling in various types of soils. Surface sampling, Amount of sampling, Boring and sampling record, Preservation and shipment of sample preparation of bore log. **(9)**

UNIT V: FIELD TESTS

Penetration tests, Standard penetration tests, Dynamic cone penetration tests with and without bentonite slurry, Static cone penetration tests, factor affecting the penetration tests. Various corrections in the test results. Interpretation of test result for design and determination of modulus of deformation. Small size penetrometers. Correlation among various test results. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Explain the Importance of Geotechnical exploration.
2. Explain the process of soil sampling from field.
3. Apply the concepts to prevent the collapse of bore holes
4. Prepare Soil investigation report.
5. Explain various field tests.

Text Books

1. Punmia B. C, Ashok Kumar Jain, and Arun Kumar Jain. Soil Mechanics and Foundations, 16th Edition, Laxmi Publications
2. Arora, K.R., Soil Mechanics and Foundation Engg, Standard Publishers and Distributors, Delhi.

Reference Books

1. Soil Mechanics by Craig R.F., Chapman & Hall
2. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
3. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
4. Principles of Geotechnical Engineering, by Braja M. Das, 6th Edition,Cengage Learning
5. Principles of Foundation Engineering, by Braja M. Das, 7th Edition,Cengage Learning

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE415 ESTIMATING AND COSTING

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE110

Course Description

Standard units - detailed and abstract estimates of buildings, roads and canals - rate analysis - reinforcement bar bending schedule - contracts and tenders - building valuation - specifications.

Course Objectives

1. Standard units - detailed and abstract estimates of buildings, roads and canals - rate analysis - reinforcement bar bending schedule - contracts and tenders - building valuation - specifications.

UNIT I: Introduction

Procedure Of Estimating:Methods of estimating - Main items of work - Methods of building estimates: Individual wall method - Centre line method - Estimate Of Buildings: Estimate of residential building - Estimate of a building from line plan. **(9)**

UNIT II:Estimate of RCC works and Road Estimating

Estimate of RCC works: Standard hooks and cranks - Estimate of RCC slab - RCC beam and RCC column with foundation - Road Estimating: Estimate of earthwork - Estimate of pitching of slopes - Estimate of earthwork of road, Canal estimate: Earthwork in canals - Estimate of earthwork in irrigation channels. **(9)**

UNIT III: Analysis Of Rates and Specifications

Preparation for analysis of rates, Quantity of materials per unit rate of work,Labour estimate - Specifications: Necessity, Types of specifications, Specifications for different civil engineering materials. **(9)**

UNIT IV: Contracts and Tenders

Contracts: Essentials of contracts, Types of engineering contracts, Advantages and disadvantages - Tender forms, Tender documents & notices time limits, Necessity. **(9)**

UNIT V: Valuation

Cost - Price & value - Methods of valuation - Out goings - Depreciation - Methods for Estimating cost depreciation - Valuation of building - Gross income - Net income - Scrap value - Salvage value - Obsolescence - Annuity - Capitalized value - Years purchase - Life of structures - Sinking fund - Standard rent - Process of fixing standard rent - Mortgage. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Learn standard units for different items of work in building.
2. Calculate various RCC Works and estimation of earth works for roads and canals.
3. Estimate the rates of materials for different specifications.
4. Prepare agreements, tenders for different civil engineering works. building construction and valuation and rent fixation of different Special structures.
5. valuate the building and resnt fixation for different civil engineering works.

Text Books

1. Dutta, B.N., Estimating and Costing, UBS publishers, 2016.
2. Birdie, G.S., Text Book of Estimating and Costing 6th Edition, Dhanpat Rai Publishing Company (P) Ltd
3. Patil, B.S., Contracts and estimations, Univ.Press, New Delhi.

References

1. Standard Schedule of rates and standard data book by public works department.
2. IS. 1200 (Parts I to XXV - 1974/ method of measurement of building and Civil Engineering works - B.I.S.)
3. Estimation, Costing and Specifications by Chakraborthi .M, Laxmi publications.
4. National Building Code.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE416 RIVER HYDRAULICS AND SEDIMENT TRANSPORT

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20CE101, 20CE102, 20CE105

Course Description

This course provides the basic knowledge necessary for planning and designing the structural measures for river hydraulics. The course first describes the river administration and planning for application. Especially the methodology of comprehensive river management will be emphasized that includes planning of river hydraulics and sediment movement to river channels and dam reservoirs. This will be followed by specific technologies of channel control and channel improvement.

Course Objectives

1. To get knowledge of fluvial geomorphology
2. To understand concept of analysis of river flow hydraulics
3. To be able to analyse hydraulic geometry and to design stable alluvial channels
4. To be able to do fluvial design for river bank protection
5. To understand the sediment properties and sediment transport in river flow.

UNIT I: FLUVIAL GEOMORPHOLOGY

Fluvial system - variables for alluvial rivers - regime concept - river classifications - thresholds of river morphology - hydraulic geometry - meander platform - geomorphic analysis of river channel responses. **(9)**

UNIT II: FOUNDATION OF FLUVIAL PROCESS

Hydraulics of flow in river channel - physical properties of sediments - scour criteria and scour -related problems - alluvial bed forms and flow resistance - sediment movements in Rivers - flow in curved channels - Stabilization and rectification of rivers, Dredging - Inland navigation - Canalization - Diversion and cofferdams - Levees and associated flood control works. **(9)**

UNIT III: REGIME RIVERS AND RESPONSES

Analytical basis for hydraulic geometry - design of stable alluvial channel - analytical river morphology - plan geometry and processes of river meanders Interlinking of rivers: Case studies. **(9)**

UNIT IV: MODELLING OF RIVER CHANNEL CHANGES

Introduction to river channel modeling - Mathematical model for erodible channels - gradual breach morphology tidal responses of river and delta system - fluvial design of river bank protection - River model - Channel control and Transitions - Discharge measurement methods - Flow resistance - Composite roughness and compound channels - Continuity and dynamic equations of unsteady flow - Method of characteristics - Dam -break problem - Density current. **(9)**

UNIT V: SEDIMENT TRANSPORT

Sediment transport - Measurement of stream flow and sediment - Sediment properties - Universal soil loss equation - Initiation of motion - Shields' diagram - Regime concept - Modes of sediment transport - Bed load - Bed form mechanics - Effective bed roughness - Armouring - Suspended load - Total load - Transport of sediment due to unsteady flow - Meandering of rivers - Braided river - Local scour at different structures - Sediment sampling - Design of stable channels - Seepage effects. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Describe about fluvial geomorphology
2. Apply the concepts for analysis of river flow hydraulics
3. Analyse hydraulic geometry and design stable alluvial channels
4. Design and modeling of river channel changes
5. Describe the sediment properties and sediment transport in river flow

Text Books

1. Santosh Kumar, River Engineering, Khanna Publishing House
2. K.D. Gupta, River Engineering, Vayu Education of India; First edition (2014)

Reference Books

1. John Fenton, River Engineering Lecture Notes, Institute of Hydraulic and Water Resources Engineering, Vienna University of Technology
2. Chang H. Howard, Fluvial Processes in River Engineering, John Wiley & Sons1988
3. Rozovskii L.I., Flow of Water in Bends of Open Channels, Academy of Sciences of the Ukraine, 1957
4. River Engineering: Margaret S. Petersen, Prentice Hall of India
5. Fundamentals of Fluvial Geomorphology: Ro Charlton, Routledge, Taylor and Francis Group
6. Loose Boundary Hydraulics: Arved. J. Raudkivi, Netherland: Balkema, 1998. ISBN: 90 -5410 -448 -1
7. Fluvial Processes in River Engineering: H. H. Chnag, John Wiley and Sons
8. River Mechanics: Pierre Y. Julien, Cambridge University Press
9. Hydraulics in Civil and Environmental Engineering: Andrew Chadwick, John Morfett and Martin Borthwick, Allen and Unwin, Spon Press London and New York
10. Sediment Transport (Theory and Practice): C. T. Yang, McGraw Hill. International Edition

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE417 ADVANCED STRUCTURAL ANALYSIS

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101, 20CE107, 20CE108

Course Description

This course Includes the analysis of structures like indeterminate beams, frames, Arches and trusses. Strain energy method and computer methods will be employed in the analysis.

Course Objectives

1. To make the Students aware of the analysis of indeterminate Structures.
2. To Teach the Students aware of influence lines for of indeterminate Structures.
3. To analyse multi-storey frames subjected to lateral and vertical loads using approximate methods like portal method, cantilever method and by using substitute frames.
4. To analyse the indeterminate trusses using stiffness and flexibility methods.
5. To make the Students familiar with the computer methods of Structural Analysis.

UNIT I: REDUNDANT FRAMES

Frames - Redundancy - Methods of solving redundant frames - Lack of fit - Temperature stresses -Trussed beams. two hinged arches-Determination horizontal thrust, Bending moment and Radial shear-Introduction to fixed arches. **(9)**

UNIT II: INFLUENCE LINES FOR INDETERMINATE STRUCTURES

Introduction - Muller Breslau principle - Influence lines for propped cantilevers and continuous beams. **(9)**

UNIT III: APPROXIMATE METHODS OF ANALYSIS OF MULTI-STOREY FRAMES

Analysis for vertical load - substitute frames - loading condition for maximum positive and negative bending moment in beams and maximum bending moment in columns - analysis for lateral load - portal method - cantilever method. **(9)**

UNIT IV: STIFFNESS AND FLEXIBILITY ANALYSIS OF TRUSSES

Introduction - Analysis of indeterminate trusses using stiffness and flexibility methods. **(9)**

UNIT V: INTRODUCTION TO FINITE ELEMENT ANALYSIS

Introduction - Structural mechanics - concepts - Basic steps of the finite element method - Advantages and Disadvantages - various elements shapes -Displacement model- formation of stiffness matrix for truss and beam elements-Element nodal load vector. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Analysis of redundant frames.
2. Analyze the Indeterminate Structures using Influence Line.
3. Analyzing the Multi-Storey Frames using Approximate methods.
4. Analyze the Indeterminate trusses using Stiffness and Flexibility method.
5. Analyzing the beams and trusses using the concepts of Finite Element Analysis

Text Books

1. Bhavikatti S.S., Structural Analysis, Vikas publishing house, New Delhi, 2014.
2. Vaidyanathan R and Perumal P., Structural Analysis, Volumes I & II Laxmi Publications New Delhi, 2016.

Reference Books

1. Reddy C.S., Basic structural Analysis, McGraw Hill Education, New Delhi, 2017.
2. Megre A.S, and Deshmukh S.K, Matrix Methods of structural Analysis, Charotar publishing house Gujarat Second Edition 2015.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

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PROFESSIONAL ELECTIVES-V

20CE418 WATERSHED MANAGEMENT

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

Topic covers basic concepts of watershed, sustainable watershed management approached and practices, integrated watershed management and modelling, social aspect inwatershed management, quantification of water quality and quantity at the catchment outlet using modern techniques, drought, flood and storm management at catchment scale.

Course Objectives

1. To discuss various aspects of water resources development and management on watershed basis.
2. To proliferate the sustainable use and development of natural resources.
3. To enrich the students for change in the hydrological fluxes due altered physiographic condition (land use or elevation) on a watershed scale.
4. To improve the quantitative problem solving skills of the students for natural resources management.

UNIT I

CONCEPT OF WATERSHED: Concept of watershed - classification of watershed - introduction to watershed management - objective of watershed development - Hydrological cycle - water balance equation - different stakeholders and their relative importance - watershed management policies and decision making.
FACTOR AFFECTING WATERSHED DEVELOPMENT: Morphological characteristics: linear - Arial and Relief aspect - land use - vegetation - soil and geological characteristics - Hydrology and geology and socio-economic characteristics. **(9)**

UNIT II

WATERSHED MODELING: Watershed delineation - modelling of rainfall - runoff process - Concept of integrated watershed management conjunctive use of water resources - Integrated water resources management. PRA - Private sector participation - Institutional issues - Socio-economy issues - Integrated development - Water legislation and implementations - Tools and emerging technologies for watershed management and planning. **(9)**

UNIT III

EROSION AND SEDIMENTATION: Types of erosion - factor affecting erosion - effect of erosion on land fertility and capacity - estimation of soil loss due to erosion: universal soil loss equation.
PREVENTION AND CONTROL TO EROSION: contour techniques - ploughing - furrowing - trenching - bunding - terracing - gully control - rockfill dams - check dams - brushwood dam - Gabion structure. **(9)**

UNIT IV

WATER HARVESTING: Rain water harvesting - catchment harvesting - harvesting structures - soil moisture conservation - check dams - artificial recharge from pond - percolation tanks.
FLOOD AND DROUGHT MANAGEMENT: Definition of flood - Flood frequency analysis: Weibul - Gumbel - and log Pearson methods.Definition and classification of drought - drought analysis techniques - drought mitigation planning.
MANAGEMENT OF WATER QUALITY: Water quality and pollution - types and Sources of pollution - water quality modeling - environmental guidelines for water quality. **(9)**

UNIT V

COVER MANAGEMENT: Land use land cover change estimation through satellite imageries - land capability classification - management of forest - agricultural - grassland and wild land - Reclamation of saline and alkaline soil. Classification of columns based on slenderness ratio - reinforcement & loading - Design of rectangular and circular columns subjected to axial load - (axial load + uni-axial bending) and (axial load + bi-axial bending). Different Types of Footings - Design of isolated - square - rectangular and circular footings.
INTEGRATED CROPPING SYSTEM FOR WATERSHEDS: Intercropping - mix cropping - strip and terrace cropping - sustainable agriculture - cover cropping (biomass conservation) - horticulture - dryland agriculture and afforestation. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Classify watershed and Identify factors to consider for watershed Development.
2. Apply the concepts of watershed development and planning
3. Evaluate the erosion rate and total amount of soil loss from a watershed
4. Select the flood and drought mitigation measures
5. Quantify the change in land use land/cover and its impact on hydrological processes.

Text Books

1. Kenneth N. Brooks Peter F. Ffolliott Joseph A. Magner. Hydrology and the Management of Watersheds. A John Wiley & Sons, Inc., Publication (4th Edition)
2. VVN, Murthy. Land and Water Management- Kalyani Pblication

Reference Books

1. JVS Murthy. Watershed Management. New Age International publisher.
2. A.M. Michel and T.P. Ojha. Hand Book on Agricultural Engineering, Volume 2.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE419 BRIDGE ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101, 20CE102, 20CE107, 20CE108, 20CE111

Course Description

The course introduces various components of bridges and their various types and hydraulic design requirements of bridges. Standard loading standards developed by IRC which form a consistent basis for design are introduced. The course provides a lucid exposition of the theory and design of pipe culverts, RC slab culverts, T- Beam Bridges and introduction to prestressed concrete bridges. The course covers the theory and design of substructures (piers and abutments), foundations, bearings and joints and introduces construction and maintenance as an important part of bridge engineering.

Course Objectives

1. To develop an understanding of and appreciation for basic concepts in proportioning and design of bridges in terms of aesthetics, geographical location and functionality.
2. To help the student develop an intuitive feeling about the sizing of bridge elements and to develop a clear understanding of conceptual design.
3. To understand the load flow mechanism and identify loads on bridges.
4. To carry out a design of bridge starting from conceptual design, selecting suitable bridge, geometry to sizing of its elements

UNIT I

INTRODUCTION: Importance of site investigation in Bridge design. Highway Bridge loading standards.Impact factor.Railway Bridge loading standards (B.G. ML Bridge) various loads in bridges.

BOX CULVERT: General aspects. Design loads, Design of Box culvert subjected to RC class AA tracked vehicle only. **(9)**

UNIT II

DECK SLAB BRIDGE: Introduction - Effective width -method of Analysis Design of deck slab Bridge (Simply supported) subjected to class AA Tracked Vehicle only.

BEAM & SLAB BRIDGE (T-BEAM BRIDGE): General features - Design of interior panel of slab - Pigeaud's Method -Design of a T-beam bridge subjected to class AA tracked vehicle only. **(9)**

UNIT III

PLATE GIRDER BRIDGE: Introduction - elements of a plate girder and their design. Design of a deck type welded plate girder - Bridge of single line B.G.
COMPOSITE BRIDGES: Introduction - Advantages - Design of Composite Bridges consisting of RCC slabs over steel girders including shear connectors. **(9)**

UNIT IV

BRIDGE BEARINGS: General features - Types of Bearings - Design principles of steel Rocker & Roller Bearings - Design of a steel Rocker Bearing - Design of Elastometric pad Bearing. **(9)**

UNIT V

PIERS & ABUTMENTS: General features - Bed Block - Materials piers & Abutments Types of piers - Forces acting on piers - Stability analysis of piers - General features of Abutments - forces acting on abutments - Stability analysis of abutments - Types of wing walls - Approaches - Types of Bridge Foundations (excluding Design). . **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Design a box culvert subjected to IRC class AA loading.
2. Design of deck slab bridge and beam slab bridge.
3. Design of plate girder and composite bridges.
4. Design of elastomeric and steel rocker bearing.
5. Differentiate between piers, abutments and their types including forces and stability analysis of abutments.

Code Books

1. IRC:6-2014 - STANDARD SPECIFICATIONS AND CODE OF PRACTICE FOR ROAD BRIDGES, SECTION : II - LOADS AND STRESSES (Revised Edition)
2. IRC:22-2015 - Standard Specifications and code of practice for road Bridges, Section VI, CompoSite Construction (Limit States Design) (Third Revision)
3. IRC:24-2010 - STANDARD SPECIFICATIONS AND CODE OF PRACTICE FOR ROAD BRIDGES, SECTION V - STEEL ROAD BRIDGES (LIMIT STATE METHOD) (Third Revision)
4. RC:112-2020 - CODE OF PRACTICE FOR CONCRETE ROAD BRIDGES (First Revision)

Text Books

1. Victor, D. Johnson, Elements of Bridge Engineering, Oxford and IBH Publishers, New Delhi(2009)
2. Vazirani & Ratwani, Design of Concrete Bridges, Khanna Publishers, New Delhi(2010)

Reference Books

1. Raina, V.K., Analysis, Design and Construction of Bridges, Tata McGraw Hill (2010)
2. Raju, N. Krishna, Design of Bridges, Oxford and IBH (2004).

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE420 OPTIMIZATION IN STRUCTURAL DESIGN

L	T	P	C
3	0	0	3

Course Description

Optimization methods; linear programming, non-linear programming - geometric programming, dynamic programming - integer programming, quadratic programming, engineering applications

Course Objectives

1. To understand basic theoretical principles and algorithms developed for solving various types of optimization problems.
2. To get a broad picture of the various applications of optimization viz linear and non-linear programming methods used in engineering.
3. To develop formulation and solution methods in optimization.
4. To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.
5. To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology.

UNIT I: INTRODUCTION AND OPTIMIZATION TECHNIQUES

Introduction - Statement of optimization problem - Classification of optimization problems - Optimization techniques - Single variable optimization - Multi-variable optimization with no constraints - Multi-variable optimization with equality constraints - Multi-variable optimization with inequality constraints. **(9)**

UNIT II: LINEAR PROGRAMMING - SIMPLEX METHOD

Introduction - standard form of a linear programming problems - geometry of linear programming problems - Definitions and theorem - Motivation to the simplex method - simplex algorithm. **(9)**

UNIT III: NON-LINEAR PROGRAMMING: ONE DIMENSIONAL MINIMIZATION

Introduction - unimodel function - Elimination method - Unrestricted search - Exhaustive search - Dichotomous search - Fibonacci method - Golden section method - Interpolation method. **(9)**

UNIT IV: GEOMETRIC PROGRAMMING

Introduction - Posynomial- Unconstrained minimization problem. dynamic programming: Introduction - Multi stage decision processes - Concept of sub optimization and the principle of optimality - Computational procedure in dynamic programming. **(9)**

UNIT V: Modern Methods of Optimization

Introduction to Axisymmetric Elements – Derivation of the Stiffness Matrix Practical Aspects of Optimization - Genetic Algorithms, Genetic Algorithms, Particle Swarm Optimization, Ant Colony Optimization, Optimization of Fuzzy Systems, Neural-Network-Based Optimization, application to structural engineering problem. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Explain principles of optimization.
2. Use the Linear Programming methods
3. Use the Non-linear Programming methods
4. Compute using Dynamic programming.
5. Use modern methods of optimization

Text Books

1. Rao S.S., Engineering optimization Theory and Practice, New Age International Publishers, New Delhi, Third Edition ,2016.
2. Gupta P. K and Hira D.S., Operations Research, S. Chand and Company Ltd.,2016.

Reference Books

1. Ravindran A, Ragsdell K.M, Reklaitis G.V, Enginnering Optimization Methods and Application, Wiley India Edition, New Delhi, Second Edition 2012.
2. Sharma S.D, Operations Research, Kedar Nath Ram Nath, Mecrut, Revised Edition, 2015.
3. Srinivasan G, Operations Research: Principles and Applications, PHI Learning Private Limited, New Delhi, Third Edition,2017
4. Kalavathy S, Operations Research, Vikas Publishing House Pvt. Ltd., New Delhi, Fourth Edition ,2014.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE421 OFFSHORE STRUCTURES

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101, 20CE102, 20CE111, 20CE110, 20CE110

Course Description

The course introduces various types of offshore structures, loads that will come on offshore structures, detailed discussion on materials used for their construction, different types of soils and their properties, different types of piles, specifics of fabrication, installation of platforms, types of vessels and barges and at last it deals with corrosion protection and different environmental factors affecting corrosion and its design.

Course Objectives

1. To know the existence of various types of offshore structures all over the world
2. To know various types of loads acting and its influence on design of the offshore structures
3. To evaluate strength of different materials used for construction
4. To determine types and properties of different offshore soils
5. To know the fabrication and installation of offshore structures
6. To know the different types of corrosion and its preventive measures

UNIT I : INTRODUCTION TO OFFSHORE STRUCTURES

Introduces - Types of offshore structures - The economic and technical factors affecting their design and construction - Reviews the evolution of offshore drilling and offshore platforms. **(9)**

UNIT II : OFFSHORE STRUCTURES LOADS AND STRENGTH

Loads on offshore platforms - Robust design of offshore platforms depends on accurate specification of the applied loads - Formulas and factors used in determining loads - Wind and wave loads for particular locations - Collection and use of metocean data - Platform's handling of loads depends on the strength of the materials used in construction - Detailed consideration of materials strength, including the types of steel and their strengths and the class of steel recommended for each structural member as well as the strength of cement grout. **(9)**

UNIT III : GEOTECNICAL DATA AND PILE DESIGN

Offshore soil investigation methods - Soil types and soil properties -Detail pile foundations - types of offshore piles - temporary support of piled structures Pile performance analysis, including pile capacity calculations for axial and cyclic loadings - Pile wall thickness and pile drivability analysis - Scour - Factors that should be reported in the soil investigation report. **(9)**

UNIT IV : FABRICATION AND INSTALLATION OF FIXED PLATFORMS

General outline of the construction procedure and proceeds to engineering of execution of the procedure - Specifics of fabrication - Jacket assembly and erection - Installation, including: loads from transportation, launch and lifting operations - Lifting procedure and calculations - Clearances - Load-out process - Transportation process - Types of vessels and barges - Transportation loads and launching and upending forces - Installation and pile handling. **(9)**

UNIT V : CORROSION PROTECTION

Introduction - Anodic and cathodic reactions important to corrosion protection - Complex principles for corrosion protection - Coatings and CP of steel structures - Environmental factors affecting CP systems, such as corrosion stress contributed by the atmosphere, water, and soil - Details of CP system design - Explication of anode manufacture, installation, dimension tolerance, and inspection procedures. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Understand the various kinds of offshore structures with their functionalities
2. Understand the different loads to considered in the design and analysis of offshore structures
3. Understand the detailed investigation of soils and their properties for offshore foundations
4. Understand the different codes and standards used for fabrication and installation of offshore structures
5. Understand different corrosion protective measure and their design

Text Books

1. Mohamed A. El-Reedy, Offshore Structures- Design, Construction and Maintenance, Gulf Professional Publishing (2012).

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE422 GROUND IMPROVEMENT TECHNIQUES

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

Identification of problematic soils; ground improvement techniques; densification in granular soils; densification in cohesive soils; soil stabilization; confinement; reinforced earth; geosynthetics; improvement of expansive soils.

Course Objectives

1. To introduce engineering properties of soft, weak and compressible deposits, principles of treatment for granular and cohesive soils and various stabilization techniques.
2. To bring out concepts of reinforced earth.
3. Applications of geotextiles in various civil engineering projects.

UNIT I: DEWATERING & GROUTINHG

Introduction - Need for engineered ground improvement, classification of ground modification techniques; suitability, feasibility and desirability of ground improvement technique. Methods of de -watering - sumps and interceptor ditches - wells - drains - Electro -osmosis. Objectives of grouting - grouts and their properties -grouting methods. **(9)**

UNIT II: DENSIFICATION

In - situ densification methods in cohesionless Soils: - Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth. In - situ densification methods in cohesive soils: - preloading or dewatering, Vertical drains - Sand Drains - Sand wick geo -drains - Stone and lime columns - thermal methods. **(9)**

UNIT III: STABILIZATION

Methods of stabilization -mechanical -cement - lime -bituminous -chemical stabilization with calcium chloride - sodium silicate and gypsum. **(9)**

UNIT IV: REINFORCED EARTH & GEOSYNTHETICS

Principles - Components of reinforced earth - factors governing design of reinforced earth walls design principles of reinforced earth walls. Geotextiles - Types, Functions and applications - geo -grids and geo -membranes - functions and applications. **(9)**

UNIT V: EXPANSIVE SOILS

Problems of expansive soils - tests for identification - methods of determination of swell pressure. Improvement of expansive soils - Foundation techniques in expansive soils - under reamed piles. **(9)**

Course Outcomes

After successful completion of the course, student will be able to

1. Identify basic deficiencies of various soil deposits and able to decide various dewatering methods to improve the soil.
2. Implement different techniques of soil densification.
3. Use admixtures in stabilizing the soil.
4. Use geo -synthetics materials in engineering applications.
5. Suggest different types of foundation techniques and methods to control swelling of soil

Text Books

1. Dr. Purushotham Raj, P., Ground Improvement Techniques, Laxmi Publications, New Delhi.
2. Dr. Sivakumar Babu, GL, An Introduction to Soil Reinforcement & Geosynthetics, Universities Press

Reference Books

1. Hausmann M.R., Engineering Principles of Ground Modification, McGraw -Hill International Edition, 1990.
2. Moseley M.P., Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA, 1993.
3. Xanthakos P.P., Abramson, L.W and Brucwe, D.A., Ground Control and Improvement, John Wiley and Sons, New York, USA, 1994.
4. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy, USA.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE423 PAVEMENT DESIGN AND ANALYSIS

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101, 20CE107, 20CE112

Course Description

Course covers various theoretical and practical aspects of design of pavements. This course includes pavement analysis; stresses in flexible and rigid pavements; analysis and design of flexible and rigid pavements; pavement maintenance and evaluation of pavement condition.

Course Objectives

1. To understand the principles and design of pavements.
2. To introduce the students the basic knowledge on various IRC guidelines for designing rigid and flexible pavements.
3. To understand the pavement maintenance and evaluation of pavement condition.

UNIT I

PAVEMENT ANALYSIS: Types of pavements - Basic difference between flexible and rigid pavements - Factors affecting design of pavements - Elastic modulus - Poisson's ratio - wheel load - equivalent single wheel load - repetition of loads - wheel configuration and tyre pressure - ESWL Concept - Tyre pressure - Contact pressure - Material characteristics - Environmental and other factors. **(9)**

UNIT II

STRESSES IN FLEXIBLE PAVEMENTS: Stress inducing factors in flexible pavements - stresses in flexible pavement - Layered systems concept - One layer system - Boussinesq Two layer system - Burmister theory for pavement design.
STRESSES IN RIGID PAVEMENTS: Types of stresses and causes - Introduction to Westergaard's equation for calculation of stresses in rigid pavements due to wheel loads and temperature - Considerations in rigid pavement analysis - wheel load stresses - warping stresses - frictional stresses - combined stresses. **(9)**

UNIT III

DESIGN OF FLEXIBLE PAVEMENT: Theoretical - and empirical methods - Burmister method - CBR Method - AASHTO Method - IRC and Asphalt Institute method. **(9)**

UNIT IV

DESIGN OF RIGID PAVEMENT: Radius of relative stiffness - critical load positions - Westergaard's stress equation - Bradley's stress coefficients - design charts. PCA method - AASHTO - IRC method - Design of cement concrete pavements for highways - Design of joints - reinforcements - tie bars - dowel bars and slab thickness as per IRC guidelines. **(9)**

UNIT V

PAVEMENT MAINTENANCE AND EVALUATION OF PAVEMENT CONDITION: Need for highway maintenance - Failures and their causes in flexible pavements and rigid pavements - Pavement evaluation - Evaluation based on Surface Appearance - Cracks - Patches and Pot Holes - Undulations - Raveling - Roughness - Skid Resistance. Environmental influence and effects - Structural Evaluation by Deflection Measurements - Benkleman beam method - Pavement Serviceability index - Pavement maintenance (IRC Recommendations only) - Strengthening of existing pavements - Overlays. **(9)**

Course Outcomes

After successful completion of the course, student will be able to

1. Provide the material characterization affected by tyre characteristics, tyre pressure and wheel load.
2. Identify stresses in flexible and rigid pavements.
3. Design flexible pavements
4. Design rigid pavements
5. Evaluate pavements and identify possible failures.

Text Books

1. Bindra B.S, Highway Engineering, Danpat Rai and Sons.
2. R. Srinivas Kumar, Pavement Design, Universities Press, 2013.
3. R. Srinivasa Kumar, "Pavement Evaluation and Maintenance Management System", Universities Press, 2014.
4. S. K. Sharma, Principles, practice and design of Highway Engineering including Air Port pavements, S. Chand publications.
5. S. K. Khanna & C. E. G. Justo, Highway Engineering, Nem Chand Publishers

References

1. Yang H Huang "Pavement Analysis and Design", Prentice Hall.
2. E. J. Yoder and M. W. Witczak, "Principles of Pavement Design", John Wiley & Sons.
3. IRC Standard specifications for Construction of Flexible and rigid pavements

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE424 PORT ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE112

Course Objectives

1. To have an overall knowledge of the design and construction of airport, docks, harbours and ports as a whole.
2. To understand the function of different components of airports, docks and harbours.

AIRPORTS

UNIT I

GENERAL
History - development - policy of air transport - aircrafts - aerodromes - air transport activities - aircrafts and its characteristics - airport classifications.
AIRPORT PLANNING
Regional planning - concepts and advantages - location and planning of airport elements - airfield - terminal area - obstructions - approach zone - zoning laws - airport capacity - development of new airport - requirements of an ideal airport layout. **(9)**

UNIT II

RUNWAY DESIGN
Wind rose daigram - runway- orientation of runway - factors affecting runway length - basic runway length - and corrections to runway length - runway geometric design.
TAXIWAY DESIGN
Factors controlling taxiway layout - geometric design standards - exit taxiway - geometric design standards - gates - locations - size - gate positions - aircraft parking configurations and parking systems - hanger - site selection - planning and design considerations. **(9)**

UNIT III

TERMINAL DESIGN AREA
Terminal area elements and requirements - terminal building functions - space requirements - location planning concepts - vehicular parking area and circulation network.
AIR TRAFFIC CONTROL AND VISUAL AIDS
Air traffic control - objectives - control system - control network - visual aids - airport markings and lighting. **(9)**

SEAPORTS

UNIT IV

Introduction - Definition of the terms associated with docks and harbour - Requirements of harbour and port - classification of harbours with examples. Factors affecting Factors affecting growth of port - Major Ports in India and abroad - Planning a Port - Selection of ideal location of harbour - Introduction to dredging. **(9)**

UNIT V

Breakwater and materials of construction for breakwater - Introduction to design of break waters - Dock - Bulkhead and Sea Walls - Design Considerations and Construction Materials - Revetments - Water front structures - Wharves - Jetty - Dolphins - Different types of dock fenders - Uses of wet docks and Dry/ Repair docks. Port facilities - Transit sheds and warehouses. **(9)**

Course Outcomes

After successful completion of the course, student will be able to

1. Figure out requirements of airport pavement.
2. Design airport runway and taxiway
3. Explain terminal design area, traffic control and visual aids
4. Identify basic requirements of docks and harbours, factors affecting growth
5. Design various components of dock and harbour

Text Books/Reference Books

1. Ashport and Wright, "Airport Engineering", 3rd edition,1992, Willey-Interscience.
2. Khanna and Arora, Airport Planning & Design, Nemchand Bros, Roorkee.
3. Bindra S. P., "Dock and Harbour Engineering", Dhanpat Rai Publications, 1979, 1st Edition.
4. Oza H. P. and Oza G.H., "Dock and Harbour Engineering", Charotar Publishing House, 1999, 4th Edition.
5. Quinn, "Planning and construction of Docks and Harbours", Tata McGraw Hill, Latest Edition.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

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Skill Oriented Courses

20ENG601 CORPORATE COMMUNCATION

(Common to all branches)

L	T	P	C
1	0	2	2

Course Prerequisites: None

Course Description

English is practical and it is a must for any institution to provide students with opportunities to indulge in actively applying their language skills. Thus the Communication Skills Lab facilitates students with adequate opportunities to put their communication skills in use. It also accommodates peer learning by engaging students in various interactive sessions. This lab will be accompanied by a practical lab component.

Course Objectives

This course enables students to:

1. Focus on their interactive skills.
2. Develop their communicative competency.
3. Fortify their employability skills.
4. Empower their confidence and overcome their shyness.
5. Become effective in their overall performance in the industry.

UNIT I: LISTENING SKILLS:

Listening/watching interviews, conversations, documentaries, etc.; Listening to lectures, discussions from TV/Radio/Podcast. **(8)**

UNIT II: SPEAKING

Articulation of sounds; Intonation.; Conversational skills (Formal and Informal); Group Discussion; Making effective Oral presentations: Role play. **(10)**

UNIT III: READING SKILLS

Reading for main ideas; Applying background knowledge to predict content; Skimming; Scanning; Making inferences; Reading different genres of texts ranging from newspapers to creative writing; Reading Comprehension. **(8)**

UNIT IV: WRITING SKILLS

Writing an introduction; Essay structure; Descriptive paragraphs; Writing a conclusion. Writing job applications and resume; Emails; Letters; Memorandum; Reports; Writing abstracts and summaries; Interpreting visual texts. **(9)**

UNIT IV: INTERVIEW SKILLS

Different types of interviews: Answering questions and offering information; Mock interviews; Body Language. **(10)**

Course Outcomes

At the end of the course, learners will be able to:

1. Read articles from magazines and newspapers.
2. Participate effectively in informal conversations.
3. Introduce themselves and their friends and express opinions in English.
4. Comprehend conversations and short talks delivered in English.
5. Write short essays of a general kind, draft Reports and personal letters and emails in English.

Suggested Reading/Textbook

1. Sanjay Kumar and Pushp Lata; Communication Skills; Oxford University Press, 2012.
2. Sabina Pillai and Agna Fernandez; Soft Skills and Employability Skills; Cambridge University Press, 2018.
3. S.P. Dhanavel; English and Communication Skills for Students of Science and Engineering; Orient Blackswan, 2009.
4. M. Ashraf Rizvi; Effective Technical Communication; Tata Mc Graw Hill Co. ltd, 2005.

Reference

1. Dr. M.Adithan; Study Skills for Professional Students in Higher Education; S.Chand & Co. Pvt., 2014.
2. Guy Brook Hart & Vanessa Jakeman; Complete IELTS: Cambridge University Press, 2014.
3. Vanessa Jakeman & Clare Mcdowell; Action Plan for IELTS: Cambridge University Press, 2006.
4. Guy Brook Hart; Instant IELTS; Cambridge University Press, 2004.
5. S.P.Bakshi & Richa Sharma; Descriptive General English; Arihant Publications, 2012.
6. Charles Browne, Brent Culligan 7 Joseph Phillips; In Focus (level 2); Cambridge University Press.
7. Steven Gershon; Present Yourself 2 (second edition); Cambridge University Press.
8. Leo Jones; Let's Talk 3 (second edition); Cambridge University Press.
9. Nutall J. C.; Reading Comprehension; Orient Blackswan.
10. www.cambridgeenglish.org/in/
11. https://learnenglish.britishcouncil.org/en/english-grammar
12. https://www.rong-chang.com/

Mode of Evaluation: Continuous Internal Evaluation, Practical Examination.

20CE601 BUILDING TECHNOLOGY

L	T	P	C
1	0	2	2

Course Prerequisites: None

Course Objectives

1. To expose the students to construction practice through an understanding of different types of construction materials and their properties.
2. To understand the techniques of construction, different finishing works and remedial practices for distressed structures.
3. To impart knowledge of modern construction materials and equipments.

UNIT I

Stones (Dressed) – Bricks – Cement – Steel – Sand and Quarry Dust – Timber – Physical and Chemical Properties –Cement, cement, and Brick - Manufacturing Process – Classification – Test on materials – IS Standards and Specifications for use in construction as per SP 21: 1983.

Experiments:

1. Determination of flexural strength of Timber
2. Determination of Compressive strength of rock
3. Manufacturing of lime based mortar

UNIT II

Use building drawing Symbols, Conventions and Abbreviations - apply various types of scales as per needs

Experiments:

1. Types of Projection adopted in Building Drawing
2. Scales for various types of Drawings
3. Working drawing, large scale drawing enlarges scale drawing.
4. Symbols, Conventions and Abbreviations for - Electrical fittings, water supply, sanitary fittings, material for construction etc.

UNIT III:

Apply the Bye laws and Principles of Planning for residential and other public buildings.

Experiments:

1. Building bye laws of local body for residential building (show local authority publication) -plot area, built up area, carpet area, FSI, size of rooms, margins, heights, passages, ventilation, circulation and others
2. Principles of planning for residential building in detail such as - Room dimension, area, heights, privacy, roominess factor, orientation, grouping, drainage, aspect, prospect, drainage, economy

UNIT IV:

Develop concept plan of buildings -Prepare detail drawings for single and two storied residential building and public building.

Experiments:

1. Concept plan and drawing of residential single and two storied buildings
2. Given situation & Plot area, preparation of detailed drawing of a single storied and double storied residential building with detail of Line plan, Detailed Plan, Ground floor Plan, First floor plan, Elevation and Sections

UNIT V:

Introduction – Types of Soils – Classification of soils as per IS standards -Bearing capacity of soil – Methods of assessing Bearing capacity of soils – Types of foundations.

Reinforced Cement Concrete (RCC) works like Footings, Columns, Plinth Beams, Lintels, Sill slabs, Sunshades, Roof Beams and Roof Slabs

Experiments:

1. Classification of soil type.
2. Determination of bearing capacity of soil
3. Preparation of reinforcement details.

Course Outcomes

The students after completing the course will be able to:

1. Compare the properties of most common and advanced building materials.
2. Use the various building drawing symbols, conventions, abbreviations and various scales Recognize the functions of different building components.
3. Apply the bye laws and principles of planning.
4. Develop concept plan of buildings.
5. Assess the soil bearing capacity and reinforcement detailing for RCC members.

Text Books

1. Arora.S.P, - Building Construction Technology (Including Engineering Materials), 2010.
2. Rangwala.S.C, - Building Construction, Charotar Publishing House Pvt. Limited, 2009.

Reference Books

1. Sharma and Kaul, - Building ConstructioN, S.Chand & Company, New Delhi, 1987.
2. Rajput.R.K, - Engineering Materials, S.Chand & Company, New Delhi. 2008.
3. Dr.Punmia.B.C, - Construction Engineering, Laxmi Publishers Private Limited, New Delhi, 1993.
4. Gupta R.K. - Civil engineering Materials and Construction Practices‖, Jain Brothers, (New Delhi).

Standards

1. SP 21: 1983, Handbook on Summaries of Indian Standards for Building Materials, Bureau of Indian Standards, New Delhi.
2. SP 34: 1987, Handbook on Concrete Reinforcement and Detailing, Bureau of Indian Standards, New Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE602 ARCHITECTURE

L	T	P	C
1	0	2	2

Course Prerequisites: None

Course Objectives

1. To introduce various Architectural aspects.
2. To understand the history of Architecture.
3. To realize the impact of climate on Architecture Buildings.

UNIT I

Review of History of Architecture – Egyptian Mesopotamia classical and Indian Buddhist Architecture – Evolution of Hindu Temple Architecture-Islamic and Mughal- Architecture– Influences of Architecture on Nature, Climate, Topography and Materials – Represented plan – Growth of mass from plan – Space organization

Experiments:

1. Prepare of architectural model for a structure

UNIT II

Shelter or form – Climate and thermal comfort in India – Passive heating and cooling strategies-Openings in Got climates – Wind, Sun and Shading – Day lighting– Natural ventilation of buildings in India – Appropriate Technology for a Climatically Responsive Energy Architecture – Projects and Case studies.

Experiments:

1. Arrange a hall as per the given location and it climatic consideration.

UNIT III:

Planning of residential buildings – Space UNITs of Living, Dining, sleeping areas, Kitchens and Bathrooms – Single storied, double storied Residential buildings with different roofing systems – Multiple accommodations – Apartments – Group Housing — Housing for Handicapped – Housing for Elders – Youth Hostels.

Experiments:

1. Prepare of utility model for Living, Dining, Sleeping areas, Kitchens and Bathrooms.

UNIT IV:

Planning concept of commercial buildings – Requirements of Spaces – Parking standards – Shopping centre – Banks – Super Markets - Hotel / Motel - Concept Line Drawings – Projects.

Experiments:

1. Prepare of elevation model for a commercial/residential building.

UNIT V:

Planning concept of Institutional Structures –Planning Concept of Schools, Library buildings – Gymnasium – Planning concepts of Industrial Structures – General – Workshop – Ware Houses.
Experiments:

1. Prepare of a plan for school building / workshop / ware house.

Course Outcomes

The students after completing the course will be able to:

1. Recognize the different qualities of Architecture.
2. Understand that Architecture can enhance the building in terms of appearance and utility.
3. Realize that Architectural design can improve comfort in living conditions of buildings.
4. Apply Architectural concept and design buildings according specific requirements.
5. Apply Concept of Institutional Structures

Text Books

1. Pramar. V.S. -Design fundamental in Architecture, Somaiya Publications Pvt. Ltd., New Delhi, 1997.
2. Arvind Krishnan, Nick Baker, Simos Yannas, Szokolay.S.V., -Climate Responsive Architecture, A Design Hand Book for Energy Efficient Building, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2007.

Reference Books

1. Ernest Pickering -Architecture Design, John Wiley & Sons.
2. Muthu Shoba Mohan.G.,Principles of Architecture., Oxford University Press., New Delhi, 2006.
3. M. Pratap Rao -Architectural Design - Theory & Design.
4. Arvind Krishnan, Nick Baker, Simos Yannas, Szokolay.S.V., -Climate Responsive Architecture., A Design Hand Book for Energy Efficient Building, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2007.
5. National Building Code of India., SP7 (Group 1) Bureau of Indian Standards, New Delhi, 2005.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE603 GEOSPATIAL DATA ANALYSIS USING QGIS

L	T	P	C
1	0	2	2

Course Prerequisites: None

Course Description

This course is designed with the intension of making students able to do the spatial analysis and mapmaking.

Course Objectives

The major objective of this course is to teach students how to

1. Create map and attribute tables in QGIS
2. Do map georeferencing and perform basic analysis in QGIS
3. Perform intermediate GIS operations in QGIS
4. Perform Advance GIS operations in QGIS
5. Perform various Civil Engineering analysis in QGIS

UNIT I

Basic GIS operations: Making a Map , Working with Attributes (QGIS3), Importing Spreadsheets or CSV files (QGIS3), Basic Vector Styling , Calculating Line Lengths and Statistics , Basic Raster Styling and Analysis (QGIS3), Raster Mosaicing and Clipping

Practicals:

1. Create a map using satellite map and create the attribute table of various layers and perform the basic analysis in QGIS

UNIT II

Mapping and Digitalisation in GIS: Working with Terrain Data Working with WMS Data Working with Projections, Georeferencing Topo Sheets and Scanned Maps, Georeferencing Aerial Imagery, Digitizing Map Data, Searching and Downloading OpenStreetMap Data

Practicals:

1. Digitalising a map using scanned map by georeferencing and create the attribute table of various layers and perform the basic analysis in QGIS

UNIT III:

Intermediate GIS operations: Performing Table Joins), Performing Spatial Joins, Performing Spatial Queries, Nearest Neighbor Analysis, Sampling Raster Data using Points or Polygons, Calculating Raster Area, Creating Heatmaps, Animating Time Series Data, Handling Invalid Geometries

Practicals:

1. Doing intermediate GIS analysis such as calculating area, Creating Heatmaps and Animating Time Series Data, by using the digitalised GIS map

UNIT IV:

Advanced GIS operations: Advanced Raster Analysis, Interpolating Point Data, Calculating Street Intersection Density, Batch Processing using Processing Framework, Automating Complex Workflows using Processing Modeler, Automating Map Creation with Print Layout Atlas, Multi Criteria Overlay Analysis

Practicals:

1. Doing advanced GIS analysis such as Interpolating Point Data, Calculating Street Intersection Density, Batch Processing using Processing Framework, Automating Complex Workflows, Automating Map Creation and Multi Criteria Overlay Analysis, by using the digitalised GIS map

UNIT V:

Network Analysis and Hydrology: Basic Network Visualization and Routing, Locating Nearest Facility with Origin-Destination Matrix, Service Area Analysis using Open route service, Travel Time Analysis with Uber Movement.Delineation of watershed, HRUs, Streams and outlets.

Practicals:

1. Performing network analysis and hydrological analysis for the given spatial problem

Course Outcomes

By the end of the course, students will be able to:

1. Create map and attribute tables for the given space by using online maps or the scanned map image.
2. Perform analysis at basic, intermediate and advance level in QGIS
3. Perform various Civil Engineering analysis in QGIS
4. Handle various civil engineering projects that requires GIS support
5. Present the outcome of the project more effectively with the help of graphics and drawings

Text Books

1. Cutts, A., & Graser, A. (2018). Learn QGIS: Your step-by-step guide to the fundamental of QGIS 3.4 (A. IswalKar (ed.); Fourth). Packet Publishing Ltd.
2. Graser, A., Peterson, G. N., & Sherman, G. (2018). QGIS Map Design (G. Sherman (ed.); Second). Locate Press LLC.
3. Islam, S., Miles, S., Menke, G., Smith, J. G., Pirelli, L.,& Hoesen, G. Van. (2019). Shammunul Islam, Simon Miles, GISP Menke, GISP Smith Jr., Luigi Pirelli, GISP Van Hoesen (Third). Packt Publishing Ltd.
4. Menke, K. (2019). Discover QGIS 3.x: A Workbook for Classroom or Independent Study (G. Sherman (ed.)). Locate Press LLC.

Reference Books

1. 1. Madry, S. (2021). Introduction to QGIS Open Source Geographic Information System (S. Madry (ed.)). Locate Press LLC.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE604 3D DESIGN WITH GOOGLE SKETCHUP

L	T	P	C
1	0	2	2

Course Prerequisites: None

Course Description

This course intends to make Civil Engineering students able to make a 3D structural drawing using Sketchup

Course Objectives

The major objective of this course is to teach students how to

1. Create a 3D object
2. Create a 3D structure
3. Animate the drawing of 3D structure
4. Render the drawing and finishing
5. Generate and Exporting the final report

UNIT I

Understanding basic user interface: Views tools, Modify objects tools, Presentation tools

Practicals:

1. Draw various 3D shapes using basic tools

UNIT II

Using Shortcuts: User Interface, Guideline with tape, Measure and Protector, Drawing Objects, Create and Use Groups

Practicals:

1. Create a small housing block using basic tools and groups

UNIT III:

Presentation: Position, Camera, Look around, Walk, Import and Export, Exporting Animation and Image

Practicals:

1. Create animation from the practical from unit III

UNIT IV:

Modify Objects: Dynamic Components, Using Simple Plugins

Practicals:

1. Render the 3D object

UNIT V:

Extension Warehouse, Layout, Style Builder, Generating Reports

Practicals:

1. Generate the report with final drawing

Course Outcomes

By the end of the course, students will be able to:

1. Create 3D drawing of structure using sketchup
2. Create animations from the 3D structural drawing
3. Finalise the 3D structural drawing by rendering
4. Generate report of final drawing
5. Provide their services as a 3D Modeler

Text Books

1. SketchUp for Site Design: A Guide to Modeling Site Plans, Terrain, and Architecture 2nd Edition by Daniel Tal
2. Google SketchUp Cookbook: Practical Recipes and Essential Techniques by Bonnie Roskes
3. SketchUp for Builders: A Comprehensive Guide for Creating 3D Building Models Using SketchUp by John Brock

Reference Books

1. Google SketchUp for Dummies

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE605 SCILAB IN CIVIL ENGINEERING

L	T	P	C
1	**0**	**2**	**2**

Course Prerequisites: None

Course Objectives

1. To make the students learn to code the different Civil Engineering problems Using SCILAB.

UNIT I

Introduction to Scilab - Scilab environment - The workspace and Working Directory - Matrix Operations - Submatrices - Statistics - Plotting Graphs - Plotting 3D graphs - Scilab Programming Language - Script Files and Function Files

Experiments:

1. Practice programs on creating matrices and there operations.
2. Practice programs on statistics by using the available statistical functions are $sum()$, $mean()$, $stdev()$, $st_{d}eviation()$ and $median()$.
3. Practice programs on Matrix operations.
4. Practice programs on Plotting Graphs.
5. Practice programs on Plotting 3D graphs.
6. Practice programs using **function**

UNIT II

Engineering Mechanics

Experiments:

1. Programs on Analysis of Truss
2. Programs on SFD and BMD of Beams

UNIT III:

Structural Analysis

Experiments:

1. Programs on analysis of indeterminate structures

UNIT IV:

Hydrology

Experiments:

1. Programs on flood forecasting

UNIT V:

Hydraulics
Experiments:

1. Open channel flow computations

Course Outcomes

The students after completing the course will be able to:

1. Code Matrix Operations, Statistics and Plotting Graphs problems using SCILAB.
2. Code for analysis of truss and beams using SCILAB.
3. Code for analysis of indeterminate structures using SCILAB.
4. Code for flood forecasting computations using SCILAB.
5. Code for open channel flow computations in SCILAB.

Text Books

1. A K Tayal, Engineering Mechanics, Statics and Dynamics, 11th Edition, Unmesh Publications, (2000)
2. S. S. Bhavikatti, K. G. Rajashekarappa, Engineering Mechanics, Wiley, 1994.
3. T.H.G. Megson, Structural and Stress Analysis, 4th Edition - March 19, 2019
4. B. C. Punmia, Pande Brij Basi Lal, Ashok Kumar Jain, Arun Kumar Jain, Irrigation and Water Power Engineering, Laxmi Publications, Ltd., 2009.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE606 PYTHON IN CIVIL ENGINEERING

L	T	P	C
1	0	2	2

Course Prerequisites: None

Course Objectives

1. To make the students learn to code the different Civil Engineering problems Using PYTHON.

UNIT I

Introduction to PYTHON - PYTHON environment - The workspace and Working Directory - Matrix Operations - Submatrices - Statistics - Plotting Graphs - Plotting 3D graphs - PYTHON Programming Language - Script Files and Function Files
Experiments:

1. Practice programs on creating matrices and there operations.
2. Practice programs on statistics by using the available statistical functions are $sum()$, $mean()$, $stdev()$, $st_deviation()$ and $median()$.
3. Practice programs on Matrix operations.
4. Practice programs on Plotting Graphs.
5. Practice programs on Plotting 3D graphs.
6. Practice programs using **function**

UNIT II

Engineering Mechanics
Experiments:

1. Programs on Analysis of Truss
2. Programs on SFD and BMD of Beams

UNIT III:

Structural Analysis
Experiments:

1. Programs on analysis of indeterminate structures

UNIT IV:

Hydrology
Experiments:

1. Programs on flood forecasting

UNIT V:

Hydraulics
Experiments:

1. Open channel flow computations

Course Outcomes

The students after completing the course will be able to:

1. Code Matrix Operations, Statistics and Plotting Graphs problems using PYTHON.
2. Code for analysis of truss and beams using PYTHON.
3. Code for analysis of indeterminate structures using PYTHON.
4. Code for flood forecasting computations using PYTHON.
5. Code for open channel flow computations in PYTHON.

Text Books

1. A K Tayal, Engineering Mechanics, Statics and Dynamics, 11th Edition, Unmesh Publications, (2000)
2. S. S. Bhavikatti, K. G. Rajashekarappa, Engineering Mechanics, Wiley, 1994.
3. T.H.G. Megson, Structural and Stress Analysis, 4th Edition - March 19, 2019
4. B. C. Punmia, Pande Brij Basi Lal, Ashok Kumar Jain, Arun Kumar Jain, Irrigation and Water Power Engineering, Laxmi Publications, Ltd., 2009.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE607 REVIT STRUCTURE

L	T	P	C
1	0	2	2

Course Prerequisites: None

Course Description

This course is designed with the intension of making students able deisgn building using Revit Structures software.

Course Objectives

The major objective of this course is to teach students how to

1. Model Structural plans, floor levels Beam column slab section in Revit
2. Model Beam, beam-column Model, structural slab and Footing in Revit
3. Model Pile cap, assign load on building, rebar in footing, rebar extension, rebar in columnin Revit
4. Model detailing of Column in Revit
5. Model Floor Level and structural Grid Line in Revit

UNIT I

Introduction - Structural plans and floor levels - structural Grid Line - Dimension - structural Materials Properties - Beam column slab section
Practicals:

1. Define structural Plans Floor Level
2. Define structural Grid Line
3. Edit structural Grid Line, Dimension
4. Define structural Materials Properties
5. Define Beam column slab section in Revit

UNIT II

Load Cases - Structural Beam - beam-column Model - structural slab - Structural isolated footing - structural Combined footing
Practicals:

1. Define Load Case in Revit
2. Draw Structural Beam in Revit
3. Modify and Replicate beam-column Model in Revit
4. Draw structural slab in Revit
5. Draw Structural isolated footing in Revit
6. Draw structural Combined footing in Revit

UNIT III:

Structural Pile cap - Assign load on building - Rebar in Footing - Rebar Extension - Rebar in Column

Practicals:

1. Draw structural Pile cap in Revit
2. Assign load on building in Revit
3. Reinforcement Detailing of Foundation in Autodesk Revit and Rebar in Footing in Revit
4. Reinforcement Detailing of Foundation in Autodesk Revit Using Revit Rebar Extension
5. Reinforcement Detailing of Column in Autodesk Revit- Rebar in Column

UNIT IV:

Detailing of Column in Autodesk Revit Using Revit rebar Extension - Reinforcement Detailing of Beam in Autodesk Revit Using Revit rebar - Reinforcement Detailing of Beam in Autodesk Revit Using Revit rebar Extension

Practicals:

1. Reinforcement Detailing of Column in Autodesk Revit Using Revit rebar Extension
2. Reinforcement Detailing of Beam in Autodesk Revit Using Revit rebar
3. Reinforcement Detailing of Beam in Autodesk Revit Using Revit rebar Extension

UNIT V:

Plans Floor Level and structural Grid Line - Autodesk Revit Rebar shape As Per Indian Standards

Practicals:

1. Structural Plans Floor Level and structural Grid Line in Autodesk Revit
2. Autodesk Revit Rebar shape As Per Indian Standards

Course Outcomes

By the end of the course, students will be able to:

1. Draw Structural plans, floor levels Beam column slab section in Revit
2. Draw Beam, beam-column Model, structural slab and Footing in Revit
3. Draw Pile cap, assign load on building, rebar in footing, rebar extension, rebar in columnin Revit
4. Draw detailing of Column in Revit
5. Draw Floor Level and structural Grid Line in Revit

Reference books

1. Mastering Autodesk Revit 2020, Robert Yori, Marcus Kim, Lance Kirby, Sybex Publishers
2. Mastering Revit Structure 2009, Thomas Weir, Eric Wing, Jamie D. Richardson, David J. Harrington, Sybex serious skills, Wiley, Indianapolis, Ind.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE608 REVIT ARCHITECTURE

L	T	P	C
1	0	2	2

Course Prerequisites: None

Course Description

This course is designed with the intension of making students able deisgn building using Revit Structures software.

Course Objectives

The major objective of this course is to teach students how to

1. Learining the Interface and Navigation of Revit Architecture
2. Creating and Modifying 3D Architectural Elements
3. Generating 2D Construction Documentation
4. Applying Visualization and Rendering Techniques
5. Understanding Project Collaboration and Coordination

UNIT I

Practicals: Create the following in Revit Architecture :

1. Create Level, User Interface, Create Wall - Adjust Height of Wall - Change wall thickness
2. Create and Modify door - Place and Modify window -Place Component
3. How to make Plan - Trim/Extend in corner -Location Line - Wall vs Core - make FLOOR - make Roof - Soffit, Fascia, Gutter -
4. Apply material - Wall Material - Make Wall With Plastering - make Ceiling - wall sweep & reveal
5. Make Curtain wall - align Command - Offset - Mirror - Pick Axis - Mirror - Draw Axis - Split Element - Split with Gap - Pin, Unpin, Delete -Move Command - Copy Command - Rotate Command -Trim - Extend to Corner -Trim - Extend Single Element

UNIT II

Practicals: Create the following in Revit Architecture :

1. How to Scale - Array - Linear Array - Radial Array - Model Text - Work Plane
2. Wall Opening- Vertical Opening - By Face Opening - shaft opening - Dormer Opening -Grid
3. Architecture Column - Structural Column - stair by component - decal - place decak - create section - Complete Railing Tutorial - Complete dimension - Massing -
4. In place mass - Make Toposurface - Label Contours - -Building pad - Split Surface - Merge Surface - Subregion - Property line -Render - Render Setup View Template - Object Style - Graphic Display Setting - Sun Setting
5. Visibility/Graphics -View Range
6. Duplicate view - Duplicate with Detailing - duplicate as dependent - Creating Sheets - Room tag - Room Schedule - Color Fill Legend -Tag all not Tagged in Revit.

UNIT III:

Practicals: Create the following in Revit Architecture :

1. Scheduling and quantities - Door schedule - Room schedule - Snap Setting - Setting up Line Weights, Line Types and Line Styles - Wall joins - Butt Join - Miter Join - Square off
2. Calculate Number of bricks and cost of Bricks - Cost Estimation of door, window & furniture -
3. Exploded 3D Diagram with Displace Elements - Revit to Lumion Exporting Problem Solution - Automatic Room Dimensions (Room Tag) - Custom Railing - Classical Baluster Railing - Doors and window on Curtain Wall.

UNIT IV:

Practicals: Create the following in Revit Architecture :

1. Gutter and Downpipes - Create Custom Grid and Level Head - Underlay Setting - Displaying objects above and below in plan views - Building Design - Door Width vs Rough Width
2. Detail Views : Coarse, Medium, Fine - How to open door- Sketchy Lines Creating Bump Maps for Renderings

UNIT V:

Practicals: Create the following in Revit Architecture :

1. Complete Home Plan Step by Step - Underlay Elements - Pinned Element - Stair Annotations - Temporary Dimension Properties - Display & Hide Ribbons - Tabs, Panel Titels, Panel Buttons -
2. Understanding Room Bounding - change color of Curtain Glass - change thickness of Curtain Glass

Course Outcomes

By the end of the course, students will be able to:

1. Demonstrate Proficiency in Revit Architecture Interface
2. Create and Modify 3D Architectural Elements
3. Produce 2D Construction Documentation
4. Apply Visualization and Rendering Techniques
5. Collaborate and Coordinate within a Project Environment

Reference books

1. Autodesk Revit 2020 Architecture Basics, Elise Moss, SDC Publications
2. Mastering Autodesk Revit 2020, Robert Yori, Marcus Kim, Lance Kirby, Sybex Publishers
3. Autodesk Revit Architecture 2011, Eric Wing, Wiley Publishing Inc., Indianapolis, Ind.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20CE609 FLOOD MODELLING USING HEC-RAS

L	T	P	C
1	0	2	2

Course Prerequisites: None

Course Description

Use of HEC-RAS for the study and modeling of floods, channels or rivers is very necessary in engineering, hydrology or hydraulic applications. HEC-RAS is one of the software leaders in the industry. The course intends to teach flood modeling, analysis and river engineering in a practical way.

Course Objectives

1. to familiarize with the user interface
2. to create 1D and 2D geometry projects, from zero to advanced and View of the models in 3D
3. to compute flow area, refinement and boundary conditions, Mapping Flood inundation
4. to computation Options, Variable Time Steps setup, export options and Rating curves
5. to apply various functionalities of the software

UNIT I

Practicals:

1. Introduction to HEC-RAS and course dynamics
2. Download and Install HEC-RAS
3. General familiarization with the user interface
4. Complete project setup and basic HEC-RAS Tips and Tricks to get started

UNIT II

Practicals:

1. 1D and 2D geometry projects creation, from zero to advanced and
2. View of the models in 3D

UNIT III:

Practicals:

1. Flow area, refinement and boundary conditions
2. Mapping Flood inundation

UNIT IV:

Practicals:

1. Computation Options, Variable Time Steps setup, export options and Rating curves

UNIT V:

Practicals:

1. Culverts and Hydraulic Structures

Course Outcomes

By the end of the course, students will be able to:

1. Carry out hydrological or water analysis and modelling projects from scratch
2. Design step by step 1D and 2D river and flood geometry projects
3. Refine flow area and the setup of all types of boundary conditions, as well as the Mapping Flood Inundation
4. Configure Computation Options, Variable Time Steps, Export Options & Rating Curves, and above all, understanding their interpretation
5. Work with Culverts and Hydraulic Structures in a professional way

Reference

1. `https://www.hec.usace.army.mil/confluence/rasdocs`

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Minor in Civil Engineering

Stream: Civil Engineering-I

20MDCE101 SURVEYING AND BUILDING TECHNOLOGY

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: None

Course Description

The course will focus on basic concepts of Surveying and Building Technology. The student will have the knowledge of fundamentals of surveying and can apply the general principles of building construction to practical examples of constructional work throughout some parts of simple domestic buildings.

Course Objectives

1. To impart basic concepts of Surveying & Building Technology.
2. To make the student familiar with Chain Survey.
3. To make the students aware Compass Survey.
4. To make the student familiar with the general principles of building construction.
5. To make the students aware with the different types of foundations used in the construction.

UNIT I: BASIC CONCEPTS OF SURVEYING

Surveying - History; Definition; primary divisions, Classification, Principles of surveying Plan and map; Basic Measurements; Instruments and Basic methods; units of measurement, Scales used for Maps and plans, Duties of a surveyor. Errors: Accuracy and Precision Sources and types of errors, theory of Probability, Rounding of numbers. Minor instruments- uses and working of the minor instruments: Hand level, Line ranger, Optical square, Abney level, Clinometers, Pantograph, Box Sextant and Planimeter. **(9)**

UNIT II: CHAIN SURVEYING:

Instruments for chaining, Ranging out, chaining a line on a flat ground; Chaining on an uneven or a sloping ground; Chain & Tape corrections; Degree of accuracy. Principles of chain surveying; Basic definitions; Well-Conditioned Triangle, Field book, Field work; Offsets, Cross Staff survey; obstacles in chain survey-problems, Conventional signs. **(9)**

UNIT III: COMPASS SURVEY:

Introduction, Bearings and angles, Designation of bearings, Conversion of bearings from one system to the other, fore bearing and back bearing, , Calculation of bearing from angles, Theory of Magnetic compass (i.e. Prismatic compass), Temporary adjustments of compass-Magnetic Declination, Local attraction-Related Problems-Errors in compass survey. **(9)**

UNIT IV: THE BUILDING PROCESS, SITEWORKS AND DRAWINGS

Choice of site; site investigation; groundwater drainage; setting out; control of building work; sequence of building operations; problems in design and construction of buildings.

BUILDING DRAWING
Drawing instruments and materials; layout and presentation of drawings; sketches; working drawings. **(9)**

UNIT V: FOUNDATIONS

Identification and characteristics of soils; design of foundations; foundation types and their selection; excavation and trench timbering; concrete; cements; aggregates; site testing of materials; concrete mixes; concreting operations; reinforced concrete; prestressed concrete; basement construction. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Outline the basic concepts of surveying
2. Use the chain and its accessories to measure the distances.
3. Use the prismatic compass to measure the horizontal angles.
4. Outline the different building process, siteworks and drawings.
5. Utilize site information to interpret the type of foundation necessary at the site.

Text Books

1. Arora K.R, Surveying (In SI Unit), Standard Publishers, 2002.
2. Bhavikatti, S.S, Surveying and Leveling Vol. I, I.K. International Pvt Ltd, 2008.
3. Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Building Construction, Laxmi Publications; Eleventh edition (2016).
4. Sushil Kumar, Building Construction, Standard Publisher Distributors.(2010).

Reference Books

1. Ivor H. Seeley, Building Technology, Red Globe Press, 1st edition, Macmillan International Higher Education
2. Venkataramaiah, C, Surveying , Universities Press, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE102 BASIC SOIL MECHANICS AND FOUNDATION ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The main goal of this course is to provide an basic understanding regarding different types of soils for foundation systems like buildings, bridges substructure, industrial complexes, ports, harbors, water tanks, and big storage tanks of industrial structure, transmission line towers, and machines.

Course Objectives

1. Understand the fundamental principles of Soil Mechanics;
2. Students learn to apply the principles of foundation engineering to real world problems
3. Prepare students for entry level geotechnical engineering employment

UNIT I

SOIL MECHANICS -INTRODUCTION: Origin of Soils- Three-phase System and Phase Relationships -Index Properties -Unified and Indian standard soil classification system. **(9)**

UNIT II: Soil Mechanics - Compaction & Consolidation of soil

Definitions - Differentiate between compaction and consolidation - Compaction mechanism and proctor tests- field compactions methods- factors affecting compaction -Consolidation mechanism through spring analogy -fundamental definitions - Terzaghi's one dimensional consolidation theory (only formula) -consolidation settlement. **(9)**

UNIT III: Soil Mechanics - Shear Strength of Soil

Types - choice of foundation - Location of depth - Safe Bearing Capacity - Terzaghi's, Meyerhoff's and Skempton's Methods. Safe bearing pressure based on N- value - allowable bearing pressure; safe bearing capacity and settlement from plate load test - allowable settlements of structures - Settlement Analysis. **(9)**

UNIT IV: Earth Pressure and Stability of Slopes

Types of lateral earth pressure - Rankine's and Coulomb's earth pressure- Infinite and finite slopes - Factor of safety -Type of slope failure -Limit equilibrium method- Taylors stability number - Numericals˙ **(9)**

UNIT V: Introduction to Foundations and Bearing Capacity

Shallow Foundations; Types, Basic terms, SBC computation using IS and Terzaghi methods. Deep Foundations; Pile and Pile capacity, Numericals. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Student will Classify the type of soil.
2. Student will Analyze the compaction and consolidation behavior of different soils.
3. Student will calculte the shear strength of soil.
4. Student will Calculte earth pressure for different soils.
5. Student will Analyse different types deep foundations under different soil conditions.

Text Books

1. Arora K. R. Geotechnical Engineering: Soil Mechanics & Foundation Engineering. Standard Publications, 17^{th} Ed.

Reference Books

1. Soil Mechanics & Foundation Engineering, by Murthy V. N. S, 6^{th} Edition, Dhanpat Rai
2. Principles of Foundation Engineering, by Braja M. Das, 7^{th} Edition ,Cengage Learning
3. Relevant BIS, IRC codes and International code of practice

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE103 STRUCTURAL ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101

Course Description

This course is designed to know how to analyse & design the basic civil engineering structural components in terms of both concrete and steel such as beams, frames, trusses, slabs, column and footings as per the International Codes. This also covers the fundamental properties of concrete and steel.

Course Objectives

1. To provide a coherent development to the students for the courses in sector of structural engineering.
2. To understand the fundamental principles and procedures of reinforced concrete and steel design;
3. To present the foundations of many basic engineering concepts related designing of structures.
4. To give an experience in the implementation of designing concepts which are applied in field of structural engineering
5. Prepare students for entry level structural engineering employment.

UNIT I: STRUCTURAL MATERIALS

Rheological behaviour of fresh Concrete- Properties of fresh and hardened concrete- Strength, Elastic properties, Creep and Shrinkage, Maturity concept, Methods of Mix Design, Non Destructive Testing of Concrete. Properties of Steel - Structural Steel sections – loads on structures - Structural steel connections and its applications- Rivet, welding and bolting. **(9)**

UNIT II: ANALYSIS OF INDETERMINATE STRUCTURES

Analysis of fixed and continuous beams - Analysis of Single Bay Single storey portal frame using Slope deflection and Moment distribution method - Analysis of Two bay Two storey portal frame using Kani's method.

UNIT III: MATRIX METHODS OF ANALYSIS

Analysis of continuous beams, frames and trusses using flexibility and stiffness methods **(9)**

UNIT IV: DESIGN OF CONCRETE STRUCTURAL ELEMENTS

Design Philosophy- Design of singly and doubly reinforced beams- Design of one way and two way slabs- Design of columns and footings. **(9)**

UNIT V: DESIGN OF STEEL STRUCTURAL ELEMENTS

Design Philosophy- Design of Tension and Compression member- Design of Plate girders and Gantry girders. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Investigate the properties of concrete and steel
2. Analyse the beams and portal frames using displacement methods
3. Analyse the beams and portal frames and trusses using matrix methods
4. Design and analyse the concrete structural elements.
5. Design and analyse the Steel structural elements.

Text Books

1. Shetty, M.S., Concrete Technology, S.Chand & Co, 2004.
2. Reddy, C.S., Basic Structural Analysis, Mc Graw Hill India, 2010
3. Subramanian, N., Design of Reinforced Concrete Structures, Oxford Publications, 2013
4. Bhavikatti, S. S., Design of Steel Structures, I.K. International Pvt Ltd, 2019
5. Subramanian, N., Steel Structures Design and Practice, Oxford University Press, 2010.

Reference Books

1. Gambhir, M.L., Concrete Technology, Tata Mc. Graw Hill Publishers, New Delhi.
2. Varghese, P. C., Limit State Design of Concrete, 2nd edition, PHI Pvt. Ltd., New Delhi, 2011.
3. Duggal, S.k., Limit State Design of Steel Structures, TMH, 2011.
4. IS 456:2000, Code of practice for Plain and Reinforced concrete, Bureau of Indian Standards, New Delhi
5. IS 800:2007, Code of practice for General construction in steel, B.I.S.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE104 WATER RESOURCES ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course will focus on basic concepts of Surveying and Building Technology. The student will have the knowledge of fundamentals of surveying and can apply the general principles of building construction to practical examples of constructional work throughout some parts of simple domestic buildings.

Course Objectives

1. To introduce the basics/fundamentals of hydrological cycle, precipitation, runoff, evaporation and other losses,
2. To measure and predict runoff and flood
3. To analyse & design of gravity dams and earth dams,
4. To estimate reservoir capacity
5. To familiarize with canal irrigation system

UNIT I: HYDROLOGIC CYCLE, PRECIPITATION AND LOSSES

Introduction - hydrologic cycle-world water balance - applications in engineering,
Precipitation - forms of precipitation - characteristics of precipitation in India - measurement of precipitation - rain gauge network - mean precipitation over an area - depth-area-duration relationships - maximum intensity/depth-duration-frequency relationship - Probable Maximum Precipitation (PMP) - rainfall data in India.
Eaporation process - evaporimeters - evapotranspiration - measurement of evapotranspiration - evapotranspiration equations - potential evapotranspiration over India - actual evapotranspiration - interception - depression storage - infiltration - infiltration capacity - measurement of infiltration - modelling infiltration capacity - classification of infiltration capacities - infiltration indices. **(9)**

UNIT II: FLOODS

FLOOD ESTIMATION: Flood Estimation by Rational method - empirical method - Unit Hydrograph Method - Flood frequency studies: Gumbel's method - Log-Pearson Type III Distribution
FLOOD HYDRAULICS: Basic Equations - Flood Routing-Reservoir routing - Channel routing - Hydrologic Storage Routing - Attenuation - Hydrologic Channel Routing - Muskingum Method - Runge Kutta Method **(9)**

UNIT III: CANAL IRRIGATION SYSTEM

Canal Irrigation System - Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular, and modular outlets. Lining of canals, types

of lining.
Canal Regulation Works: Canal falls: Necessity and location of falls - Types of falls - Classification of falls, Canal regulators, off-take alignment - head regulators and cross-regulators - regulator, outlets and escapes **(9)**

UNIT IV: RESERVOIR PLANNING:

Investigations for reservoir planning - selection of site for a reservoir - Zones of storage in a reservoir - Storage capacity, Catchment Yield and Reservoir Yield - Mass inflow curve and demand curve - Calculation of reservoir capacity for a specified yield from the mass inflow curve - Determination of safe yield from a reservoir of a given capacity - Sediment flow in streams: Reservoir Sedimentation - Life of reservoir. Reservoir sediment control, Reservoir Losses, Economic height of a dam. **(9)**

UNIT V: DAMS

GRAVITY DAMS: Introduction - Forces acting on a gravity dam - Combination of loading for design, Modes of failure, stability requirements - principal and shear stresses - Stability analysis, Elementary Profile of a Gravity dam - Practical profile of a gravity dam - Limiting height of a gravity dam- High and low gravity dams - Galleries - Stability analysis of non - overflow section of Gravity dam.
EARTH DAMS: Introduction - Types of earth dams - Causes of failure of earth dams - Criteria for safe design of earth dams - Section of an earth dam
SPILLWAYS: Types of Spillways - Types of Energy Dissipators. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Estimate the areal average precipitation over the basin using the knowledge of hydrological cycle.
2. Estimate flood using flood routing techniques.
3. Plan and design canal irrigation system.
4. Plan and fix reservoir capacity.
5. Analyse stability of gravity and earth dams

Text Books

1. S. K. Garg, Irrigation Engineering and Hydraulic Structures, Khanna Publishers
2. K Subramanya, Engineering Hydrology, Mc-Graw Hill.

Reference Books

1. K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc- Graw Hill.
2. G L Asawa, Irrigation Engineering, Wiley Eastern
3. L W Mays, Water Resources Engineering, Wiley.
4. J D Zimmerman, Irrigation, John Wiley & Sons

5. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE201 CIVIL ENGINEERING LABORATORY

L	T	P	C
0	0	4	2

Course Prerequisites: None

Course Description

This course covers the different laboratory/field experiments in the area of Civil Engineering.

Course Objectives

1. To understand the behaviour of materials under different types of loading
2. To represent field measurements into document form
3. To demonstrate tests in the laboratory to obtain different soil properties
4. To provide an opportunity to learn how to measure the parameters wich governs the quality of the materials
5. To make the students to learn the principles and procedures of testing Highway materials and to get hands on experience by conducting the tests and evolving inferences

LIST OF EXPERIMENTS

1. Axial deformation
2. Deflections of structural elements
3. Non-destructive tests on structural elements
4. Utility of Total Station
5. Experiments using planimeter
6. Grain size distribution by Sieve Analysis
7. Determination of field density by core-cutter
8. To determine the compressive strength of Concrete.
9. To determine the compressive strength of Cement
10. Impact test
11. Crushing test
12. Shape test
13. Specific gravity and water absorption
14. Fineness modulus of aggregates

Course Outcomes

The students after completing the course will be able to:

1. Examine the compressive strength of cement and concrete
2. Use modern instruments for different surveying purposes
3. Do various tests to apply in practical problems
4. Implement good quality construction techniques
5. Select the appropriate materials for use in different road layers

Text Books

1. Laboratory Manual for Civil Engineering Second Edition, HS Moondra, Rajiv Gupta, CBS PUBLISHERS AND DISTRIBUTORS PVT LTD
2. IS 13311-1 (1992): Method of Non-destructive testing of concrete, Part 1: Ultrasonic pulse velocity [CED 2: Cement and Concrete]
3. Surveying (Volume I), Dr. B.C. Punmia, Er. Ashok Kumar Jain, Dr. Arun Kumar Jain, Sixteenth Edition, Laxmi Publications (P) Ltd.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20MDCE105 ECONOMICS OF TRANSPORTATION SYSTEMS

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

This course offers a multi-disciplinary approach to transportation systems and intends to bring an overall understanding of the concepts of transport engineering.

Course Objectives

1. To have an overall knowledge of the transportation engineering and its components.
2. To provide knowledge of the planning and management of different modules of transportation systems.
3. To cater to the need of understanding the economics of transport system and explain the application of a range of techniques.
4. To improve the knowledge of factors and measures of accident involved to understand the transportation safety issues.
5. To bring out an understanding of concepts of Barrier-free design and planning as deemed necessary for a transportation system.

UNIT-I: Basics of Transportation Engineering

Introduction to Transportation Engineering; Role of transport; Types of transport systems; Evolution of transport modes; Transport problems and mobility issues; Urban form and Transport patterns; land use transport - cycle; concept of accessibility, Classification of roads; Typical cross sections of roads in urban and rural area; Flexible and Rigid pavement; Road geometric design. **(9)**

UNIT-II: Transportation Systems

Urban transportation systems - Mass rapid transit system, Bus Rapid transit system, Light rail transit system, Personal rapid Planning of railway - layout, passenger facilities, traffic control. Airport Planning - requirements and components. Planning of Harbours and ports - Inland waterways; Pipeline transportation. **(9)**

UNIT-III: Transport Economics

Transportation costs; Supply and demand; Supply of transport services; Economics of traffic congestion; Vehicle operating costs; Fuel costs; Maintenance; Value of travel time savings; Accident costs. Economic analysis of projects; Methods of evaluation; Cost-benefit ratio; Financing of road projects; Private Public Partnership (PPP) **(9)**

UNIT-IV: Road Safety:

Road accidents - Causes, Scientific Investigations and Data Collection; Ensuring Traffic Safety in new design, reconstruction and operation; Road safety audit; Traffic management techniques. **(9)**

UNIT-V: Barrier Free Environment for Transportation Infrastructure:

Design Standards for Barrier Free Transport; Universal Design Theory; Barrier Free Public Transportation; Access Audit; Disability Models and Public Policies; Case studies **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Understand the basic concepts of transportation engineering in reference to their background
2. Determine the planning and management aspects of various transportation systems.
3. Understand and analyze the economics involved in the transportation.
4. Understand the safety issues in transportation and evaluate the risks involved.
5. Improve their multidisciplinary understanding of the barrier-free concept in transportation for making an accessible environment for all.

Text Books

1. Sergio, Jara-Díaz, Transport Economic Theory, Emerald Publishing; Illustrated edition, 2007
2. Button, K., TransportEchonomics, Edward Elgar Publishing Inc., 20022
3. Palma, A., & Lindsey, R., & Vickerman, R., & Quinet, E., A Handbook of Transport Economics, Elgar Online
4. Khanna, S.K. & Justo E.G., Highway Engineering, Nem Chand & Bros., 2000
5. Kadiyali, L. R., Principles of Highway Engineering, Khanna Publishers, 2001
6. Khanna, S. K. & Arora. M. G., Airport Planning and Design, Nemchand & Bros.

Reference Books

1. Horonjeff R. & McKelvy, F., Planning and Design of Airports, McGraw Hill, 5e, 2010
2. IRC: 37-2001, Guidelines for the Design of Flexible Pavements, IRC 2001, New Delhi'
3. IRC:37-2012, Tentative Guidelines for the Design of Flexible Pavements
4. O' Flaherty, C.A (Ed.)., Transport Planning and Traffic Engineering, Elsevier, 1997
5. Rangwala, S. C. , Airport Engg. Charotar Publishing Co., 16e, 2016
6. Yoder, E. J & Witezak, M. W, Principles of Pavement Design, John Wiley & Sons, 1991
7. Paquette, R.J., et al, Transportation Engineering Planning and Design, John Wiley & Sons, New York, 1982.
8. Alan Black, Urban Mass Transportation Planning, McGraw-Hill, 1995.
9. Winfrey, Economic analysis for Highways, International Textbook Company, Pennsylvania, 1969.
10. CRRI, Road User Cost Study in India, New Delhi, 1982
11. IRC, Manual on Economic Evaluation of Highway Projects in India, SP30, 2007

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE108 BASIC ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course covers demand, quality and treatment of water along with characterization, water and wastewater treatment plant units and design , low cost treatment of wastewater and household drainage. Similarly, air pollution, noise pollution and solid waste management are also included. Further the course also covers basic laboratory

Course Objectives

1. To explain different sources of water, water quality standards, water demands, distribution of water, population forecast, characteristics of water.
2. To analyze various water treatment plant units and their design considerations, advanced water treatment systems.
3. To explain the generation and collection of wastewater; wastewater treatment plant design, various wastewater treatment units and sludge treatment.
4. To explain various impacts of air and noise pollution and various methods to control them air and noise pollution
5. To describe about solid waste generation, characterization, impacts and various management techniques

UNIT I: WATER SUPPLY ENGINEERING

Water- Sources of Water, Water quality standards, Quantity of water: water demands, percapita demand, design period, population forecast, fluctuation in demand. General requirement for water supply: Sources, Types of intakes, Pumping and distribution of water; Quality of water: Physical, chemical, and biological characteristics of water and significance, necessity of treatment, water quality standards for various water uses. **(9)**

UNIT II: WATER TREATMENT

Engineering system for water purification: Aeration, Screening, Coagulation and Flocculation, Sedimentation, Softening, Filtration, Disinfection; Methods of treatment: Removal of color, tastes and odor control, removal of iron and manganese, fluoridation and defluorination. Advanced water treatment: Ion exchange, electro-dialysis, RO (principles only. **(9)**

UNIT III: WASTEWATER TREATMENT

Generation and collection of wastewaters- sanitary, storm and combined sewerage systems, quantities of sanitary wastes and storm water, design of sewerage system. Engineered system for wastewater treatment: Primary treatment, Screening, Grit removal, Sedimentation, Sedimentation aided with coagulation. Secondary treatment: Basis of microbiology, Growth and food utilization, Suspended growth systems, Attached growth systems, Secondary clarification, Disinfections of effluents; Sludge treatment and disposal: Sludge characteristics, thickening, disposal. **(9)**

UNIT IV: AIR AND NOISE POLLUTION

Air - Composition and properties of air, urban air pollution, Air quality standards, Measures and major equipment for air pollution control, Noise - Basic concept, measurement, and various noise control methods. **(9)**

UNIT V: SOLID WASTE MANAGEMENT

Solid waste management-Municipal solid waste, Composition, and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment, and disposal of MSW. Effects of solid waste on environment: effects on air, soil, water surface and ground, health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle, Disposal methods. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Estimate water demand and population forecasting and characteristics of water
2. Estimate water generation and perform basic design of the unit operations that are used in water treatment plants.
3. Explain various wastewater generation sources and different units of wastewater treatment and sludge treatment techniques
4. Describe the impacts of air and noise pollution and review various air and noise pollution control methods
5. Discuss about the impacts of solid waste and various solid waste management techniques

Text Books

1. Environmenatal Engineering (Volume I & II) by S. K. Garg-Khanna Publishers.
2. Rao M and Rao H. V. N. Air Pollution, McGraw Hill Education, 2017.
3. Jagbir Singh and Ramanathan A. L., Solid Waste Management: Present and Future Challenges, I K International Publishing House Pvt. Ltd., 2009
4. Environmental Engineering by H. S. Peavy, D.R. Rowe and G. Tchobanoglous, MGH.

Reference Books

1. Birdie, G.S, Birdie, J.S., Water supply and sanitary Engineering, Including Environmental Engineering, Water and Air Pollution Laws and Ecology, Dhanpat Rai Publications, 1996.
2. Punmia, B.C, Ashok Kr Jain, Arun Kr Jain., Waste Water Engineering, Laxmi Publications, 1998.
3. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
4. Metcalf & Eddy, Wastewater Engineering Treatment and Dispose, McGraw Hill Publication

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Minor in Civil Engineering

Stream: Civil Engineering-II

20MDCE106 ENGINEERING MECHANICS AND MATERIALS

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: None

Course Description

This course covers study of forces and geometric properties of rigid bodies, simple stresses and strains, shear force and bending moment for determinate beams, flexural, shear stresses and deflection of beams.

Course Objectives

1. To Study the forces on rigid bodies
2. To study the geometric properties of different shapes
3. To understand the nature of stresses and strains developed in simple geometries
4. To understand the concepts of shear force and bending moment and deflections in beams
5. To understand concept of flexural and shear stresses

Unit-I

STATICS OF PARTICLES: Introduction to Mechanics - System of Units -Laws of mechanics -Lame's theorem - Parallelogram and triangular Law of forces -Resolution of coplanar forces - Free body diagram - Equilibrium of particles
STATICS OF RIGID BODY: Moment of a force - Varignon's theorem - Moments and Couples -Equivalent system of forces - Requirements of stable equilibrium - Equilibrium of Rigid bodies subjected to two, three and four force system. **(9)**

Unit-II

CENTROID, CENTER OF GRAVITY AND MOMENT OF INERTIA: Center of Gravity and Centroid - Area and polar moment of inertia - Radius of Gyration -Parallel and Perpendicular Axis Theorems -Mass Moment of inertia - Problems on centroid and area moment of inertia of plane figures and build-up sections. **(9)**

Unit-III

SIMPLE STRESSES AND STRAINS: Concept of stress and strain- Types of stresses and strains- St. Venant's principle, Elasticity and plasticity - Hooke's law - Stress - Strain diagram for mild steel - Working stress - Factor of safety - Lateral strain, Poisson's ratio and volumetric strain - Elastic moduli and the relationship between them - Bars of varying section - composite bars - Temperature stresses. Strain Energy - Resilience **(9)**

Unit-IV

SHEAR FORCE AND BENDING MOMENT Concept of Shear Force (SF) and Bending Moment (BM) - SF and BD diagrams for Cantilever and Simply supported and Overhanging beams under point load(s), part and whole Uniformly Distributed Load(s), Uniformly Varying Load(s) and moment(s) -Calculation of maximum value and its location of SF and BM for all above load cases

DEFLECTIONS OF BEAMS Slope and deflection- Relationship between moment, slope and deflection, determine slopes and deflections of the determinate beams (Simply supported and Cantilever) using Double integration method, Macaulay's method, Moment area method. **(9)**

Unit-V

BENDING STRESSES: Assumptions - Derivation of bending equation, Neutral axis - Determination of bending stresses - Section modulus of rectangular and circular sections, I & T sections and built-up sections
SHEAR STRESSES- Derivation of shear stress formula - Shear stress distribution across various beam sections like rectangular, circular, triangular, I & T sections, Built-up sections. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Analyse force systems for a particle and rigid body and resolving the force system under equilibrium conditions
2. Determine centroid, center of gravity and moment of inertia of various surfaces and solids.
3. Learn the concepts of stress and strain in mechanics of solids
4. Analyse the beams for shear force, bending moment and deflections
5. Analyse bending and shear stresses for different types of beam sections

Text Books

1. R K Rajput, Strength of Material, S Chand Publications
2. Ferdinand P. Beer, E. Russell Johnston (2010), Vector Mechanics for Engineers: Statics and Dynamics (9th Edition), Tata McGraw-Hill International Edition.

Reference Books

1. S. S. Bhavikatti, (2008), Engineering Mechanics, New Age International.
2. Irving H. Shames, (2003), Engineering Mechanics - Statics and Dynamics, PrenticeHall of India Private limited.
3. S. Timoshenko D.H. Young J.V. Rao, SukumarPati, Engineering Mechanics, McGraw HillEducation; 5th edition
4. S. Ramamrutham and R. Narayanan, Strength of Materials, Dhanpat Rai Publishing Company

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE101 SURVEYING AND BUILDING TECHNOLOGY

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course will focus on basic concepts of Surveying and Building Technology. The student will have the knowledge of fundamentals of surveying and can apply the general principles of building construction to practical examples of constructional work throughout some parts of simple domestic buildings.

Course Objectives

1. To impart basic concepts of Surveying & Building Technology.
2. To make the student familiar with Chain Survey.
3. To make the students aware Compass Survey.
4. To make the student familiar with the general principles of building construction.
5. To make the students aware with the different types of foundations used in the construction.

UNIT I: BASIC CONCEPTS OF SURVEYING

Surveying - History; Definition; primary divisions, Classification, Principles of surveying Plan and map; Basic Measurements; Instruments and Basic methods; units of measurement, Scales used for Maps and plans, Duties of a surveyor. Errors: Accuracy and Precision Sources and types of errors, theory of Probability, Rounding of numbers. Minor instruments- uses and working of the minor instruments: Hand level, Line ranger, Optical square, Abney level, Clinometers, Pantograph, Box Sextant and Planimeter. **(9)**

UNIT II: CHAIN SURVEYING:

Instruments for chaining, Ranging out, chaining a line on a flat ground; Chaining on an uneven or a sloping ground; Chain & Tape corrections; Degree of accuracy. Principles of chain surveying; Basic definitions; Well-Conditioned Triangle, Field book, Field work; Offsets, Cross Staff survey; obstacles in chain survey-problems, Conventional signs. **(9)**

UNIT III: COMPASS SURVEY:

Introduction, Bearings and angles, Designation of bearings, Conversion of bearings from one system to the other, fore bearing and back bearing, , Calculation of bearing from angles, Theory of Magnetic compass (i.e. Prismatic compass), Temporary adjustments of compass-Magnetic Declination, Local attraction-Related Problems-Errors in compass survey. **(9)**

UNIT IV: THE BUILDING PROCESS, SITEWORKS AND DRAWINGS

Choice of site; site investigation; groundwater drainage; setting out; control of building work; sequence of building operations; problems in design and construction of buildings.

BUILDING DRAWING
Drawing instruments and materials; layout and presentation of drawings; sketches; working drawings. **(9)**

UNIT V: FOUNDATIONS

Identification and characteristics of soils; design of foundations; foundation types and their selection; excavation and trench timbering; concrete; cements; aggregates; site testing of materials; concrete mixes; concreting operations; reinforced concrete; prestressed concrete; basement construction. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Outline the basic concepts of surveying
2. Use the chain and its accessories to measure the distances.
3. Use the prismatic compass to measure the horizontal angles.
4. Outline the different building process, siteworks and drawings.
5. Utilize site information to interpret the type of foundation necessary at the site.

Text Books

1. Arora K.R, Surveying (In SI Unit), Standard Publishers, 2002.
2. Bhavikatti, S.S, Surveying and Leveling Vol. I, I.K. International Pvt Ltd, 2008.
3. Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Building Construction, Laxmi Publications; Eleventh edition (2016).
4. Sushil Kumar, Building Construction, Standard Publisher Distributors.(2010).

Reference Books

1. Ivor H. Seeley, Building Technology, Red Globe Press, 1st edition, Macmillan International Higher Education
2. Venkataramaiah, C, Surveying , Universities Press, 2008.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE102 BASIC SOIL MECHANICS AND FOUNDATION ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The main goal of this course is to provide an basic understanding regarding different types of soils for foundation systems like buildings, bridges substructure, industrial complexes, ports, harbors, water tanks, and big storage tanks of industrial structure, transmission line towers, and machines.

Course Objectives

1. Understand the fundamental principles of Soil Mechanics;
2. Students learn to apply the principles of foundation engineering to real world problems
3. Prepare students for entry level geotechnical engineering employment

UNIT I

SOIL MECHANICS -INTRODUCTION: Origin of Soils- Three-phase System and Phase Relationships -Index Properties -Unified and Indian standard soil classification system. **(9)**

UNIT II: Soil Mechanics - Compaction & Consolidation of soil

Definitions - Differentiate between compaction and consolidation - Compaction mechanism and proctor tests- field compactions methods- factors affecting compaction -Consolidation mechanism through spring analogy -fundamental definitions - Terzaghi's one dimensional consolidation theory (only formula) -consolidation settlement. **(9)**

UNIT III: Soil Mechanics - Shear Strength of Soil

Types - choice of foundation - Location of depth - Safe Bearing Capacity - Terzaghi's, Meyerhoff's and Skempton's Methods. Safe bearing pressure based on N- value - allowable bearing pressure; safe bearing capacity and settlement from plate load test - allowable settlements of structures - Settlement Analysis. **(9)**

UNIT IV: Earth Pressure and Stability of Slopes

Types of lateral earth pressure - Rankine's and Coulomb's earth pressure- Infinite and finite slopes - Factor of safety -Type of slope failure -Limit equilibrium method- Taylors stability number - Numericals˙ **(9)**

UNIT V: Introduction to Foundations and Bearing Capacity

Shallow Foundations; Types, Basic terms, SBC computation using IS and Terzaghi methods. Deep Foundations; Pile and Pile capacity, Numericals. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Student will Classify the type of soil.
2. Student will Analyze the compaction and consolidation behavior of different soils.
3. Student will calculte the shear strength of soil.
4. Student will Calculte earth pressure for different soils.
5. Student will Analyse different types deep foundations under different soil conditions.

Text Books

1. Arora K. R. Geotechnical Engineering: Soil Mechanics & Foundation Engineering. Standard Publications, 17^{th} Ed.

Reference Books

1. Soil Mechanics & Foundation Engineering, by Murthy V. N. S, 6^{th} Edition, Dhanpat Rai
2. Principles of Foundation Engineering, by Braja M. Das, 7^{th} Edition ,Cengage Learning
3. Relevant BIS, IRC codes and International code of practice

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE104 WATER RESOURCES ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course will focus on basic concepts of Surveying and Building Technology. The student will have the knowledge of fundamentals of surveying and can apply the general principles of building construction to practical examples of constructional work throughout some parts of simple domestic buildings.

Course Objectives

1. To introduce the basics/fundamentals of hydrological cycle, precipitation, runoff, evaporation and other losses,
2. To measure and predict runoff and flood
3. To analyse & design of gravity dams and earth dams,
4. To estimate reservoir capacity
5. To familiarize with canal irrigation system

UNIT I: HYDROLOGIC CYCLE, PRECIPITATION AND LOSSES

Introduction - hydrologic cycle-world water balance - applications in engineering,
Precipitation - forms of precipitation - characteristics of precipitation in India - measurement of precipitation - rain gauge network - mean precipitation over an area - depth-area-duration relationships - maximum intensity/depth-duration-frequency relationship - Probable Maximum Precipitation (PMP) - rainfall data in India.
Eaporation process - evaporimeters - evapotranspiration - measurement of evapotranspiration - evapotranspiration equations - potential evapotranspiration over India - actual evapotranspiration - interception - depression storage - infiltration - infiltration capacity - measurement of infiltration - modelling infiltration capacity - classification of infiltration capacities - infiltration indices. **(9)**

UNIT II: FLOODS

FLOOD ESTIMATION: Flood Estimation by Rational method - empirical method - Unit Hydrograph Method - Flood frequency studies: Gumbel's method - Log-Pearson Type III Distribution
FLOOD HYDRAULICS: Basic Equations - Flood Routing-Reservoir routing - Channel routing - Hydrologic Storage Routing - Attenuation - Hydrologic Channel Routing - Muskingum Method - Runge Kutta Method **(9)**

UNIT III: CANAL IRRIGATION SYSTEM

Canal Irrigation System - Canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular, and modular outlets. Lining of canals, types

of lining.
Canal Regulation Works: Canal falls: Necessity and location of falls - Types of falls - Classification of falls, Canal regulators, off-take alignment - head regulators and cross-regulators - regulator, outlets and escapes **(9)**

UNIT IV: RESERVOIR PLANNING:

Investigations for reservoir planning - selection of site for a reservoir - Zones of storage in a reservoir - Storage capacity, Catchment Yield and Reservoir Yield - Mass inflow curve and demand curve - Calculation of reservoir capacity for a specified yield from the mass inflow curve - Determination of safe yield from a reservoir of a given capacity - Sediment flow in streams: Reservoir Sedimentation - Life of reservoir. Reservoir sediment control, Reservoir Losses, Economic height of a dam. **(9)**

UNIT V: DAMS

GRAVITY DAMS: Introduction - Forces acting on a gravity dam - Combination of loading for design, Modes of failure, stability requirements - principal and shear stresses - Stability analysis, Elementary Profile of a Gravity dam - Practical profile of a gravity dam - Limiting height of a gravity dam- High and low gravity dams - Galleries - Stability analysis of non - overflow section of Gravity dam.
EARTH DAMS: Introduction - Types of earth dams - Causes of failure of earth dams - Criteria for safe design of earth dams - Section of an earth dam
SPILLWAYS: Types of Spillways - Types of Energy Dissipators. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Estimate the areal average precipitation over the basin using the knowledge of hydrological cycle.
2. Estimate flood using flood routing techniques.
3. Plan and design canal irrigation system.
4. Plan and fix reservoir capacity.
5. Analyse stability of gravity and earth dams

Text Books

1. S. K. Garg, Irrigation Engineering and Hydraulic Structures, Khanna Publishers
2. K Subramanya, Engineering Hydrology, Mc-Graw Hill.

Reference Books

1. K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc- Graw Hill.
2. G L Asawa, Irrigation Engineering, Wiley Eastern
3. L W Mays, Water Resources Engineering, Wiley.
4. J D Zimmerman, Irrigation, John Wiley & Sons

5. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE201 CIVIL ENGINEERING LABORATORY

L	T	P	C
0	0	4	2

Course Prerequisites: None

Course Description

This course covers the different laboratory/field experiments in the area of Civil Engineering.

Course Objectives

1. To understand the behaviour of materials under different types of loading
2. To represent field measurements into document form
3. To demonstrate tests in the laboratory to obtain different soil properties
4. To provide an opportunity to learn how to measure the parameters wich governs the quality of the materials
5. To make the students to learn the principles and procedures of testing Highway materials and to get hands on experience by conducting the tests and evolving inferences

LIST OF EXPERIMENTS

1. Axial deformation
2. Deflections of structural elements
3. Non-destructive tests on structural elements
4. Utility of Total Station
5. Experiments using planimeter
6. Grain size distribution by Sieve Analysis
7. Determination of field density by core-cutter
8. To determine the compressive strength of Concrete.
9. To determine the compressive strength of Cement
10. Impact test
11. Crushing test
12. Shape test
13. Specific gravity and water absorption
14. Fineness modulus of aggregates

Course Outcomes

The students after completing the course will be able to:

1. Examine the compressive strength of cement and concrete
2. Use modern instruments for different surveying purposes
3. Do various tests to apply in practical problems
4. Implement good quality construction techniques
5. Select the appropriate materials for use in different road layers

Text Books

1. Laboratory Manual for Civil Engineering Second Edition, HS Moondra, Rajiv Gupta, CBS PUBLISHERS AND DISTRIBUTORS PVT LTD
2. IS 13311-1 (1992): Method of Non-destructive testing of concrete, Part 1: Ultrasonic pulse velocity [CED 2: Cement and Concrete]
3. Surveying (Volume I), Dr. B.C. Punmia, Er. Ashok Kumar Jain, Dr. Arun Kumar Jain, Sixteenth Edition, Laxmi Publications (P) Ltd.

Mode of Evaluation: Continuous Internal Evaluation and End Semester Examination

20MDCE107 TRAFFIC AND ROAD SAFETY ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course intends to bring out a holistic understanding of concepts of traffic engineering and safety as deemed necessary for a multidisciplinary approach in transportation system.

Course Objectives

1. To have an overall knowledge of the traffic components and assess the traffic characteristics and related problems.
2. To develop a strong knowledge base of traffic planning and its management in any transportation area.
3. To provide knowledge of traffic control devices and its techniques in transportation interaction for the management of different modules of urban transportation system.
4. To improve the knowledge of factors and measures of accident involved to understand the transportation safety issues.
5. To bring out an understanding of concepts of Barrier-free design and planning as deemed necessary for a transportation system.

UNIT-I: Basics of Traffic Engineering:

Aim of traffic engineering; traffic stream components and characteristics - road user characteristics, vehicle characteristics; Basic Parameters of Traffic Volume; Speed and Density- Traffic Volume Studies, speed studies; Parking Studies and Parking characteristics. **(9)**

UNIT-II: Intelligent Transportation Systems:

Introduction to Intelligent Transportation Systems (ITS) - Definition of ITS and Identification of ITS Objectives, ITS applications, Benefits of ITS, ITS Data collection; Telecommunications in ITS; ITS functional areas; ITS user needs and services; case studies. **(9)**

UNIT-III: Traffic Control, Design and Regulation

Traffic control types and methods; Intersections; Traffic signs; road markings; traffic signals; traffic islands. **(9)**

UNIT-IV: Road Safety:

Road accidents - Causes, Scientific Investigations and Data Collection; Ensuring Traffic Safety in new design, reconstruction and operation; Road safety audit; Traffic management techniques. **(9)**

UNIT-V: Barrier Free Environment for Transportation Infrastructure:

Design Standards for Barrier Free Transport; Universal Design Theory; Barrier Free Public Transportation; Access Audit; Disability Models and Public Policies; Case studies **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Understand the basic concepts of traffic engineering in reference to their background
2. Determine the planning and management aspects of urban traffic systems.
3. Understand the different methods involved in traffic control, operations and management.
4. Understand the safety issues in transportation and evaluate the risks involved.
5. Improve their multidisciplinary understanding of the barrier-free concept in transportation for making an accessible environment for all.

Text Books

1. Khanna, S.K. & Justo E.G., Highway Engineering, Nem Chand & Bros., 2000
2. Kadiyali, L. R., Principles of Highway Engineering, Khanna Publishers, 2001
3. Khanna, S. K. & Arora. M. G., Airport Planning and Design, Nemchand & Bros.
4. ITS Hand Book 2000: Recommendations for World Road Association (PIARC) by Kan Paul Chen, John Miles.

Reference Books

1. Bednar, M. J., "Barrier Free Environments", Dowden, Hutchinson & Ross, Inc., Community Development Series, Volume 33, Pennsylvania.
2. Disability Standards for Accessible Public Transport, Australia.
3. Steinfeld, E. and Danford, G. (Eds.), "Enabling Environments - Measuring the Impact of environment on disability and rehabilitation"
4. Preiser, W.F.E., "Universal Design Handbook", Ostroff, E.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20MDCE108 BASIC ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

The course covers demand, quality and treatment of water along with characterization, water and wastewater treatment plant units and design , low cost treatment of wastewater and household drainage. Similarly, air pollution, noise pollution and solid waste management are also included. Further the course also covers basic laboratory

Course Objectives

1. To explain different sources of water, water quality standards, water demands, distribution of water, population forecast, characteristics of water.
2. To analyze various water treatment plant units and their design considerations, advanced water treatment systems.
3. To explain the generation and collection of wastewater; wastewater treatment plant design, various wastewater treatment units and sludge treatment.
4. To explain various impacts of air and noise pollution and various methods to control them air and noise pollution
5. To describe about solid waste generation, characterization, impacts and various management techniques

UNIT I: WATER SUPPLY ENGINEERING

Water- Sources of Water, Water quality standards, Quantity of water: water demands, percapita demand, design period, population forecast, fluctuation in demand. General requirement for water supply: Sources, Types of intakes, Pumping and distribution of water; Quality of water: Physical, chemical, and biological characteristics of water and significance, necessity of treatment, water quality standards for various water uses. **(9)**

UNIT II: WATER TREATMENT

Engineering system for water purification: Aeration, Screening, Coagulation and Flocculation, Sedimentation, Softening, Filtration, Disinfection; Methods of treatment: Removal of color, tastes and odor control, removal of iron and manganese, fluoridation and defluorination. Advanced water treatment: Ion exchange, electro-dialysis, RO (principles only. **(9)**

UNIT III: WASTEWATER TREATMENT

Generation and collection of wastewaters- sanitary, storm and combined sewerage systems, quantities of sanitary wastes and storm water, design of sewerage system. Engineered system for wastewater treatment: Primary treatment, Screening, Grit removal, Sedimentation, Sedimentation aided with coagulation. Secondary treatment: Basis of microbiology, Growth and food utilization, Suspended growth systems, Attached growth systems, Secondary clarification, Disinfections of effluents; Sludge treatment and disposal: Sludge characteristics, thickening, disposal. **(9)**

UNIT IV: AIR AND NOISE POLLUTION

Air - Composition and properties of air, urban air pollution, Air quality standards, Measures and major equipment for air pollution control, Noise - Basic concept, measurement, and various noise control methods. **(9)**

UNIT V: SOLID WASTE MANAGEMENT

Solid waste management-Municipal solid waste, Composition, and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment, and disposal of MSW. Effects of solid waste on environment: effects on air, soil, water surface and ground, health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle, Disposal methods. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Estimate water demand and population forecasting and characteristics of water
2. Estimate water generation and perform basic design of the unit operations that are used in water treatment plants.
3. Explain various wastewater generation sources and different units of wastewater treatment and sludge treatment techniques
4. Describe the impacts of air and noise pollution and review various air and noise pollution control methods
5. Discuss about the impacts of solid waste and various solid waste management techniques

Text Books

1. Environmenatal Engineering (Volume I & II) by S. K. Garg-Khanna Publishers.
2. Rao M and Rao H. V. N. Air Pollution, McGraw Hill Education, 2017.
3. Jagbir Singh and Ramanathan A. L., Solid Waste Management: Present and Future Challenges, I K International Publishing House Pvt. Ltd., 2009
4. Environmental Engineering by H. S. Peavy, D.R. Rowe and G. Tchobanoglous, MGH.

Reference Books

1. Birdie, G.S, Birdie, J.S., Water supply and sanitary Engineering, Including Environmental Engineering, Water and Air Pollution Laws and Ecology, Dhanpat Rai Publications, 1996.
2. Punmia, B.C, Ashok Kr Jain, Arun Kr Jain., Waste Water Engineering, Laxmi Publications, 1998.
3. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication
4. Metcalf & Eddy, Wastewater Engineering Treatment and Dispose, McGraw Hill Publication

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

Honors in Civil Engineering

20HDCE101 ADVANCED SURVEYING

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE102

Course Description

A Civil Engineer has to be conversant with all the measurement techniques to know the ground topography and he should be able to use the modern survey equipments and be able to use different software applications in surveying.

Course Objectives

Students should be able to use advance surveying equipment's and methods through this subject.

Unit - I

Tacheometric Surveying Introduction- purpose- principle- instruments- stadia constants- methods of tacheometry- anallatic lens- subtense bar- field work in tacheometry- reduction of readings-errors and precisions. Geodetic Surveying Principle and Classification of triangulation system-Selection of base line and stations- Orders of triangulation- Triangulation figures- Station marks and signals- marking signals- Extension of base- Reduction of Centre- Selection and marking of stations **(9)**

Unit - II

Theory of Errors Introduction -types of errors-definitions- laws of accidental errors- laws of weights- theory of least squares- rules for giving weights and distribution of errors to the field observations- determination of the most probable values of quantities. **(9)**

Unit - III

Field Astronomy Introduction- purposes- astronomical terms- determination of azimuth- latitude-longitude and time corrections to the observations. **(9)**

Unit - IV

Aerial photogrammetry Introduction- Principle- Uses- Aerial camera- Aerial photographs-Definitions- Scale of vertical and tilted photograph– Ground Co-ordinates- Displacements and errors- Ground control- Procedure of aerial survey- Photomaps and mosaics- Stereoscopes-Parallax bar. **(9)**

Unit - V

Modern Surveying Instruments Introduction- Electromagnetic spectrum- Electromagnetic distance measurement- Total station- Digital self-levelling levels- and scanners for topographical survey. **(9)**

Course Outcomes

The students after completing the course will be able to do:

1. Conduct tacheometry and geodetic survey.
2. Apply principles of theory of errors for correction of measurements.
3. Apply knowledge of astronomy for solving civil engineering problems.
4. Explain use of aerial camera- aerial photographs and procedure of aerial survey.
5. Utilize stereoscope and parallax bars.

Text Books

1. Surveying Vol. I, II and III by Dr. B.C. Punamia, Laxmi Publishers. New Delhi
2. Surveying and Levelling Vol. I and II by T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruh
3. Surveying Vol. I, II and III by Dr. K.R. Arora, Standard Book House. New Delhi
4. Surveying Vol. I and II by S. K. Duggal, Tata Mcgraw Hill, New Delhi
5. Surveying and Levelling by N.N. Basak, Tata Mcgraw Hill, New Delhi

Reference Books

1. Surveying and Levelling by R. Agor, Khanna Publishers, New Delhi
2. Advanced Surveying by R. Agor, Khanna Publishers, New Delhi
3. Fundamentals of Surveying by Roy, S.K., Prentice Hall India, New Delhi
4. Surveying and Leveling by Subramanian, R., Oxford University Press, New Delhi

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20HDCE102 ENVIRONMENTAL GEOTECHNIQUES

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20CE111, 20CE104

Course Description

Geotechnical aspects of waste and waste containment. Nature of soils, contaminants and contaminant transport processes in the subsurface. Saturated and unsaturated flow in soils and performance of natural and geosynthetic base barrier, drainage and cover systems. Mechanical aspects and stability of waste containment facilities. Analytical tools and their role in design of containment systems. Key design elements and case studies of municipal, mining and industrial wastes.

Course Objectives

1. Provide an understanding of the use of geotechnical concepts in the analysis and design of environmental systems.
2. Focus will be placed on the evaluation of waste containment facilities.
3. The course will also cover relevant aspects of remediation technologies of contaminated sites.
4. The course will cover demonstrating the selection, design and performance of various waste containment facilities.

UNIT 1

Fundamentals of Geoenviromental Engineering: Scope of Geoenviromental engineering Three phase soil system - role of soil in geoenvironmental applications - importance of soil physics, soil chemistry, hydrogeology, biological process - sources and type of ground contamination - impact of ground contamination on geoenvironment **(9)**

UNIT 2

Soil-Water-Contaminant Interaction: Soil mineralogy characterization and its significance in determining soil behaviour - soil-water interaction and concepts of double layer - forces of interaction between soil particles, factors effecting retention and transport of contaminants. **(9)**

UNIT 3

Waste Containment System: Different components of waste containment system and its stability issues - property evaluation for checking soil suitability for waste containment - design of waste containment facilities. **(9)**

UNIT 4

Contaminant Site Remediation: Site characterization - risk assessment of contaminated site - remediation methods for soil and groundwater - selection and planning of remediation methods - some examples of in-situ remediation. **(9)**

UNIT 5

Geomembranes for landfills and ponds: Geosynthetics clay liner, designing with GCL's, Filtration, Erosion control, slope protection. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Understand the regulatory framework related to safe containment of wastes.
2. Evaluate the soil contaminant interaction forces.
3. Quantify the mechanical and hydraulic properties needed to satisfy design criteria of projects involving clay barriers.
4. Select, justify the selection, and design base liner systems, final cover systems, and liquid collection systems for municipal and hazardous waste as well as mining disposal sites.
5. Evaluate the mechanical and hydraulic properties of soil, solid waste, and geosynthetics.

Text Books

1. David, D. E. and Koerner, R. M., Waste Containment Facilities, ASCE Press, Allied Pub. Pvt. Ltd., 2007
2. S.K.Gulhati and Manoj data, "Geotechnical Engineering", The Mc-Graw-Hill publications, 2006.

Reference Books

1. Mitchell, J. K., "Fundamentals of Soil Behavior" Wiley, 2005.
2. Koerner, R. M., Designing with Geosynthetics, Pearson Education Inc., 2005
3. Ramanatha Ayyar, T. S., Soil Engineering in Relation to Environment, LBS Centre for Science and Technology, Thiruvananthapuram, 2000.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20HDCE103 APPLIED HYDRAULICS

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101

Unit-I (Introduction)

Introduction, engineered and natural open channel flows, review of conservation laws, Definition of specific energy, specific energy diagrams, flows over variable bathymetry, flows through contractions and expansions

Unit-II (Uniform flow)

Uniform flow force balance, normal depth calculations, flows in composite channels, Uniform flow - efficient channel design, Hydraulic jumps, momentum and energy analyses, stilling basin design.

Unit-III (Non-Uniform flow)

Gradually varied flow, basic equation and profile classifications, Gradually varied flow, numerical methods, Unsteady flow, routing introduction, Unsteady flow, kinematic and dynamic methods

Unit-IV (Hydraulic Structures in Channels)

Hydraulic structures - weirs and flumes, Hydraulic structures - culverts (HY8 introduction / demo) Stream gaging techniques, shear stress estimates, Sediment motion - Turbulent boundary layers, Shields parameter, Sediment transport - bedload and suspended load

Unit-V (Flow Modelling)

No-Class (field demonstration of stream gaging), HEC-RAS and HEC-GEORAS Introduction / demo **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Differentiate the types of open channel flow.
2. Estimate and design the depth of flow in uniform composite open channels.
3. Apply the un-steady flow routing methods for open channels flow.
4. Design the culvert in an open channel.
5. Evaluate and estimate the rating curve and flow velocities in an open channel section.

Text Books

1. Open Channel Hydraulics, Terry Sturm (2005), McGraw Hill Publication

Reference Books

1. Open Channel Hydraulics, Ven Te Chow, McGraw Hill Publication
2. Hydraulics of Open channel flow, Hubert Chanson (2004), Elsevier

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20HDCE104 ADVANCED CONCRETE TECHNOLOGY

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20CE106

Course Description

This course covers ingredients of concrete and admixtures, properties of fresh concrete and hardened concrete, testing of hardened concrete and mix design. The course further covers special concretes used in construction industry.

Course Objectives

1. To explain properties of ingredients of concrete and procedures for testing concrete ingredients.
2. To recognizes the reasons for the use of Chemical and mineral admixtures.
3. To study the behavior of fresh and hardened concrete and also impart the methods of proportioning of concrete mixtures.
4. To make aware of factors affecting the durability of concrete.
5. To explains the characteristics of special concrete and its use.

UNIT-I : Concrete Material Properties:

Cement, grade of Cement, chemical composition, Hydration of Cement, Structure of hydrated Cement, Special Cement, properties and tests, Aggregates classification- Testing Aggregates, fibres, Water. **(9)**

UNIT-II :Admixtures

Chemical: Types and classification; actions and interactions; usage; effects on properties of concrete. Mineral : Flyash, ground granulated blast furnace slag, rice-husk ash and silica fume; chemical composition; physical characteristics; effects on properties of concrete; advantages and disadvantages. **(9)**

UNIT-III : Fresh and Hardened Concrete:

Rheological behaviour of fresh Concrete- Properties of fresh and hardened concrete- Strength, Elastic properties, Creep and Shrinkage, Maturity concept, Methods of Mix Design, Non Destructive Testing of Concrete. **(9)**

UNIT-IV : Durability of concrete:

Durability concept; factors affecting, reinforcement corrosion; fire resistance; frost damage; sulfate attack; alkali silica reaction; concrete in sea water, statistical quality control, acceptance criteria as per code. **(9)**

UNIT-V : Special Concretes:

Light weight Concrete, Fly-ash Concrete- Fibre reinforced Concrete, Polymer Concrete, Self Compacting concrete, Air entrained concrete, Polymer Concrete, Recycled aggregate concrete-properties and application. **(9)**

Course Outcomes

The students after completing the course will be able to do:

1. Identify properties and Quality Control tests on concrete ingredient as per IS cOde.
2. Determine the consequences of using admixtures in concrete.
3. Design the concrete mix and determine the properties of fresh and hardened of concrete.
4. Analyze the factors affecting the durability of concrete.
5. Update the knowledge on recent advances in special concretes.

Text Books

1. Neville, A.M., Properties of Concrete, Low priced Edition, 4th edition.
2. Shetty, M.S., Concrete Technology, S.Chand & Co, 2009.

Reference Books

1. Special Structural concretes by Rafat Siddique, Galgotia Publications 2000.
2. Design of Concrete Mixes by N.Krishna Raju, CBS Publications, 2000.
3. Concrete: Micro Structure by P.K.Mehta, ICI, Chennai.
4. Concrete Technology by A.R. Santha kumar, Oxford University Press Oct 2006.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20HDCE105 DESIGN OF HYDRAULIC STRUCTURES

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101, 20CE102, 20CE107, 20CE109, 20CE110

Course Description

Structures that are constructed for the purpose of the utilisation of water or to contai n the damages caused by water, occupy a position of special importance in human society. Although an introduction to this unique class of structure is available through the course on Water Resources Engineering, the present course plans to discuss each of these structures in detail, with ample worked examples. Special reference would be made, wherever possible, to relevant national and international standards and norms. The course would cover the design aspects of the hydraulic structures meant for storage, diversion, conveyance and distribution of water apart from structures for river flow modification and control. Preliminary design aspects of hydropower structures would also be included. Foundation considerations in the design of the structures would be discussed for each structure.

Course Objectives

1. To understand the design of various hydraulic structures
2. To determine the design flood for dams

UNIT I: STORAGE, DIVERSION, CONVEYANCE & DISTRIBUTION STRUCTURES

An Introduction- Reservoirs behind dams and pond area behind barrages: determination of capacities (influence of sedimentation) - Dead and Live storages - Design of storage structures: Gravity dam: Spillway and Non-overflow sections and their design - Concrete dam details: joints - water-seals - galleries and adits - instrumentation: purpose and techniques - sluices - Foundation treatment for concrete dams (curtain and consolidation grouting) - Other types of concrete dams (Arch, Buttress, Hollow, etc.) **(9)**

UNIT II: DAMS, SPILLWAYS, GATES

Design flood for dams (according to the size of dams and reservoir capacities) - PMF, SPF, Return Period - Backwater curve analysis for reservoirs - Typical sections of earth and rockfill dams (homogeneous / zoned) - Analysis and design of embankment dams - Types of gates for dams and barrages (radial and vertical lift types).
Types of spillways (adaptations for concrete and embankment dams) - Flow characteristics of gated/ungated spillways / breast-walled gates - Types of energy dissipators (Hydraulic Jump / Ski-Jump / Rollerbucket) - Influence of tail water rating curve on choice of energy Dissipater. **(9)**

UNIT III: DIVERSION STRUCTURES

Barrages and weirs on permeable foundations - Design consideration of barrages for surface and sub - surface flows (raft foundation on alluvial rivers) - Retrogression and flow concentration effects on barrage design - Design consideration of barrages (gravity design on boulder bed rivers)

- Sedimentation characteristics for barrage ponds and its influence by gate operation - management of sedimentation in barrage ponds - Barrage components: Glacis - Rigid apron - Flexible (concrete block) apron - End - sill arrangements for energy dissipation for weir and under - sluice sections of a barrage - Pier - Divide wall - Sheet Piles. **(9)**

UNIT IV: CANAL STRUCTURES

Head regulator - Cross regulator and Falls - Canal section design (unlined and lined) - in cutting and filling - Aqueducts - Superpassage - Syphon Aqueducts - Distribution structures for conveying water from canals to irrigation fields - Canal capacity determination from field water requirements - Guide bunds for flow control of rivers (for barrages and bridges)- its design features. **(9)**

UNIT V: HYDROPOWER

Principal components of a hydropower station: Intakes and Trash racks - Water conductor system - Tunnels - Surge tanks - Penstocks - Anchor blocks - Turbine foundation - Structures for prevention of riverbank and coastal erosion (considerations for toe scour - provision of filter to prevent subsidence). **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Identify hydraulic structures required to control and convey water
2. Compute the design flood for dams,
3. Design basic components of various hydraulic structures

Text Books

1. Hydraulic Structures, P. Novak, A. I. B. Moffat,, Nalluri .C and Narayanan .R,Taylor and Francis, U. K.
2. Garg S.K Irrigation and Hydraulic Structures, Khanna Publisher

Reference Books

1. Hydraulics of Spillways and Energy Dissipators, R. M. Khatsuria, Marcel Dekker Publishing, New York.
2. Manual on Barrages and Weirs on Permeable Foundation, Publication 179, (Volumes I and II), Central Board of Irrigation and Power, New Delhi.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20HDCE106 TRANSPORTATION INFRASTRUCTURE AND MANAGEMENT

L	T	P	C
3	**0**	**0**	**3**

Course Prerequisites: 20CE112

Course Description

The course is intended to provide an overview of infrastructure planning and management approaches for building an efficient transport system by bringing out a holistic understanding of safe, accessible and sustainable components.

Course Objectives

1. To study various parameters of traffic flow and its concepts in urban contexts.
2. To know the economics of transport system and application of a range of techniques.
3. To study social, economic and environmental implications of various modes of transportation.
4. To provide knowledge of barrier-free design and planning as deemed necessary for a transportation system.
5. To improve the knowledge of transportation safety issues.

UNIT I: TRAFFIC ENGINEERING

Traffic characteristics-various traffic studies and their applications, Basic Parameters of Traffic Volume, Speed and Density; Parking Studies and Parking characteristics; Traffic control devices- Traffic signs- markings- traffic signals and traffic islands; Principles of highway lighting; Design of Traffic Signals. **(9)**

UNIT II: TRANSPORT ECONOMICS

Dynamics of Transport Market; Transport costing; Pricing policy; Cost/Benefit Analysis and Passenger Transport Subsidies; Road Investment; Competition, Regulation and Integration in Public Transport. **(9)**

UNIT-III: MULTIMODEL TRANSPORT INTEGRATION

Contemporary issues in transportation; Transportation, landuse and urban form; Travel pattern and Behaviour; Multimodal planning concepts and process; Transit and landuse; Freight and goods movement; Motorised and Non-motorised transportation. **(9)**

UNIT-IV: BARRIER-FREE TRANSPORTATION

Introduction to Transport Accessibility; Elements of road infrastructure - Pedestrian, cycle, junctions, vehicle lane, etc.; Design Standards and public policies for Barrier Free Transport; Universal Design Theory; Barrier Free Public Transportation; Access Audit for Barrier-free transport environment; Introduction to Intelligent Transportation Systems (ITS). **(9)**

UNIT-V: TRANSPORTATION SAFETY

Road and Transport Safety - factors for improving safety on roads, causes of accidents due to drivers and pedestrians, preventive maintenance- Vehicle act ; Vehicle and driver safety - Driver safety programme, driver's responsibility, accident reporting and investigation procedures; Transportation of Hazardous Goods - driver training-parking of tankers on the highways speed of the vehicle , warning symbols, inspection and maintenance of vehicles-check list - decanting procedures; Transportation and construction safety - Transport precautions, safety on manual mechanical handling equipment operations, safe driving, movement of cranes conveyors etc. **(9)**

Course Outcomes

The students after completing the course will be able to:

1. Determine the planning and management aspects of various transportation systems.
2. Identify and analyse various aspects of economics involved in transportation.
3. Understand the role of multimodal integration in the improvement of level of transportation services.
4. Identify the accessibility requirements for transport infrastructure to improve the quality of mobility and to create barrier-free environment for all.
5. Understand the safety issues in transportation and evaluate the risks involved.

Text and Reference Books

1. Khanna, S.K. & Justo E.G., Highway Engineering, Nem Chand & Bros., 2000
2. Kadiyali, L. R., Principles of Highway Engineering, Khanna Publishers, 2001
3. Bednar, M. J., "Barrier Free Environments", Dowden, Hutchinson & Ross, Inc., Community Development Series, Volume 33, Pennsylvania.
4. Cole, S. "Applied Transport Economics", Kogan page Limited., 1987.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20HDCE107 PROJECT PLANNING AND IMPLEMENTATION

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

A Civil Engineer has to be able to manage the modern construction project and he/she should be able to use different construction methods and techniques.

Course Objectives

To study and understand the concept of planning, scheduling, cost and quality control, safety during construction, organization and use of project information necessary for construction project.

UNIT I CONSTRUCTION PLANNING

Basic Concepts in the Development of Construction Plans - Choice of Technology and Construction Method - Defining Work Tasks - Defining Precedence Relationships among Activities - Estimating Activity Durations - Estimating Resource Requirements for Work Activities - Coding Systems. **(9)**

UNIT II SCHEDULING PROCEDURES AND TECHNIQUES

Construction Schedules - Critical Path Method - Scheduling Calculations - Float - Presenting Project Schedules - Scheduling for Activity-on-Node and with Leads, Lags, and Windows Scheduling with Resource Constraints and Precedences - Use of Advanced Scheduling Techniques - Scheduling with Uncertain Durations - Calculations for Monte Carlo Schedule Simulation - Crashing and Time/Cost Tradeoffs - Improving the Scheduling Process. **(9)**

UNIT III COST CONTROL, MONITORING AND ACCOUNTING

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. **(9)**

UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION

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 with Sampling by Variables - Safety. **(9)**

UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION

Types of Project Information - Accuracy and Use of Information - Computerized Organization and Use of Information - Organizing Information in Databases - Relational Model of Databases - Other Conceptual Models of Databases - Centralized Database Management Systems - Databases and Applications Programs - Information Transfer and Flow. **(9)**

Course Outcomes

The students after completing the course will be able to do:

1. The development of construction planning
2. The development of scheduling procedures and techniques
3. The cost control, monitoring and accounting
4. The quality control and safety during construction
5. The organization and use of project information

Text Books

1. Calin M. Popescu, Chotchai Charoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.
2. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", McGraw-Hill Publishing Company, New Delhi, 1998.

Reference Books

1. Chris Hendrickson and Tung Au, "Project Management for Construction - Fundamental Concepts for Owners, Engineers", Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Halpin, D. W., "Financial and Cost Concepts for Construction Management", John Wiley & Sons, New York, 1985.
3. Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20HDCE108 BASIC STRUCTURAL DYNAMICS

L	T	P	C
3	0	0	3

Course Prerequisites: 20CE101

Course Objectives

1. To acquaint with basic principles relating to Dynamics of structures under both damped and undamped condition.
2. To understand Impact of degree of freedom on vibration of structures
3. To make students learn about mathematical treatment of dynamics of structural Problems both single degree and multi degree of freedom system.
4. To train students in dealing with behaviour of structure subjected vibration and dynamic forces.

UNIT I

INTRODUCTION
Basic concepts of structural dynamics: degree of freedom system - force displacement relationship damping force - equation of motion - mass-spring-damper system - methods of Solution of differential equation.

UNIT II

SINGLE DEGREE OF FREEDOM SYSTEM- FREE VIBRATION
Solution to single degree of freedom systems subjected to free vibrations - undamped and damped,logarithmic decrement and numerical problems.

UNIT III

SINGLE DEGREE OF FREEDOM SYSTEM-FORCED VIBRATION
Solution to single degree of freedom systems subjected to forced vibrations - undamped and damped,resonance, dynamic load factor, half power band width, transmissibility ratio, response to impulsive loading, Duhamel's Integral.

UNIT IV

MULTI DEGREE OF FREEDOM SYSTEM
Equation of motion and solution to MDOF system subjected to free vibration, Eigen value and Eigen vectors, Mode shapes, Normalization of modes, response of MDOF systems subjected to forced vibration.

UNIT V

DYANMICS OF CONTINUOUS SYSTEM
Approximate methods of analysis,Flexural vibrations of beams- Elementary case-Equation of motion -Analysis of undamped free shapes of simple beams with different end conditions-principles of application to continuous beams.

Course Outcomes

After the completion of the course the students will be able to

1. Identify different types of degree of freedom system conditions and other dynamic parameter.
2. Study the response of Free vibrations on undamped and damped SDOF system.
3. Compute impact of Forced vibrations on undamped and damped SDOF system.
4. Evaluate dynamic response of MDOF system by Modal analysis.
5. Interpret the behaviour of continuous system of structures subjected to different loading conditions.

Text Books

1. A.K.Chopra, "Structural Dynamics for Earthquake Engineering",Prentice Hall,1994
2. S.R Damodarasamy & S.Kavitha,"Basics of Structural Dynamics and a Seismic Design", PHI Pvt. Ltd., 2009

Reference Books

1. Clough & Penziem, Dynamics of structures, Mc Graw Hill Publications
2. Mario Paz, Structural dynamics, CBS Publications.
3. I.S:1893(latest) "code of practice for earthquakes resistant design of structures"

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20HDCE109 REPAIR AND REHABILITATION OF STRUCTURES

L	T	P	C
3	0	0	3

Course Prerequisites: None

Course Description

This course covers various deterioration mechanisms or damage mechanisms in structures, scientific aspects and its use while practicing repair works at site, selecting measurable parameters that are useful in deciding the further repair and maintenance practices.

Course Objectives

1. To understand the importance of performance of construction materials and its components
2. To provide a comprehensive knowledge on the diagnosis the damage, condition assessment of structures.
3. To learn various repair techniques of damaged structures, corroded structures
4. To study the various types and properties of repair materials
5. To learn the importance and methods of strengthening of structures.

UNIT I : Construction Materials

Performance of construction materials and components in services for strength, permeability, thermal properties and cracking effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, Effects of cover thickness **(9)**

UNIT II : Maintenance and Diagnosis

Maintenance, Repair and rehabilitation, Facets of Maintenance, Importance of Maintenance, Preventive measures based on various aspects of inspection- Condition assessment and rating procedure for evaluating a damaged structure. Diagnosis of construction failures. **(9)**

UNIT III : Corrosion Damages and Protection

Corrosion damage of reinforced concrete, methods of corrosion protection, Corrosion inhibitors, corrosion resistant steels, coatings, cathodic protection, rust eliminators. Causes of deterioration of concrete, steel, masonry and timber structures, surface deterioration, efflorescence, causes, prevention and protection. **(9)**

UNIT IV : Materials and Techniques

Special concrete and mortar, concrete chemicals, expansive cement, polymer concrete sulphur infiltrated concrete, Ferro cement, fiber reinforced concrete. Methods of repair in concrete, steel and masonry structures. Gunite and shotcrete, epoxy injection. **(9)**

UNIT V: Strengthening and Demolition

Strengthening of existing structures - repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering, wear, fire, leakage, marine exposure, coatings for set concrete and steel reinforcement. Demolition techniques of structures -
Case Study-1: Repair/Rehabilitation of Jetty at Mumbai, India,
Case Study-2: Rehabilitation of RCC Overhead Reservoir at Siliguri, WB, India,
Case Study-3: A Double Storied Load Bearing Residential Building at Mumbai, India **(9)**

Course Outcomes

The students after completing the course will be able to do:

1. Recognize the performance of construction materials and components.
2. Diagnosis the damage of distress structures.
3. Investigate the condition assessment of structures against corrosion damage.
4. Select the proper repair materials and its application.
5. Select the method to strengthen the distressed structures.

Text Books

1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991
2. Allen .R.T, and Edwards .S.C, Shaw D.N, "Repair of Concrete Structures",Chapman and Hall, 2005.

Reference

1. `https://www.academia.edu/25940789/REPAIR_REHABILITATION_and_RETROFITTING_OF_RCC_FOR_SUSTAINABLE_DEVELOPMENT`
2. Raiker .R.N, "Learning from Failures, Deficiencies in Design, Construction and Service", R&D Centre (SDCPL), Raikar Bhavan, Bombay 1987.
3. "Repair & Rehabilitation", Compilation from The Indian Concrete Journal,- ACC - RCD Publication 2001.
4. VK Raina, Concrete Bridge Practice Construction, Maintenance and Rehabilitation, 2nd Edition, Shroff Publishers and Distributors, August, 2010.
5. WH Ransom, Building Failures, Diagnosis and Avoidance, 2nd Edition, E and F.N. Spon Publishers, December 1987.

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination

20HDCE601 NUMERICAL ANALYSIS USING PYTHON

L	T	P	C
1	0	2	2

Course Prerequisites: None

UNIT I

Finding the roots of Non-Linear Equations
Experiments:

1. Find the Roots of Non-Linear Equation Using Bisection Method.
2. Find the Roots of Non-Linear Equation Using Newton's Method.

UNIT II

Curve Fitting
Experiments:

1. Curve Fitting by Least Square Approximations.

UNIT III:

Solve the System of Linear Equations
Experiments:

1. Solve the System of Linear Equations Using Gauss - Elimination Method.
2. Solve the System of Linear Equations Using Gauss - Seidel Iteration Method.
3. Solve the System of Linear Equations Using Gauss - Jordan Method.

UNIT IV:

Numerical Integration
Experiments:

1. Integrate numerically using Trapezoidal Rule.
2. Integrate numerically using Simpson's Rules.

UNIT V:

Numerical Solution of Ordinary Differential Equations
Experiments:

1. Numerical Solution of Ordinary Differential Equations by Euler's Method.
2. Numerical Solution of Ordinary Differential Equations by Runge - Kutta Method.

Course Outcomes

After completion of the course the student will be able to

1. Find Roots of non-linear equations
2. Do curve fitting by least square approximations
3. Solve the system of Linear Equations
4. Integrate Numerically
5. Find Numerical Solution of Ordinary Differential Equations

Text Books

1. M. K. Jain, S. R. K. Iyenger, R. K. Jain, Numerical Analysis (Problems and Solutions, New Age International)
2. B.S. Grewal, Numerical Methods in Engineering & Science, Khanna Publishers

Reference

1. Python Programming And Numerical Methods: A Guide For Engineers And Scientists. Link: `https://pythonnumericalmethods.berkeley.edu/notebooks/Index.html`
2. Dimitrios Mitsotakis, Computational Mathematics An introduction to Numerical Analysis and Scientific Computing with Python, 1st Ed. Chapman & Hall. June 2023
3. Richard L. Burden, J. Douglas Faires, Numerical Analysis, 9th Ed. Brooks/Cole, Cengage Learning
4. James V Lambers, Amber C Sumner Mooney, Explorations In Numerical Analysis: Python Edition. World Scientific, 2021

Mode of Evaluation: Assignments, Mid Term Tests, End Semester Examination