Curriculum and Syllabi

B.E. CIVIL ENGINEERING

Semesters I to VIII

Regulations 2019

Department of Civil Engineering

Vision

To develop Competent Civil Engineers to meet the infrastructure challenges of India and the world.

Mission

- To become one of the reputed departments offering Civil Engineering Program in the country.
- To produce excellent engineers to cope up with the changes through dynamic, innovative   and flexible curriculum.
- To provide a conducive environment for teaching & learning and to develop leaders with effective communication skills.
- To conduct quality research driven by industry & societal needs and provide affordable engineering solutions.

Programme: B.E – Civil Engineering

Programme Educational Objectives (PEOs) - Regulation 2019

B.E Civil Engineering graduates will:

PEO.1 Graduates who effectively demonstrate engineering knowledge, problem solving skill, design capabilities and entrepreneurial skills by providing practical solutions.

PEO.2 Graduates who effectively demonstrate professionalism in multi-disciplinary engineering environment, leadership quality, teamwork and engage in life-long learning.

PEO.3 Graduates who demonstrate an ethical commitment to the community and the profession through involvement with professional societies.

PEO.4 Graduates who make contributions to knowledge and establish best engineering practice through research and development.

Programme outcomes (Pos) – Regulations 2019

PO.1 **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.

PO.2 **Problem Analysis**: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO.3 **Design/development of solutions:** Design solutions for complex 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

PO.4 **Conduct investigations of complex problems:** 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.

PO.5 **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
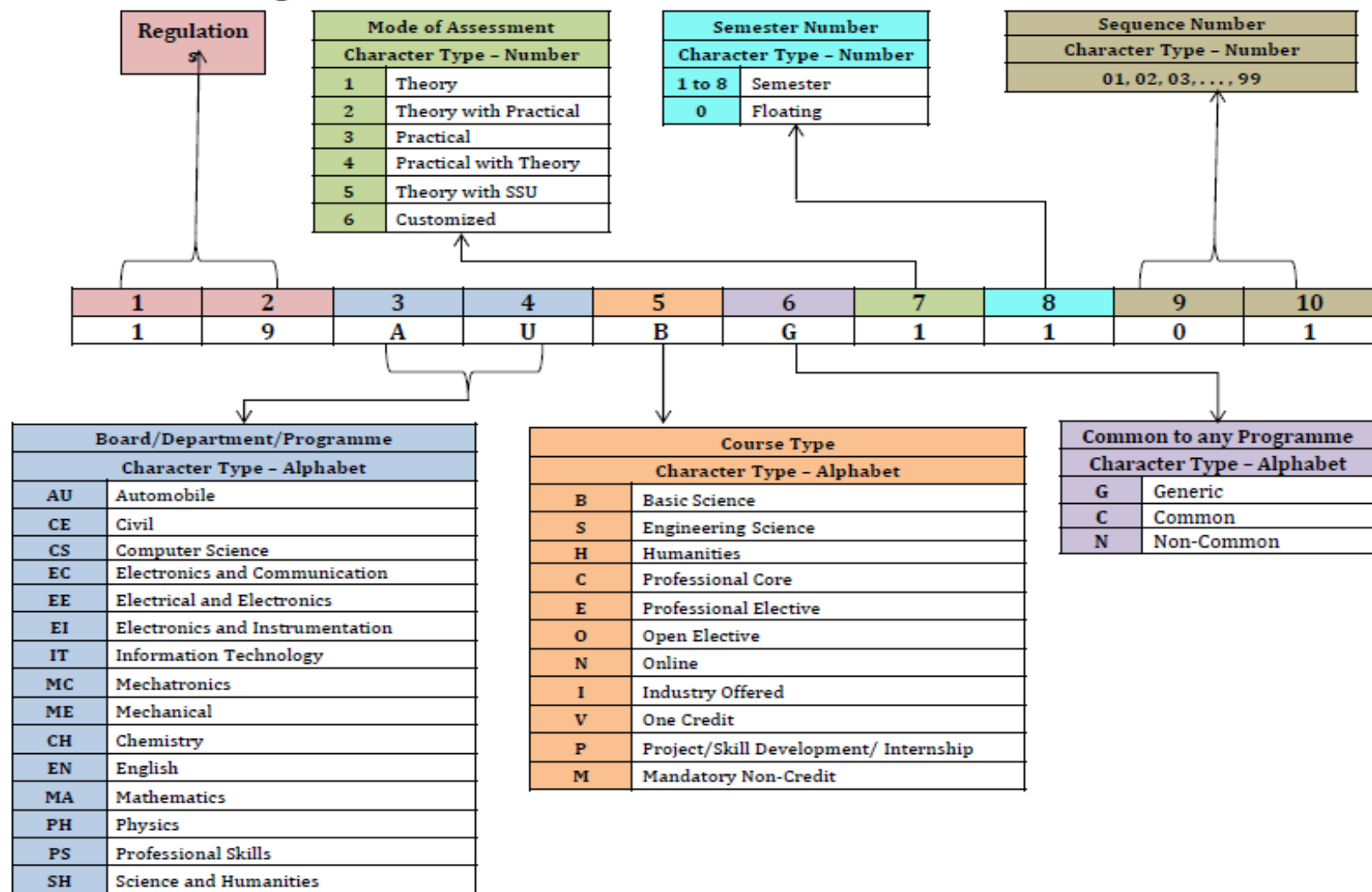
PO.6 **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO.7 **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

PO.8 **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO.9 **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO.10 **Communication:** Communicate effectively on complex 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.

PO.11 **Project management and finance:** 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 projects and in multidisciplinary environments.

PO.12 **Life-long learning**: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO.1 **Problem Analysis:** Able to arrive solutions to real time problems related to various domains of civil engineering through problem solving skills

PSO2. **Design and Management:** Able to design systems, components and processes considering safety, quality and cost consideration and able to prepare project documents, engineering drawings and construction schedules.

Dr. Mahalingam College of Technology, Pollachi
2019 Regulations - Course Code Generation Procedure for UG Courses(v1)

Regulation

Mode of Assessment	
Character Type – Number	
1	Theory
2	Theory with Practical
3	Practical
4	Practical with Theory
5	Theory with SSU
6	Customized

Semester Number	
Character Type – Number	
1 to 8	Semester
0	Floating

Sequence Number
Character Type – Number
01, 02, 03, . . . , 99

1	2	3	4	5	6	7	8	9	10
1	9	A	U	B	G	1	1	0	1

Board/Department/Programme	
Character Type – Alphabet	
AU	Automobile
CE	Civil
CS	Computer Science
EC	Electronics and Communication
EE	Electrical and Electronics
EI	Electronics and Instrumentation
IT	Information Technology
MC	Mechatronics
ME	Mechanical
CH	Chemistry
EN	English
MA	Mathematics
PH	Physics
PS	Professional Skills
SH	Science and Humanities

Course Type	
Character Type – Alphabet	
B	Basic Science
S	Engineering Science
H	Humanities
C	Professional Core
E	Professional Elective
O	Open Elective
N	Online
I	Industry Offered
V	One Credit
P	Project/Skill Development/ Internship
M	Mandatory Non-Credit

Common to any Programme	
Character Type – Alphabet	
G	Generic
C	Common
N	Non-Common

![MCET Logo]

Dr. MAHALINGAM
COLLEGE OF ENGINEERING AND TECHNOLOGY
Affiliated to Anna University, Chennai; Approved by AICTE ; Accredited by NAAC with Grade 'A++'
Accredited by NBA - Tier1 (Mech, Auto, Civil, EEE, ECE, E&I and CSE)
Udumalai Road, Pollachi - 642 003. Tel: 04259-236030/40/50 Fax: 04259-236070 www.mcet.in

Programme: B.E Civil Engineering
2019 Regulations
Curriculum for Semesters I to II

Course Code	Course Title	Duration	Credits	Marks
19SHMG6101	Induction Program	3 Weeks	-	100

Semester I (2019 Batch)

Course Code	Course Title	Hours/Week L	T	P	Credits	Marks	Common to Programmes
19ENHG2101	Communication Skills – I	2	0	2	3	100	All
19MABC1101	Matrices and Calculus	3	1	0	4	100	AU, CE, EC, EI, EE, MC, ME
19PHBN2101	Physics for Civil Engineering	3	0	2	4	100	-
19EESN2101	Basics of Electrical and Mechanical Engineering	3	0	2	4	100	-
19CESN3101	Engineering Drawing for Civil Engineering	0	0	4	2	100	-
19PSHG3001	Wellness for Students	0	0	2	1	100	All
	TOTAL	**11**	**1**	**12**	**18**	**600**	

Semester II (2019 Batch)

Course Code	Course Title	Hours/Week L	T	P	Credits	Marks	Common to Programmes
19ENHG2201	Communication Skills – II	2	0	2	3	100	All
19MABC1201	Ordinary Differential Equations and Complex Variables	3	1	0	4	100	AU, CE, EC, EI, EE, MC, ME, PR
19CHBN2201	Chemistry for Civil Engineering	3	0	2	4	100	-
19CESN1201	Engineering Mechanics	3	1	0	4	100	-
19CSSC2001	C Programming	3	0	2	4	100	AU, CE, EC, EI, EE, MC, ME, PR
19CECN3201	Computer Aided Building Drawing Laboratory	0	0	4	2	100	-
19PSHG3002	Personal Effectiveness	0	0	2	1	100	All
19CHMG6201	Environmental Sciences	1	0	0	-	-	All
	TOTAL	**15**	**2**	**12**	**22**	**700**	

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MCET
COLLEGE OF ENGINEERING AND TECHNOLOGY
Enlightening Technical Minds   Estd. 1998
An Autonomous Institution
(Since 2011)

Programme: B.E CIVIL ENGINEERING
2019 Regulations
Curriculum for Semesters I to VIII

Course Code	Course Title	Duration	Credits	Marks
19SHMG6101	Induction Program	3 Weeks	-	100

SEMESTER I (2020 Batch onwards)

Course Code	Course Title	Hours/Week L	T	P	Credits	Marks	Common to Programmes
19ENHG2101	Communication Skills – I	2	0	2	3	100	All
19MABC1101	Matrices and Calculus	3	1	0	4	100	AU, CE, EC, EI, EE, MC, ME
19PHBN2101	Physics for Civil Engineering	3	0	2	4	100	-
19EESN2101	Basics of Electrical and Mechanical Engineering	3	0	2	4	100	-
19CESN3101	Engineering Drawing for Civil Engineering	0	0	4	2	100	-
19PSHG6001	Wellness for Students*	0	0	2	-	-	All
	TOTAL	**11**	**1**	**12**	**17**	**500**	

SEMESTER II (2020 Batch onwards)

Course Code	Course Title	Hours/Week L	T	P	Credits	Marks	Common to Programmes
19ENHG2201	Communication Skills – II	2	0	2	3	100	All
19MABC1201	Ordinary Differential Equations and Complex Variables	3	1	0	4	100	AU, CE, EC, EI, EE, MC, ME, PR
19CHBN2201	Chemistry for Civil Engineering	3	0	2	4	100	-
19CESN1201	Engineering Mechanics	3	1	0	4	100	-
19CSSC2001	C Programming	3	0	2	4	100	AU, CE, EC, EI, EE, MC, ME, PR
19CECN3201	Computer Aided Building Drawing Laboratory	0	0	4	2	100	-
19PSHG6001	Wellness for Students*	0	0	2	1	100	All
19CHMG6201	Environmental Sciences	1	0	0	-	-	All
	TOTAL	**15**	**2**	**12**	**22**	**700**	

*Annual Pattern

SEMESTER III (2019 Batch onwards)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABN1301	Transforms and Partial Differential Equations	3	1	0	4	100	All
19CECN1301	Construction Materials and Practices	3	0	0	3	100	-
19CECN1302	Transportation Engineering	3	0	0	3	100	-
19CECN1303	Surveying	4	0	0	4	100	-
19CESN1301	Solid Mechanics	3	1	0	4	100	-
19CECN3301	Surveying Practice Laboratory	0	0	3	1.5	100	-
19CECN3302	Materials Laboratory	0	0	3	1.5	100	-
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
TOTAL		**16**	**2**	**8**	**22**	**800**	

SEMESTER IV (2019 Batch onwards)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19MABG1401	Probability and Statistics	3	1	0	4	100	All
19CECN1401	Hydraulics Engineering	3	1	0	4	100	-
19CECN1402	Concrete Technology	3	0	0	3	100	-
19CECN1403	Structural Analysis	3	1	0	4	100	-
19CECN3401	Hydraulics Engineering Laboratory	0	0	3	1.5	100	-
19CECN3402	Concrete and Transportation Engineering Laboratory	0	0	3	1.5	100	-
19PSHG6002	Universal Human Values 2: Understanding Harmony	2	1	0	3	100	All
XXXXXXXXXX	One Credit Course	0	0	2	1	100	-
19CEPN6401	Mini – Project	0	0	4	2	100	-
TOTAL		**14**	**4**	**12**	**24**	**900**	

Course Code	Course Title	Hours/Week	Credits	Marks
XXXXXXXXXX	Internship or Skill Development*	2 weeks	1	100

*Refer to clause:4.8 in UG academic regulations 2019

SEMESTER V (2019 Batch onwards)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19CESN1501	Geology and Soil Mechanics	3	1	0	4	100	-
19CECN1502	Design of RC Structures	3	1	0	4	100	-
19CECN1503	Environmental Engineering	4	0	0	4	100	-
XXXXXXXXX	Professional Elective – I	3	0	0	3	100	-
XXXXXXXXX	Professional Elective – II	3	0	0	3	100	-
XXXXXXXXX	Open Elective – I	3	0	0	3	100	-
19CECN3501	Soil Mechanics Laboratory	0	0	3	1.5	100	-
19CECN3502	Environmental Engineering Laboratory	0	0	3	1.5	100	-
19PSHG6501	Employability Skills 1: Teamness and Interpersonal Skills	0	0	2	1	100	All
TOTAL		**19**	**2**	**8**	**25**	**900**	

SEMESTER VI (2019 Batch onwards)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19CECN1601	Foundation Engineering	3	1	0	4	100	-
19CECN1602	Design of Steel Structures	3	1	0	4	100	-
19CEEN10XX	Professional Elective – III	3	0	0	3	100	-
XXXXXXXXX	Professional Elective – IV	3	0	0	3	100	-
XXXXXXXXX	Open Elective – II	3	0	0	3	100	-
19CECN3601	Building Drawing Laboratory	0	0	3	1.5	100	-
19CECN3602	Computer Aided Design and Drafting Laboratory	0	0	3	1.5	100	-
19PSHG6601	Employability Skills 2: Campus to Corporate	0	0	2	1	100	All
19CEPN6601	Innovative and Creative Project	0	0	4	2	100	-
TOTAL		**15**	**2**	**12**	**23**	**900**	

Course Code	Course Title	Hours/Week	Credits	Marks
XXXXXXXXX	Internship or Skill Development*	2 - 4 weeks	1	100

*Refer to clause: 4.8 in UG academic regulations 2019

SEMESTER VII (2019 Batch onwards)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19CECN1701	Water Resources and Irrigation Engineering	4	0	0	4	100	-
19CECN1702	Construction Project Management	4	0	0	4	100	-
XXXXXXXXX	Professional Elective – V	3	0	0	3	100	-
XXXXXXXXX	Professional Elective – VI	3	0	0	3	100	-
XXXXXXXXX	Open Elective – III	3	0	0	3	100	-
19CECN3701	Quantity Surveying and Estimation Laboratory	0	0	4	2	100	-
TOTAL		**17**	**0**	**4**	**19**	**600**	

SEMESTER VIII (2019 Batch onwards)

Course Code	Course Title	Hours/Week			Credits	Marks	Common to Programmes
		L	T	P			
19CEPN6801	Project	0	0	16	8	200	-
TOTAL		**0**	**0**	**16**	**8**	**200**	

Course Code	Course Title	Hours/Week	Credits	Marks
XXXXXXXXX	Internship or Skill Development*	8 - 16 weeks	4	100

*Refer to clause: 4.8 in UG academic regulations 2019

Total Credits (2019 Batch only): 166

Total Credits (2020 Batch onwards): 166

Professional Electives for Semester V to VII (2019 Batch onwards)

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
19CEEN1001	Advanced Construction Techniques	3	0	0	3	100
19CEEN1002	Advanced Concrete Structures	3	0	0	3	100
19CEEN1003	Air Pollution Management	3	0	0	3	100
19CEEN1004	Building Services	3	0	0	3	100
19CEEN1005	Electronic Surveying	3	0	0	3	100
19CEEN1006	Ground Improvement Techniques	3	0	0	3	100
19CEEN1007	Industrial Waste Management	3	0	0	3	100
19CEEN1008	Maintenance and Rehabilitation of Structures	3	0	0	3	100
19CEEN1009	Municipal Solid Waste Management	3	0	0	3	100
19CEEN1010	Numerical Methods	3	0	0	3	100
19CEEN1011	Prefabricated Structures	3	0	0	3	100
19CEEN1012	Prestressed Concrete Structures	3	0	0	3	100
19CEEN1013	Principles of Management	3	0	0	3	100
19CEEN1014	Basics of Python Programming	3	0	0	3	100
19CEEN1015	Quality Control and Assurance	3	0	0	3	100
19CEEN1016	Railways, Airports and Harbour Engineering	3	0	0	3	100
19CEEN1017	Remote Sensing and GIS	3	0	0	3	100
19CEEN1018	Safety in Construction	3	0	0	3	100
19CEEN1019	Seismic Design of Structures	3	0	0	3	100
19CEEN1020	Smart Materials and Structures	3	0	0	3	100
19CEEN1021	Architecture and Town Planning	3	0	0	3	100
19CEEN1022	3D Concrete Printing	3	0	0	3	100
19CEEN1023	Hydrology	3	0	0	3	100

OPEN ELECTIVES
(Offered to other Programmes)

Course Code	Course Title	Hours/Week			Credits	Marks
		L	**T**	**P**		
19CEOC1001	Environmental Impact Assessment	3	0	0	3	100
19CEOC1002	Safety Engineering	3	0	0	3	100
19CEOC1003	Geographical Information System	3	0	0	3	100
19CEOC1004	Applied Design thinking concepts	3	0	0	3	100
19CEOC1005	Startup Fundamentals for Engineers	3	0	0	3	100

LIST OF SKILL DEVELOPMENT COURSES
(Offered during IV, VI and VIII Semester)

Course Code	Course Title	Hours/Week			Credits	Marks
		L	T	P		
19CEPN6011	Introduction to Interior Design Sketch-up Tool	2	0	0	1	100
19CEPN6012	Introduction to ANSYS	2	0	0	1	100
19CEPN6013	Welding Technology	1	0	1	1	100
19CEPN6014	Fire and Safety Engineering	2	0	0	1	100

Regulations 2019

Detailed Syllabi for

Semesters I to VIII

Course Code: 19SHMG6101	Course Title: Induction Program (common to all B.E/B.Tech programmes)
Course Category: Mandatory Non-Credit Course	Course Level: Introductory
Duration: 3 Weeks	Max. Marks:100

Pre-requisites

➢ Nil

Course Objectives

The course is intended to:

1. Explain various sources available to meet the needs of self, such as personal items and learning resources.
2. Explain various career opportunities, opportunity for growth of self and avenues available in the campus.
3. Explain the opportunity available for professional development.
4. Build universal human values and bonding amongst all the inmates of the campus and society.

List of Activities:

1. History of Institution and Management: Overview on NIA Education Institutions-Growth of MCET – Examination Process-OBE Practices – Code of Conduct – Centre of Excellence
2. Lectures by Eminent People, Motivational Talk – Alumni, Employer
3. Familiarization to Dept./Branch: HoD Interaction – Senior Interaction – Department Association
4. Universal Human Value Modules: Module 1, Module 2, Module 3 and Module 4
5. Orientation on "Professional Skill Courses"
6. Proficiency Modules – Mathematics, English, Physics and Chemistry
7. Introduction to various Chapters, Cell, Clubs and its events
8. Creative Arts: Painting, Music and Dance
9. Physical Activity: Games and Sports, Yoga and Gardening
10. Group Visits: Visit to Local areas and Campus Tour

Course Outcomes	Cognitive
At the end of this course, students will be able to:	Level
CO1: Explain various sources available to meet the needs of self, such as personal items and learning resources through visit to local areas and campus	Understand
CO2: Explain various career opportunities and avenues available in the campus through orientation sessions	Understand
CO3: Explain the opportunity available for professional development through professional skills, curricular, co–curricular and extracurricular activities	Understand
CO4: Build universal human values and bonding amongst all the inmates of the campus and society for having a better life	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO2	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO3	1	-	-	-	-	-	-	2	1	2	-	-	-	-
CO4	2	-	-	-	-	-	-	2	1	2	-	-	-	-

High–3; Medium–2; Low–1

Assessment Pattern

Component	Marks	Details
Attendance	10	Minimum 80% and 1 mark for every 2% observed
Knowledge Test	40	Objective type questions
Work plan for future	50	Career plan developed consulting mentor
Total	**100**	

Non–letter Grades

Marks Scored	Performance Level
70 & above	Good
30 – 69	Average
< 30	Fair

Course Code: 19ENHG2101	Course Title: COMMUNICATION SKILLS – I (Common to all B.E/B.Tech Programmes)		
Course Category: Humanities	Course Level: Introductory		
L:T:P (Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max Marks:100

Pre–requisites

> ➢ The student should have undergone English as his/her first or second language in school.

Course Objectives

The course is intended to:
1. Listen and understand monologues and dialogues of a native speaker on par with B1 of CEFR level.
2. Speak in simple sentences to convey their opinions and ideas on par with B1 of CEFR level.
3. Read and infer a given text on par with B1 of CEFR level.
4. Draft basic formal written communication on par with B1 of CEFR level.

UNIT I – LISTENING 15 Hours

Importance of active listening –Physical condition needed for active listening –Identifying relevant points while taking notes – Framing questions at different linguistic contexts – Listening for specific details of concrete monologues and dialogues –Listening to organize ideas – Developing ideas –Listening to compose paragraphs – Paraphrasing the aural input.

UNIT II – SPEAKING 15 Hours

Importance of note making to practice speaking – Traditional note making, developing Mind map – Collecting points from various sources – Identifying relevant ideas needed for the speech –Using mind–map to organize thought processing – Prioritizing the ideas – Types of sentences –Frequently used words (Institution, home and leisure) – Mother Tongue Influence – Expressing the thoughts in simple sentences – Tenses & Voices (Active & Passive) – Postures, gestures and eye contact – Intonation and Sentence stress – Express one's thoughts coherently.

UNIT III – READING 15 Hours

Reading strategies – Skimming –Scanning – Interpretation of visual data – Factual texts on subjects of relevance – Inferring texts – Reading to write a review –Checking the accuracy of reading while presenting the interpreted data – Reading to comprehend.

UNIT IV – WRITING 15 Hours

Writing Simple and short sentences **–** Writing E–mail, Memo, Note and Message – Letter Writing – Importance of punctuations – Identifying the main points – Organising the main ideas – Writing a draft.

LABORATORY COMPONENT

LIST OF TASKS:

1. BEC Preliminary Listening Test–I & Speaking Test–1.

2. BEC Preliminary Listening Test–2 &Speaking Test–2.

3. BEC Preliminary Listening Test–3 &Speaking Test–3.

4. BEC Preliminary Listening Test–4 &Speaking Test–4.

5. BEC Preliminary Listening Test–5 &Speaking Test–5.

6. BEC Preliminary Listening Test–6 &Speaking Test–6.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Listen actively and paraphrase simple messages and specific details of concrete monologues and dialogues	Apply
CO.2 Express one's views coherently in a simple manner	Apply
CO.3 Read and comprehend factual texts on subjects of relevance	Understand
CO.4 Write texts bearing direct meanings for different contexts maintaining an appropriate style	Apply

Text Book(s):

T 1.   Whitby Norman, Business Benchmark Pre–intermediate to Intermediate Students' Book CUP Publications, 2nd Edition, 2014.

T 2.   Wood Ian, Williams Anne, Cowper Anna, Pass Cambridge BEC Preliminary, Cengage Learning,2nd edition, 2015.

T 3.   Learners Book prepared by the faculty members of Department of English.

Reference Book(s):

R 1.   BEC - Preliminary – Cambridge Handbook for Language Teachers, 2nd Edition, CUP 2000.

R 2.   Hewings Martin – Advanced Grammar in use – Upper–intermediate Proficiency, CUP, Third Edition, 2013.

Web References:

1.   http://www.grammarinenglish.com –Jan 23,2018

2.   https://www.northshore.edu/support_centre /pdf/listen–notes.pdf

3.   http://www.examenglish.com/BEC/BEC_Vantage.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	1	1	2	1	3	-	1	-	1
CO2	-	-	-	-	-	1	1	2	1	3	-	1	-	1
CO3	-	-	-	-	-	1	1	2	1	3	-	1	-	1
CO4	-	-	-	-	-	1	1	2	1	3	-	1	-	1

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2,3,4	50	30
	CCET II	1,2,3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19MABC1101	Course Title: MATRICES AND CALCULUS
	(Common to AU, CE, MC, ME, EC, EI & EE)
Course Category: Basic Science	**Course Level: Introductory**

L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre–requisites
 ➢ NIL

Course Objectives

The course is intended to:
1. Determine the canonical form of a Quadratic form using Orthogonal transformation
2. Use different testing methods to check the convergence of infinite series.
3. Apply differential and integral calculus to determine the evolutes of a curve and improper integrals.
4. Apply partial derivatives to find extreme values of functions of two variables.
5. Apply multiple integrals to find area of plane curves and volume of solids.

UNIT I – MATRICES   **9+3 Hours**
Rank of a matrix – System of linear equations – Symmetric – Skew symmetric and orthogonal matrices – (Definitions and examples only) – Eigenvalues and Eigenvectors – Diagonalization of symmetric matrices through orthogonal transformation – Cayley – Hamilton Theorem – Transformation of quadratic forms to canonical forms through orthogonal transformation.

UNIT II – SEQUENCES AND SERIES   **9+3 Hours**
Sequences – Definition and Examples – Series – Tests for convergence– Power series – series for exponential, trigonometric and logarithm functions – Comparison Test – Integral Test – Cauchy's root test – D Alembert's ratio test – Alternating series – Leibnitz's test.

UNIT III – DIFFERENTIAL AND INTEGRAL CALCULUS   **9+3 Hours**
Reading strategies – Skimming –Scanning – Interpretation of visual data – Factual texts on subjects of relevance – Inferring texts – Reading to write a review –Checking the accuracy of reading while presenting the interpreted data – Reading to comprehend.

UNIT IV – MULTIVARIABLE DIFFERENTIATION   **9+3 Hours**
Writing Simple and short sentences **–** Writing E-mail, Memo, Note and Message – Letter Writing – Importance of punctuations – Identifying the main points – Organising the main ideas – Writing a draft.

UNIT V – MULTIVARIABLE INTEGRATION   **9+3 Hours**
Multiple Integration: Double integrals – Change of order of integration in double integrals – Change of variables (cartesian to polar, cartesian to spherical and cartesian to cylindrical) – Triple integrals – Applications: areas and volumes.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Determine the canonical form of a Quadratic form using Orthogonal transformation	Apply
CO.2 Use different testing methods to check the convergence of infinite series.	Apply
CO.3 Determine the evolute of a curve and evaluate improper integrals using beta gamma functions	Apply
CO.4 Apply partial derivatives to find extreme values of functions of two variables.	Apply
CO.5 Apply multiple integrals to find area of plane curves and volume of solids	Apply

Text Book(s):

T1. Erwin kreyzig, "Advanced Engineering Mathematics", 10th edition, John Wiley & Sons, 2015.
T2. Veerarajan T., "Engineering Mathematics for First Year" , Tata McGraw-Hill, New Delhi, 2011.
T3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, 1st edition, 2017.

Reference Book(s):

R 1. G.B.Thomas and R.L Finney, Calculus and Analytic Geometry, 9th edition, Pearson, Reprint, 2010.
R 2. N.P.Bali and Manish Goyel, "A Text book of Engineering Mathematics", Laxmi Publication, 9th edition, 2010.
R 3. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc16_ma05

2. https://nptel.ac.in/courses/122101003/2

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO2	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO3	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO4	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO5	3	2	1	1	-	-	1	1	-	1	-	1	-	-

High–3; Medium–2; Low–1

Assessment Pattern:

	Assessment Component	CO. No.	Marks	Total
Continuous Comprehensive Evaluation	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5,	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19PHBN2101	Course Title: PHYSICS FOR CIVIL ENGINEERING		
Course Category: Basic Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre–requisites

> ➢ NIL

Course Objectives

The course is intended to:

1. Determine the equilibrium condition of particles and rigid bodies.

2. Inculcate the knowledge of elastic properties of materials.

3. Calculate geometric properties like centre of gravity, moment of inertia and mass moment of inertia for various sections.

4. Explain the principles of waves and acoustics for civil engineering applications.

5. Determine the quality of materials through Non-Destructive Testing (NDT).

UNIT I – BASICS OF MECHANICS   9 Hours

Review of fundamental laws of mechanics – scalars, vectors – Newton's law of mechanics, Gravitational law. Particles and rigid body, Concept of force and its effect on rigid body system of forces–Free body diagram–principle of transmissibility–equilibrium conditions–equilibrium of particles subjected to coplanar and non–coplanar force system – equilibrium of particles subjected to coplanar Triangle law, Parallelogram law and Lami's theorem.

UNIT II – PROPERTIES OF MATTER   9 Hours

Elasticity – Stress strain diagram and its uses – Elastic constants – Factors affecting elastic modulus and tensile strength – Twisting couple – Torsion stress and deformations – Torsion pendulum: Theory and experiment – Bending of beams – Bending moment – Cantilever: Theory and experiment – I shaped girders – Stress due to bending in beams.
Viscosity: Coefficient of viscosity, streamline and turbulent flow, Reynold's number, Experimental determination of low and high viscous liquids: *Poiseuille's and* Stoke's method.

UNIT III – PROPERTIES OF SURFACES AND SOLIDS   9 Hours

Centroid and centre of mass– Centroid of lines and areas – Area moments of inertia of plane areas –Theorems of Pappus – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section – Parallel axis theorem and perpendicular axis theorem –Principal moments of inertia of plane areas – Principal axes of inertia–Mass moment of inertia –mass moment of inertia for prismatic, cylindrical and spherical solids from first principle.

UNIT IV – WAVES AND ACOUSTICS   9 Hours

Introduction to waves–Longitudinal and transverse waves, speed of wave motion. Seismic waves: P waves, S waves, Surface waves, Love waves, Rayleigh waves– isolation of structures against seismic waves.

Classification of sound – decibel– Weber–Fechner law – Sabine's formula– derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Methods of sound absorptions – absorbing materials – noise and its measurements, sound insulation and its measurements, impact of noise in multi–storeyed buildings.

UNIT V – NON-DESTRUCTIVE TESTING (NDT)   9 Hours

Liquid Penetrant Method – Characteristics of Liquid Penetrant Testing materials, X–Ray Radiographic testing: Tube shift method – Exposure factor – Attenuation –Principle of Ultrasonic testing: Ultrasonic transducer – Couplant – Ultrasonic flaw detector: Pulse echo system, transmission, A, B & C scan displays - Inspection standards.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Determine the equilibrium condition of particles and rigid bodies using the law of mechanics	Understand
CO.2 Explain the elastic properties of materials.	Understand
CO.3 Calculate geometric properties like centre of gravity, moment of inertia and mass moment of inertia for various sections.	Understand
CO.4 Explain the principles of waves and the factors affecting acoustics of buildings and their remedies.	Understand
CO.5 Describe the Non-Destructive Testing (NDT) methods to inspect the quality of materials.	Understand

Text Book(s):

T 1.   F. P. Beer, E. R. Johnston Jr, "Vector Mechanics for Engineers (in SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing Co. Ltd., New Delhi, 2005.

T 2.   M.N. Avadhanulu, P.G. Kshirsagar, "A Textbook of Engineering Physics", S. Chand & Co., New Delhi, 2011.

Reference Book(s):

R 1.   D.S. Mathur, "Properties of Matter", S. Chand & Co., New Delhi, 2012.

R 2.   V. Rajendran, "Engineering Physics", Tata McGraw–Hill Publishing Co. Ltd., New Delhi 2017.

R 3.   R. C. Hibbeller, "Engineering Mechanics: Combined static and dynamics", Prentice Hall, 2010.

Web References:

1. http://www.physicsclassroom.com/

2. http://nptel.ac.in/course.php?disciplineId=115

LIST OF EXPERIMENTS (ANY FIVE):

ENGINEERING PHYSICS LABORATORY

1. Determination of Young's Modulus of the material – Cantilever bending method.
2. Determination of Moment of inertia of the metallic disc – Torsional Pendulum
3. Determination of Rigidity modulus of the metallic wire – Torsional Pendulum
4. Determination of Viscosity of less viscous liquid –*Poiseuille's method.*

5. Determination of Viscosity of high viscous liquid –*Stoke's method.*

6. Determination of velocity and compressibility of ultrasonics in given liquid.

7. Verification of Lami's Theorem

Course Articulation Matrix*

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	1	1	-	1	-	1	-	-
CO2	2	1	-	-	-	-	1	1	-	1	-	1	-	-
CO3	2	1	-	-	-	-	1	1	-	1	-	1	-	-
CO4	2	1	-	-	-	-	1	1	-	1	-	1	-	-
CO5	2	1	-	-	-	-	1	1	-	1	-	1	-	-

High–3; Medium–2; Low–1

Assessment pattern:

	Assessment Component	CO .No.	Unit No	Marks	Scaleto	Total
Continuous Comprehensive Evaluation	CCET I	1,2	1,2	50	20	40
	CCET II	3,4	3,4	50		
	CCET III	5	5	50		
	Continuous Evaluation of Laboratory Experiments	1,2,3,4,5	1,2,3,4,5	20	20	
End Semester Examination	ESE	1,2,3,4,5	1,2,3,4,5	100	60	60
					Total	100

Course Code: 19EESN2101	Course Title: BASICS OF ELECTRICAL AND MECHANICAL ENGINEERING		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 2	Credits:4	Total Contact Hours:75	Max Marks:100

Pre–requisites

> ➢ NIL

Course Objectives

The course is intended to:

1. Explain the basic concepts and laws of electrical engineering

2. Describe the basics of wiring

3. Explain the basic concepts of electronics engineering

4. Explain the concepts of Conventional and Non–conventional power sources

5. Explain the concepts of Refrigeration and Air conditioning systems

UNIT I – INTRODUCTION TO ELECTRICAL ENGINEERING   9 Hours

DEFINITION – symbol and units of electrical quantities–Active and passive elements –ohms law statement illustration, and limitation – Kirchhoff's law statement and illustration – Resistance in series and voltage division technique – Resistance in parallel and current division technique – Method of solving a circuit by Kirchhoff's law – Star to delta and delta to star transformation

UNIT II – INTRODUCTION TO AC MACHINES AND WIRING   9 Hours

Construction, Principle of Operation of Single phase and Three phase Induction machines – BASIC OF WIRING: Basic components of Wiring (Wires, Switches, Fuses, sockets, plug, lamps and lamp holders, rating of different accessories and its functions). TYPES OF CIRCUIT: Open circuit –Closed circuit –Short circuit. WIRING METHODS: Series circuit – Parallel circuit –Combination of series and parallel circuit. Illustration of House Wiring–Safety Precautions and measures

UNIT III – INTRODUCTION TO ELECTRONICS ENGINEERING   9 Hours

Intrinsic and extrinsic semiconductor, PN junction diode – construction – working, bipolar junction transistor – construction – working, static and dynamic characteristics of instruments – units and standards of measurements – general measurements systems – data acquisition systems – sensors in civil engineering – acoustic emission sensor – fibre optic sensor

UNIT IV – CONVENTIONAL AND NON–CONVENTIONAL POWER PLANTS   9 Hours

Power plant – Definition, Classifications – Layout of Steam power plant, hydroelectric power plant, Diesel power plant, nuclear power plant, Solar power plant, wind energy conversion system, Bio- gas power plant, Geothermal power plant, OTEC, MHD, and Tidal power plant.

UNIT V – REFRIGERATION AND AIR CONDITIONING SYSTEMS   9 Hours

Refrigeration – terminologies, COP, Refrigerant – types and properties, Classifications – Vapour compression refrigeration system, vapour absorption refrigeration system, Layout of

a typical domestic refrigerator. Air conditioning system – definition, classifications – working of the window, split and year–round air conditioning systems.

LIST OF EXERCISES:

1. Making of two-way staircase wiring for lamp and making of internal wiring of tube light and checking connection.
2. Making of a domestic wiring circuit to connect a light, a fan with a regulator and a socket
3. VI Characteristics of PN Diode and common emitter configuration of BJT.
4. Study of wind turbine power plant and solar power plant
5. Study and performance analysis of vapour compression refrigeration system
6. Study and performance analysis of Air Conditioning system.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the basic concepts and laws of electrical engineering.	Understand
CO.2 Describe the basics of wiring.	Understand
CO.3 Explain the basic concepts of electronics engineering.	Understand
CO.4 Explain the concepts of Conventional and Non–conventional power sources.	Understand
CO.5 Explain the concepts of Refrigeration and Air conditioning systems.	Understand

Text Book(s):

T1.   S.C. Arora and S Domkundwar, "A course in Power Plant Engineering" Dhanpatrai & Sons, New Delhi, 2008.

T2.   Muthusubramanian R, Salivahanan S and Muraleedharan K A, "Basic Electrical, Electronics and Computer Engineering", Tata McGraw Hill, Second Edition, (2006).

T3.   Kalsi .H.S, "Electronics Instrumentation", 3rdEdition (copyright 2010, Second Reprint 2011) Tata McGraw Hill, New Delhi, 2010

Reference Book(s):

R 1.   Manohara Prasad, "Refrigeration and Air conditioning", New Age International, 2004.

R 2.   Bhattacharya, "Electrical Machines", Tata McGraw Hill, Second Edition, 2008.

R 3.   Ray C. Mullin, Phil Simmons, "Electrical Wiring Commercial" Cengage learning, 2011

R 4.   John Cadick, Mary Capelli–Schellpfeffer, Dennis Neitzel, "Electrical Safety Handbook" Tata McGraw Hill third edition, 2005

R 5.   Ming L. Wang, Jerome P. Lynch, HoonSohn "Sensor Technologies for Civil Infrastructures, Volume 1: Sensing Hardware and data collection methods and performance assessment",Elsiver–2014

R 6.   Millman J, Halkias .C andSatyabratajit, "Electronic Devices and Circuits", Second Edition, Tata McGraw–Hill, New Delhi, 2007

R 7.   Jeyachandran.K, Natarajan.S. & Balasubramanian.S, "A Primeron Engineering Practices Laboratory", Anuradha Publications, 2007.

R 8.   Electrical practices laboratory manual for civil engineers – MCET.

Web References:

1. https://www.jove.com/science–education/10114/electrical–safety–precautions–and–basic–equipment

Course Articulation Matrix*

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO2	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO3	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO4	1	-	-	-	-	-	-	1	2	3	-	-	-	-
CO5	1	-	-	-	-	-	-	1	2	3	-	-	-	-

*Subject to change based on assessment.
High–3; Medium–2; Low–1

Assessment pattern:

	Assessment Component	CO. No.	Marks	Total
Continuous Comprehensive Evaluation	CCET I	1,4	50	20
	CCET II	2,3	50	
	CCET III	5	50	
	Continuous Evaluation of Laboratory Experiments	1,2,3,4,5	10	20
	Final Assessment of Laboratory Experiments	1,2,3,4,5	10	
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CESN3101	Course Title: ENGINEERING DRAWING FOR CIVIL ENGINEERING			
Course Category: Engineering Science		Course Level: Introductory		
L:T:P (Hours/Week) 0: 0: 4	Credits:2	Total Contact Hours: 60		Max Marks:100

Pre–requisites

➢ NIL

Course Objectives

The course is intended to:

- Understand and develop the skill of drawing different symbols of civil engineering drawings, building components, orthographic projection, isometric views of simple objects and buildings, perspective view of simple building, plan and elevation residential buildings.

UNIT I – INTRODUCTION TO ENGINEERING DRAWING   **3+9 Hours**

Importance of graphics in engineering applications – Size, layout and folding of drawing sheets – Lettering and dimensioning – Methods of Dimensioning – BIS standards and symbols in civil engineering drawing – building terminologies as per NBC – First angle projection – projection of points and lines.

UNIT II – ORTHOGRAPHIC PROJECTION   **3+9 Hours**

Representation of Three-Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – layout of views –Orthographic projection of simple objects – drawing views of doors, windows, dog legged staircase.

UNIT III – ISOMETRIC PROJECTIONS   **3+9 Hours**

Isometric Projection of solids – practices on simple solids like prisms, pyramids, cylinder& cone – practices on simple residential buildings.

UNIT IV –PERSPECTIVE PROJECTIONS   **3+9 Hours**

Concepts of Perspective projection of simple solids like prisms, pyramids by Visual Ray Method – Concepts of Perspective projection of building by vanishing point method.

UNIT V – BUILDING DRAWING   **3+9 Hours**

Introduction to types & Orientation of buildings – types of foundations – trusses. Drawing of different views of Isolated wall foundation – column footing (stepped footing, combined footing, trapezoidal footing) – drawing of plan and elevation view of two room building.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Draw the various symbols used for civil engineering drawings.	Apply
CO.2 Draw the orthographic views of building components.	Apply
CO.3 Draw the isometric views of simple objects and buildings.	Apply

CO.4	Draw the perspective view of residential building.	Apply
CO.5	Draft plan and elevation of residential buildings.	Apply

Text Book(s):

T 1. Rangawala, "A text book of Civil Engineering Drawing", Charotar publishers, 3rd edition, 2017.

T 2. N. Kumaraswamy& A. KameswaraRao, "Building Planning and Drawing", Charotar publishers, 8th edition, 2015

Reference Book(s):

R 1. Anurag A. Kandya, "Elements of Civil Engineering" Charotar publishers, 3rd edition, 2017 (Reprint)

R 2. 2. B.P. Verma, "Civil Engineering Drawing & House Planning", Khanna publishers, 12th edition, 2006

PUBLICATIONS OF BUREAU OF INDIAN STANDARDS

1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.

2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.

3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.

4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.

5. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods. The mode of delivery is like practical.

6. National building code of India (SP–7) Volume 1, Part 3 –"Development control rules and general building requirements", third revision 2016.

Web References:

1. http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco–tutorial.html

2. http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf

List of Experiments:

1. Lettering, Dimensions & drawing of civil engineering drawing symbols.

2. Orthographic projection of simple solids

3. Drawing of elevation of doors & windows

4. Drawing of plan & elevation of dog legged staircase

5. Isometric projection of simple solids & buildings

6. Perspective projection of simple solids and buildings

7. Drawing of different views of foundation.

8. Drawing plan and elevation of two room building.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	-	-	-	-	2	2	-	2	2	-
CO2	1	-	-	-	-	-	-	-	2	2	-	2	2	-
CO3	1	-	-	-	-	-	-	-	2	2	-	2	2	-
CO4	1	-	-	-	-	-	-	-	2	2	-	2	2	-
CO5	1	-	-	-	-	-	-	-	2	2	-	2	2	-

High–3; Medium–2; Low–1

Assessment pattern:

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19PSHG3001	Course Title: Wellness for Students (Common to all B.E/B.Tech Programmes) (2019 Batch only)		
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 0: 0 :2	Credits: 1	Total Contact Hours: 30	Max Marks:100

Pre–requisites

 ➢ NIL

Course Objectives

The course is intended to:

1. Articulate the importance of wellness for success in life.

2. Understand the dimensions of wellbeing and relevant practices

3. Guide in adopting such practices to improve wellness

4. Reflect the impact of changes sensed on personal and social effectiveness

UNIT I – WELLNESS – IMPORTANCE AND DIMENSIONS   6 Hours

Values and aspirations – goals – SMART Goals – means for achieving goals – job Vs career – success in life – attributes of successful persons. Maslow's Hierarchy of needs motivation – Concept of wellness – impact of absence of wellness – Wellness as important component to achieve success.

Wellbeing as per WHO – Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods – Guna – causes and impact – multiple dimensions of human structure (physical, astral, causal bodies) – human–panchabootha relationship.

UNIT II – PRACTICES FOR PHYSICAL WELLNESS THROUGH YOGA   6 Hours

Simplified Physical Exercises: Hand, Leg, Neuromuscular breathing, eye exercises, kapalabathy, makarasanam 1 & 2, body massage, 14–points acupressure – Suryanamaskar – relaxation. Simple asanas.

UNIT III – PRACTICES FOR PHYSICAL WELLNESS THROUGH EXERCISES   6 Hours

Fitness as a subset of Wellness – health related physical fitness – skill related physical fitness. Exercises related ailment and injuries – safety and precautions – first aid.

Fitness development: Muscular strength – exercises (calisthenics): pull–up, sit–up, push–up and weight training; Explosive power – exercises: vertical jump, long jump; Cardio respiratory endurance– exercises: walking, jogging, treadmill, stair climbing, bicycling, skipping; Flexibility – exercises: stretching.

Speed, agility, balance and coordination – exercises: sprint, cone drill, ladder drill, hurdle drill, ball throw – mental agility exercises.

UNIT IV – PRACTICES FOR MENTAL WELLNESS   6 Hours

Meditation: Mind and its functions – mind wave frequency – Agna, Thuriyam and Shanthi meditation – introspection: analysis of thoughts, moralization of desire, neutralization of anger and eradication of worries – simple mindfulness exercises.

UNIT V – PRACTICES FOR SOCIAL AND SPIRITUAL WELLNESS   6 Hours

Kayakalpa yoga – youthfulness and life force – cultural education – greatness of guru – universal compassion – fivefold culture. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.

Food & sleep for wellness: balanced diet – good food habits for better health (anatomic therapy) – hazards of junk food – food and the gunas.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the concept of wellness and its importance to be successful in career and Life	Understand
CO.2 Explain the dimensions of wellness and practices that can promote Wellness	Understand
CO.3 Demonstrate the practices that can promote wellness	Respond
CO.4 Sense and improve the wellness periodically and its impact on personal Effectiveness	Value
CO.5 Maintain harmony with self, family, peers, society and nature	Internalize

Text Book(s):

T 1.   Reading material and workbook prepared by PS team of the college

Reference Book(s):

R 1.   Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar ,"Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, I Ed. (2010).

R 2.   Dr.R.Nagarathna, Dr.H.R.Nagendra, "Integrated approach of yoga therapy for positive health", Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.

R 3.   Tony Buzan, Harper Collins, The Power of Physical Intelligence (English).

Course offering:

Orientation programme (3 days)   CO1 and CO2

Student practice (weekly review classes)   CO3

Student journal writing (interim reviews)   CO4 and CO5

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	1	-	-	-	-	-
CO2	-	-	-	-	-	-	1	1	1	-	-	-	-	-
CO3	-	-	-	-	-	1	1	1	1	-	-	1	-	-
CO4	-	-	-	-	-	1	1	-	1	-	-	-	-	-
CO5	-	-	-	-	-	1	1	-	1	-	-	1	-	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	**Yoga:**	1,2,3,4,5		75
	Physical Exercises, KayaKalpa		15	
	Meditation		15	
	Assessment of student's workbook		10	
	Sports:			
	Physical Exercises, KayaKalpa		20	
	Assessment of student's workbook		15	
End Semester Examination (combined for yoga and sports)	Written test (MCQ and short answers)	1,2,3,4,5	30	Marks out of 100 is reduced to 25
	Physical exercises		50	
	Viva–voce		20	
			Total	100

Course Code: 19PSHG6001	Course Title: WELLNESS FOR STUDENTS (Common to all B.E/B.Tech Programmes) (2020 Batch onwards)		
Course Category: Humanities	Course Level: Introductory		
L:T:P (Hours/Week) 0: 0 :2	Credits: 1	Total Contact Hours: 30	Max Marks:100

Pre–requisites

> ➢ NIL

Course Objectives

The course is intended to:
1. Set SMART goals for academic, career and life
2. Apply time management techniques
3. Articulate the importance of wellness for success in life.
4. Understand the dimensions of wellbeing and relevant practices

UNIT I – GOAL SETTING

Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people. Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume. Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment.

UNIT II – TIME MANAGEMENT - TOOLS AND TECHNIQUES

Importance of planning and working to time. Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination

UNIT III – PRACTICES FOR PHYSICAL WELLNESS

Concept of wellness – impact of absence of wellness - Wellness as important component to achieve success. Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods.
Simplified Physical Exercises. Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Joint movements, Warm up exercises, simple asanas, WCSC simplified exercises.

UNIT IV – PRACTICES FOR MENTAL WELLNESS

Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.
Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas

UNIT V – PUTTING INTO PRACTICE

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Set well-articulated goals for academics, career, and personal aspirations	Apply
CO.2 Apply time management techniques to complete planned tasks on time	Apply
CO.3 Explain the concept of wellness and its importance to be successful in career and life	Apply
CO.4 Explain the dimensions of wellness and practices that can promote wellness	Apply
CO.5 Demonstrate the practices that can promote wellness	Valuing

Text Book(s):

T 1.   Reading material, workbook and journal prepared by PS team of the college

Reference Book(s):

R.1   Stephen R Covey, "First things first", Simon & Schuster Uk, Aug 1997.

R.2   Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster Uk, 2004.

R.3   Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, "Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, I Ed. (2010).

R.4   Dr. R. Nagarathna, Dr.H.R. Nagendra, "Integrated approach of yoga therapy for positive health", Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.

R.5   Tony Buzan, Harper Collins, "The Power of Physical Intelligence English)".

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	1	1	-	1	-	-
CO2	-	-	-	-	-	-	-	-	1	-	1	1	-	-
CO3	-	-	-	-	-	-	-	-	1	-	-	1	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	1	-	-
CO5	-	-	-	-	-	1	1	-	1	-	-	1	-	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Personal Effectiveness	1,2,5	35	75
	Yoga and Physical Exercise:	3,4,5		
	Physical Exercises		20	
	Meditation		10	
	Assessment of student's workbook		10	
End Semester Examination	Written test (MCQ and short answers)	1,2,3,4,5	30	Marks out of 100 is reduced to 25
	Physical exercises		50	
	Viva–voce		20	
			Total	100

Course Code: 19ENHG2201	Course Title: COMMUNICATION SKILLS – II (Common to all B.E/B.Tech Programmes)		
Course Category: Humanities		Course Level: Introductory	
L:T:P (Hours/Week) 2: 0: 2	Credits:3	Total Contact Hours:60	Max Marks:100

Pre-requisites

➢ Communication Skills – I

Course Objectives

The course is intended to:

1. Listen and understand monologues and dialogues of a native speaker on par with B2 of CEFR level.
2. Speak in simple sentences to convey their opinion and ideas on par with B2 of CEFR level.
3. Read and infer a given text on par with B2 of CEFR level.
4. Draft basic formal written communication on par with B2 of CEFR level.

UNIT I – LISTENING   **15 Hours**

Importance and purpose of extensive listening and intensive listening –Body Language – Listening tasks on complex and abstract themes – Correlating Ideas related to listening input – importance of empathetic – listening for main ideas – Paraphrasing– Listening to native speakers English – Compound and Complex sentences – Developing ideas – Listening to compose paragraphs.

UNIT II – SPEAKING   **15 Hours**

Jotting down ideas collected from listening to speak – organising the ideas – Expressing one's view coherently – Understanding grammatical elements (Noun – Pronoun Antecedent) – Expressing ideas assertively – Answering questions during presentations – Understanding the use of discourse markers – word stress and sentence stress – voice modulation and pauses – Highlighting significant points – interpretation of visual data – Using verbal cues – Preparing simple hand – outs.

UNIT III – READING   **15 Hours**

Reading strategies – Skimming &Scanning – Inferring meaning– Barriers to reading – sub vocalisation, Eye fixation, Regression – Speed Reading Techniques – Reading different types of texts and their contexts with speed – Note making – Reading a review – Paraphrasing – Reading to comprehend

UNIT IV – READING   **15 Hours**

Reading strategies – Skimming &Scanning – Inferring meaning– Barriers to reading – sub vocalisation, Eye fixation, Regression – Speed Reading Techniques – Reading different types of texts and their contexts with speed – Note making – Reading a review – Paraphrasing – Reading to comprehend.

UNIT V – WRITING   **15 Hours**

Reported speech& Concord (Subject – verb Agreement) – Report writing – Different kinds of Report – Structure of the report – Writing Proposal – Plagiarism – References – Appendices – Techniques for Report writing – Registers.

LABORATORY COMPONENT

 LIST OF TASKS:

1. BEC Vantage Listening Test-I & Speaking Test-1.

2. BEC Vantage Listening Test-2 & Speaking Test-2.

3. BEC Vantage Listening Test-3 & Speaking Test-3.

4. BEC Vantage Listening Test-4 & Speaking Test-4.

5. BEC Vantage Listening Test-5 & Speaking Test-5.

6. BEC Vantage Listening Test-6 & Speaking Test-6.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.5 Listen actively and empathetically, and paraphrase discussions and presentations on complex and abstract themes and topics	Apply
CO.6 Express one's views coherently, fluently and confidently highlighting the significant points with supporting details	Apply
CO.7 Read and comprehend different types of texts and their contexts reasonably at moderate speed	Understand
CO.8 Write detailed reports on variety of subjects synthesizing information gathered during listening & reading citing appropriate references	Apply

Text Book(s):

T 2.   Whitby Norman, Business Benchmark Upper Intermediate Students' Book CUP Publications, 2nd Edition, 2014.

       T 3.   Learners Book prepared by the faculty members of Department of English.

Reference Book(s):

R 3.   Cambridge BEC Vantage - Practice Tests, Self-study Edition, Cambridge University Press, 2002

R 4.   Hewings Martin - Advanced Grammar in use - Upper-intermediate Proficiency, CUP, Third Edition, 2013.

Web References:

1. http://www.grammarinenglish.com - Jan 23, 2018

   2. https://www.northshore.edu/support_centre /pdf/listen-notes.pdf

   3. http://www.examenglish.com/BEC/BEC_Vantage.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	1	3	-	1	-	1
CO2	-	-	-	-	-	-	-	2	1	3	-	1	-	1
CO3	-	-	-	-	-	-	-	2	1	3	-	1	-	1
CO4	-	-	-	-	-	-	-	2	1	3	-	1	-	1
CO5	-	-	-	-	-	-	-	2	1	3	-	1	-	1

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2,3,4	50	
	CCET II	1,2,3,4	50	30
	CCET III	1,2,3,4	50	
	Tutorials / Quiz / Assignments	1,2	30	10
End Semester Examination	ESE	1,2,3,4	100	60
			Total	100

Course Code: 19MABC1201	Course Title: ORDINARY DIFFERENTIAL EQUATIONS AND COMPLEX VARIABLES (Common to AU, CE, MC, ME, EC, EI, EE)		
Course Category: Basic Science		**Course Level: Introductory**	
L:T:P (Hours/Week) 3: 1: 0	**Credits: 4**	**Total Contact Hours: 60**	**Max Marks:100**

Pre-requisites

> Matrices and Calculus

Course Objectives

The course is intended to:

1. Explain the concepts of vector differentiation and integration.

2. Determine the solution of second and higher order ordinary differential equations

3. Construct analytic functions

4. Use the concept of complex integration to evaluate definite integrals.

5. Apply Laplace transform techniques to solve ordinary differential equations

UNIT I - VECTOR CALCULUS   **9+3 Hours**

Gradient – Divergence – Curl – Line integrals – Surface integrals – Volume integrals – Theorems of Green, Gauss and Stokes (without proof) and their applications.

UNIT II - COMPLEX VARIABLES (DIFFERENTIATION)   **9+ 3 Hours**

Cauchy-Riemann equations – Analytic functions – Properties – Harmonic functions – Finding harmonic conjugate – Conformal mapping (w=z+a, w= az, w=1/z) – Mobius transformation and their properties.

UNIT III - COMPLEX VARIABLES (INTEGRATION)   **9+3 Hours**

Contour integrals – Cauchy Integral formula (without proof) – Cauchy Integral theorem – Taylor's series – Singularities of analytic functions – Laurent's series–Residues – Cauchy Residue theorem (without proof) – Evaluation of real definite integrals around unit circle and semi circle (Excluding poles on the real axis).

UNIT IV - ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDERS   **9+3 Hours**

Second and higher order linear differential equations with constant coefficients – Second order linear differential equations with variable coefficients (Cauchy - Euler equation– Legendre's equation) – Method of variation of parameters – Solution of first order simultaneous linear ordinary differential equations

Unit V - LAPLACE TRANSFORM   **12 Hours**

Laplace Transform – Properties of Laplace Transform – Laplace transform of integrals – Laplace transform of periodic functions -Inverse Laplace transforms - Convolution theorem – Solution of ordinary differential equations by Laplace Transform method – Applications on engineering problems.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the concepts of vector differentiation and integration.	Apply
CO.2 Use the concept of complex variables to construct analytic functions	Apply
CO.3 Use the concept of complex integration to evaluate definite integrals	Apply
CO.4 Use the concept of complex integration to evaluate definite integrals	Apply
CO.5 Apply Laplace transform techniques to solve ordinary differential equations	Apply

Text Book(s):

T1. Erwin kreyzig, Advanced Engineering Mathematics, 9th edition, John Wiley & Sons, 2015.

T2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2011.

T3. Ramana B.V., higher Engineering Mathematics, Tata McGraw-Hill, New Delhi, 11th Reprint, 2017.

Reference Book(s):

R.1 G.B. Thomas and R.L Finney, Calculus and Analytic Geometry, 9th edition, Pearson, Reprint, 2010.

R.2 N.P. Bali and Manish Goyel, A text book of Engineering Mathematics, Laxmi Publication, Reprint, 2010.

R.3 B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2014.

Web References:

1. https://onlinecourses.nptel.ac.in/noc16_ma05

2. https://nptel.ac.in/courses/122101003/2

3. https://nptel.ac.in/courses/111105035/22

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	-	-	1	-	1	-	1	-	-
CO2	3	2	1	1	-	-	-	1	-	1	-	1	-	-
CO3	3	2	1	1	-	-	-	1	-	1	-	1	-	-
CO4	3	2	1	1	-	-	-	1	-	1	-	1	-	-
CO5	3	2	1	1	-	-	-	1	-	1	-	1	-	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorial	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CHBN2201	Course Title: CHEMISTRY FOR CIVIL ENGINEERING		
Course Category: Basic Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 0: 2	Credits: 4	Total Contact Hours:75	Max Marks:100

Pre-requisites

➢ Nil

Course Objectives

The course is intended to:

1. Explain the chemistry of water and water conditioning methods.

2. Explain the mechanism of corrosion and corrosion control

3. Explain different renewable energy sources and storage devices.

4. Describe the preparation, properties and applications of engineering plastics

5. Describe the chemistry of building materials in modern construction.

UNIT I - WATER TECHNOLOGY   9 Hours

. Water quality parameters–Types of water- Hardness of water – Types, expression, units, problems - determination of hardness by EDTA method – Boiler feed water - boiler troubles (scale, sludge, priming, foaming, caustic embrittlement, Boiler corrosion) - Water conditioning methods – Internal conditioning – phosphate, calgon and sodium aluminate conditioning, External conditioning – demineralization, Desalination of brackish water-reverse osmosis process

UNIT II - CORROSION AND CONTROL   9 Hours

Corrosion- causes- consequences - types- chemical, electrochemical corrosion (galvanic, differential aeration-Pitting corrosion), factors influencing corrosion (Based on Metal and Environment)-corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints-constituents and function

UNIT III - ENERGY SOURCES AND STORAGE DEVICES   9 Hours

Introduction – Nuclear energy - nuclear fission - nuclear fusion - nuclear chain reactions - nuclear reactor power generation - classification of nuclear reactor - solar energy conversion - solar cells - wind energy, Batteries - Types of batteries- alkaline battery - lead storage battery - lithium-ion battery.

UNIT IV - POLYMERS, PLASTICS AND COMPOSITES   9 Hours

 Polymers–definition-polymerization-types-addition and condensation polymerization-classification – Terminologies – Plastics – Classification, Engineering plastics
(PVC, Teflon, Polycarbonates, Polyurethanes, PET)– preparation, properties and uses, Compounding of plastics – Moulding technique – blow and extrusion. Polymer composites – FRP and ceramic matrix composites.

UNIT V - CHEMISTRY OF BUILDING MATERIALS **9 Hours**

Chemistry of lime and gypsum, Cement – chemical composition, classification, manufacture by wet and dry process, setting and hardening of cement, chemical reactions during the hydration of cement, waterproof and white cement–properties and uses, Chemistry and applications of ceramics, fly ash and glass in construction

LABORATORY COMPONENT

LIST OF EXPERIMENTS:

1. Estimation of hardness of water by EDTA method.

2. Determination of corrosion rate of mild steel by weight loss method.

3. Determination of molecular weight of polymer by viscometric method.

4. Determination of percentage of calcium oxide in cement by titrimetric method

5. Estimation of strength of hydrochloric acid by p^H metry.

6. Determination of iron in water by spectrophotometry.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Calculate hardness of water based on water quality parameters associated with water conditioning methods	Apply
CO.2 Explain the mechanism of corrosion and its control techniques.	Understand
CO.3 Explain different renewable energy sources and storage devices.	Understand
CO.4 Identify a suitable plastic for a specific engineering application.	Understand
CO.5 Describe the chemistry of building materials in modern construction.	Understand

Text Book(s):

T 1. Jain & Jain, Engineering Chemistry (All India),17th edition, Dhanpat Rai Publishing Company(P) Ltd, New Delhi, 2018

T 2. Wiley Engineering Chemistry, Second Edition, Wiley India Pvt Ltd, New Delhi, 2011

Reference Book(s):

R 1. Dara S.S., and Umare S.S.,A text book of Engineering Chemistry, S.Chand & Co Ltd,New Delhi, 2014

R 2. V.R.Gowariker, N.V.Viswanathan and Jayadev Sreedhar, Polymer Science, New Age International(P) Ltd, Chennai, 2006

R 3. Renu Bapna and Renu Gupta, Engineering Chemistry, Macmillan India Publisher Ltd, 2010

R 4. Jeffery G.H., Bassett J., Mendham J. and Denny R.C., Vogel's Text Book of Quantitative Chemical Analysis, Oxford, ELBS, London, 2012

R 5. Shoemaker D.P. and C.W.Garland., Experiments in Physical Chemistry, Tata McGraw-Hill Pub. Co., Ltd., London, 2009

Web References:

1. http://nptel.ac.in/courses/122101001/downloads/lec.23.pdf
2. https://nptel.ac.in/courses/104106075/Week1/MODULE%201.pdf
3. https://nptel.ac.in/courses/103102015/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	1	1	-	3	3	-	3	-	-
CO2	2	1	-	-	-	1	1	-	3	3	-	3	-	-
CO3	2	1	-	-	-	1	1	-	3	3	-	3	-	-
CO4	2	1	-	-	-	1	1	-	3	3	-	3	-	-
CO5	2	1	-	-	-	1	1	-	3	3	-	3	-	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Evaluation of Laboratory Experiments	1,2,3,4,5	10	20
	Final Assessment of Laboratory Experiments	1,2,3,4,5	10	
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CESN1201	Course Title: ENGINEERING MECHANICS		
Course Category: Engineering Science		Course Level: Introductory	
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours: 60	Max Marks:100

Pre-requisites

> ➢ Physics for Civil Engineering

Course Objectives

The course is intended to:

1. Gain knowledge on Equilibrium of rigid bodies.
2. Gain knowledge on application of equilibrium.
3. Gain knowledge on Friction.
4. Gain knowledge on Dynamics of particles.
5. Gain knowledge on Dynamics of rigid bodies.

UNIT I - EQUILIBRIUM OF RIGID BODIES   9+3 Hours

Types of supports - Types of beams and loads - Free body diagram - Action and reaction forces - stable equilibrium - Moments and Couples - Moment of a force about a point and about an axis - Vectorial representation of moments and couples - Scalar components of a moment - Varignon's theorem - Single equivalent force - Equilibrium of Rigid bodies in two dimensions - Equilibrium of Rigid bodies in three dimensions.

UNIT II - APPLICATION OF EQUILIBRIUM   9+3 Hours

Introduction to static determinacy and indeterminacy of beams and trusses - Types of trusses - Analysis for member forces by method of joints and method of sections - Shear force and bending moment diagram - simply supported, cantilever and overhanging beams - Relationship between load, bending moment and shear force - Theory of simple bending, analysis of beams for stresses - Stress distribution at a cross section due to bending moment and shear force for cantilever, simply supported and overhanging beams with different loading conditions - Flitched Beams.

UNIT III – FRICTION   9+3 Hours

Frictional force - Laws of Coulomb friction - Coefficient of Static and Kinematic friction -Block Friction - Motion Impending (Static and Kinematic) - Coplanar systems with friction (Ladder, Wedges and Screw).

UNIT IV - DYNAMICS OF PARTICLES   9+3 Hours

Kinematics of particles - Displacements, Velocity and acceleration, their relationship - Relative motion - Rectilinear and Curvilinear motions

UNIT V - DYNAMICS OF RIGID BODIES   9+3 Hours

Kinetics of rigid bodies - Newton's law - D' Alembert's principle - Work, Energy equation of particles - Impulse and Momentum - Impact of elastic bodies - Natural Frequency - Time period - Mode shapes.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Calculate the forces and moments using equilibrium equations	Apply
CO.2 Compute the forces acting on trusses and to draw SF & BMD for various beams	Apply
CO.3 Calculate the friction of screws, belts, wedges, ladders of different machine components.	Apply
CO.4 Calculate relative velocities of particles based on kinematic principles.	Apply
CO.5 Apply the concepts of dynamics of rigid bodies to calculate momentum.	Apply

Text Book(s):

T 1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2012).

T 2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010)

T 3. Beer, F.P and Johnson Jr. E.R., "Mechanics of Materials", 7th Edition, McGraw-Hill Education, New york (2015)

Reference Book(s):

R 1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education 2010.

R 2. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education 2006.

R 3. Raghu Ramakrishnan, Johannes Gehrke. "Database Management Systems", Third Edition, McGraw Hill International Edition, New Delhi 2013

R 4. Jefrey D.Ulman and Jenifer Widom, "A First Course in Database Systems", Third Edition, Prentice-Hall, New Delhi, 2012.

R 5. Bhavikatti, S.S and Rajashekarappa, K.G., "Engineering Mechanics", New Age International (P) Limited Publishers, 1998.

R 6. Kumar, K.L., "Engineering Mechanics", 3rd Revised Edition, Tata McGraw-Hill Publishing company, New Delhi 2008.

Web References:

1. http://nptel.ac.in/courses/112103109/(updated 01-Mar-2019)

2. http://www.iitg.ac.in/ssg/me101.html(updated 31-Jan-2015)

3. https://www.coursera.org/learn/engineering-mechanics-statics(updated 01-Mar-2019)

4. http://www.vssut.ac.in/lecture_notes/lecture1423904717.pdf (updated 01-Aug-2014)

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CSSC2001	Course Title: C PROGRAMMING (Common to AU, CE, MC, ME, EC, EI, EE)		
Course Category: Engineering Science	Course Level: Introductory		
L:T:P (Hours/Week) 3: 0: 2	Credits: 4	Total Contact Hours:75	Max Marks:100

Pre-requisites

➢ NIL

Course Objectives

The course is intended to:

1. Explain about computer organization and problem solving techniques

2. Write programs using appropriate programming constructs

3. Develop programs using arrays, functions & strings

4. Implement programs using pointers, structures& unions

5. Write programs using files & preprocessor directives

UNIT I - INTRODUCTION   **7 Hours**

Generation and Classification of Computers –Basic Organization of a Computer – Software development life cycle – Problem Solving Techniques :Algorithm,Pseudocode and Flow Chart.

UNIT II - C PROGRAMMING BASICS   **10 Hours**

Introduction to C programming – Structure of a C program – Keywords – Identifiers-Constants– Variables – Data Types – Operators and Expressions –Formatted & Unformatted I/O functions– Decision statements – Loop control statements.

UNIT III - ARRAYS, FUNCTIONSAND STRINGS   **10 Hours**

Arrays: Characteristics –One-dimensional and Two-dimensional arrays – Functions: Declaration & Definition of function –Built in function – User defined function –Types of functions – Call by value &reference – Strings: Formatting strings – String handling functions.

UNIT IV - POINTERS, STRUCTURES & UNION   **9 Hours**

Pointers: Features and Types of pointers – Arithmetic operations with pointers–Pointers and Arrays –Structures: Features– Operations on Structures – Array of structures – Unions.

UNIT V - FILES & PRE-PROCESSOR DIRECTIVES   **9 Hours**

Introduction to Files – Stream and File Types – File operations (Open, close, read, write) – Command line arguments – Pre-processor Directives: Macro Expansion, File Inclusion, Conditional Compilation.

LIST OF EXPERIMENTS   **30 Hours**

1. Programs to process data types, operators and expression evaluation. (any 1)
    a. To find area of rectangle/circle/square.
    b. To find the simple interest and compound interest.
2. Programs using decision and looping statements. (any 2)
    a. To find the maximum number among 3 given numbers.
    b. To check whether given year is leap year or not.
    c. To display the Fibonacci series.
    d. To find the factorial of a number.
3. Programs using Arrays
    a. To search for particular number among N numbers. (1D array)
    b. To compute matrix addition. (2 D array)
4. Programs using Functions and Strings (any 2)
    a. To swap two numbers using call by reference.
    b. To find the cube of a number.
    c. To manipulate strings using string functions.
    d. To check whether the string is palindrome or not.
5. Programs using Pointer, Structure & Union
    a. To perform arithmetic operations using pointers.
    b. To display the information of N students using Structure.
    c. To display the employee details using Union.
6. Programs using Files (any 1)
    a. To read the contents of a text file.
    b. To copy the contents from one file into another.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain about computer organization and problem solving techniques	Understand
CO2: Write programs for the given scenario using appropriate programming Constructs	Apply
CO3: Develop programs using arrays, functions & strings for the given Scenario	Apply
CO4: Implement programs for given application using pointers, structures& unions	Apply
CO5: Write programs using files & preprocessor directives for simple problems	Apply

Text Book(s):

T1.   Ashok N. Kamthane, Amit.N. Kamthane, "Programming in C", Third Edition, Pearson Education, 2015.

Reference Book(s):

R 1.   Ajay Mittal, "Programming in C-A Practical Approach", Third Edition, Pearson Education, 2010.

R 2.   Yashavant P. Kanetkar, "Let Us C", Sixteenth Edition, BPB Publications,2018

R 3.   Pradip Dey, Manas Ghosh, "Computer Fundamentals and Programming in C", Second edition, Oxford University Press, 2013

Web References:

1.   http://www.cprogramming.com/
2.   http://www.c4learn.com/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	2	-	-	-	2	-	-	-	-	-
CO2	3	2	1	2	2	-	-	-	2	-	-	-	-	-
CO3	3	2	1	2	2	-	-	-	2	-	-	-	-	-
CO4	3	2	1	2	2	-	-	-	2	-	-	-	-	-
CO5	3	2	1	2	2	-	-	-	2	-	-	-	-	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	20
	CCET II	3,4	50	
	CCET III	5	50	
	Continuous Evaluation of Laboratory Experiments	1,2,3,4,5	10	20
	Final Assessment of Laboratory Experiments	1,2,3,4,5	10	
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN3201	Course Title: COMPUTER AIDED BUILDING DRAWING LABORATORY			
Course Category: Professional Core		Course Level: Introductory		
L:T:P (Hours/Week) 0: 0: 4	Credits: 2	Total Contact Hours:60		Max Marks:100

Pre-requisites

> ➢ Engineering Drawing for Civil Engineering

Course Objectives

The course is intended to:

• Understand the principles of planning for various buildings by incorporating building bye laws and develop the skills of drawing the different components of buildings using CAD software.

List of Exercises

1. Introduction to CAD commands and drawing of simple objects.
2. Drawing of plan, elevation and section of types of foundations. (Wall foundation, Column footing – Stepped, Combined and Trapezoidal)
3. Drawing of plan, elevation of dog legged staircase and bifurcated staircase.
4. Drawing of section of King post & Queen Post wooden truss.
5. Drawing of plan, elevation & section of simple buildings.
6. Drawing of plan, elevation & section of one BHK residential building with RCC flat roof – single storey – load bearing structure
7. Drawing of plan, elevation & section of one BHK residential building with RCC flat roof – single storey – framed structure
8. Drawing of plan, elevation & section of two BHK residential building with RCC flat roof – single storey – load bearing structure
9. Drawing of plan, elevation & section of two BHK residential building with RCC flat roof – single storey – framed structure
10. Drawing of plan, elevation & section of Commercial building.
11. Drawing of perspective view of a single storied building.
12. Drawing of perspective view of a two storied building.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Draw plan, elevation and section of wall foundations and column footings (stepped, combined and trapezoidal) using CAD software	Apply
CO.2 Draw plan, elevation of dog legged and bifurcated staircase using CAD software.	Apply
CO.3 Draw the king post and Queen post wooden trusses using CAD software.	Apply
CO.4 Draw plan, elevation and sectional view of residential buildings using CAD software.	Apply
CO.5 Draw the perspective view of buildings using CAD software.	Apply

Reference Book(s):

R 1. Rangawala, "A text book of Civil Engineering Drawing (including computer aided

R 2. N. Kumaraswamy & A. Kameswara Rao, "Building Planning and Drawing", Charotar publishers, 8th edition, 2015.

R 3. B.P. Verma, "Civil Engineering Drawing & House Planning", Khanna publishers, 12th

R 4. 19CECN3201- Computer Aided Building Drawing Laboratory Manual - MCET

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	3	3	-	-	1	2	2	-	2	3	-
CO2	1	-	-	3	3	-	-	1	2	2	-	2	3	-
CO3	1	-	-	3	3	-	-	1	2	2	-	2	3	-
CO4	1	-	-	3	3	-	-	1	2	2	-	2	3	-
CO5	1	-	-	3	3	-	-	1	2	2	-	2	3	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19PSHG3002	Course Title: PERSONAL EFFECTIVENESS (Common to all B.E/B.Tech Programmes) (2019 Batch only)		
Course Category: Humanities	Course Level: Introductory		
L: T: P (Hours/Week) 0: 0: 2	Credits: 1	Total Contact Hours:30	Max Marks:100

Pre-requisites

> ➢ NIL

Course Objectives

The course is intended to:

1. Set SMART goals for academic, career and life

2. Identify strength, weaknesses and opportunities

3. Plan for achieving the goals

4. Apply time management techniques

5. Create time and pursue activities of self interest

UNIT I - THE IMPORTANCE OF ENVISIONING

Importance of positive self-perception – Principle of dual creation (Everything gets created twice – Envisioning) - Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people – Importance of goal setting –Importance of planning and working to time.

UNIT II - FUNDAMENTAL PRINCIPLES OF GOAL SETTING AND WORKING TO TIME

Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume

UNIT III - GOAL SETTING AND ACTION ORIENTATION

Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment – Importance of action orientation - Converting goals to actionable tasks – Establishing Road map – Using Gantt chart for planning and progress

UNIT IV - TIME MANAGEMENT - TOOLS AND TECHNIQUES

Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination

UNIT V - PUTTING INTO PRACTICE

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Identify the strengths, weaknesses and opportunities	Apply
CO.2 Set well-articulated goals for academics, career, and personal aspirations	Apply
CO.3 Establish the road map to realize the goals	Apply
CO.4 Apply time management techniques to complete planned tasks on time	Apply
CO.5 Create time and pursue activities of self-interest that add value	Value

Text Book(s):

Reading material, workbook and journal prepared by PS team of the college.

Reference Book(s):

R.1   Stephen R Covey, "First things first", Simon & Schuster Uk, Aug 1997.

R.2   Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster Uk, 2004.

Course offering:

Orientation programme (2 days)	CO1 and CO2
Student practice (weekly review classes)	CO3
Student journal writing (interim reviews)	CO4 and CO5

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	1	-	1	1	-	1	-	-
CO2	-	-	-	-	-	-	1	-	-	-	1	1	-	-
CO3	-	-	-	-	-	-	1	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	2	1	1	-	-	-
CO5	-	-	-	-	-	1	1	-	-	-	-	1	-	-

Assessment Pattern:

	Assessment Component	CO. No.	Marks	Total
	Personal Effectiveness	1,2,5	35	
	Yoga and physical Exercise: Physical Exercises	3,4,5	20	75
	Meditation		10	
	Assessment of student's workbook		10	
End Semester Examination	Written test (MCQ and short answers)	1,2,3,4,5	30	Marks out of 100 is reduced to 25
	Physical exercises		50	
	Viva-voce		20	
			Total	100

Course Code: 19PSHG6001	Course Title: WELLNESS FOR STUDENTS (Common to all B.E/B.Tech Programmes) (2020 Batch onwards)			
Course Category: Humanities		Course Level: Introductory		
L:T:P (Hours/Week) 0: 0: 2	Credits:1	Total Contact Hours:30		Max Marks:100

Pre-requisites

> ➢ NIL

Course Objectives

The course is intended to:

1. Set SMART goals for academic, career and life
2. Apply time management techniques
3. Articulate the importance of wellness for success in life.
4. Understand the dimensions of wellbeing and relevant practices
5. Demonstrate the practices that can promote wellness.

UNIT I - GOAL SETTING   6 Hours

Understanding Vision and mission statements - Writing personal mission statements – 'Focus' as a way of life of most successful people. Clarifying personal values, interests and orientations – Awareness of opportunities ahead – Personal SWOT analysis - Principles driving goal setting: Principle of response and stimuli, Circle of influence and circle of concern, What you see depends on the role you assume. Potential obstacles to setting and reaching your goals - Five steps to goals setting: SMART goals, Inclusive goals, Positive stretch, Pain vs gain, Gun-point commitment.

UNIT II - TIME MANAGEMENT - TOOLS AND TECHNIQUES   6 Hours

Importance of planning and working to time. Pareto 80-20 principle of prioritization – Time quadrants as a way to prioritize weekly tasks – The glass jar principle - Handling time wasters – Assertiveness, the art of saying 'NO' – Managing procrastination

UNIT III - PRACTICES FOR PHYSICAL WELLNESS   6 Hours

Concept of wellness – impact of absence of wellness - Wellness as important component to achieve success. Wellbeing as per WHO - Dimensions of Wellbeing: Physical, Mental, Social, Spiritual – indicators and assessment methods.
Simplified Physical Exercises. Fitness as a subset of Wellness – health related physical fitness - skill related physical fitness. Joint movements, Warm up exercises, simple asanas, WCSC simplified exercises.

UNIT IV - PRACTICES FOR MENTAL WELLNESS   6 Hours

 Meditation: Mind and its functions - mind wave frequency – Simple basic meditation – WCSC meditation and introspection tables. Greatness of friendship and social welfare – individual, family and world peace – blessings and benefits.
Food & sleep for wellness: balanced diet - good food habits for better health (anatomic therapy) – hazards of junk food - food and the gunas

UNIT V – PUTTING INTO PRACTICE   6 Hours

Practicals: Using the weekly journal – Executing and achieving short term goals – Periodic reviews.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Set well-articulated goals for academics, career, and personal aspirations	Understand
CO.2 Apply time management techniques to complete planned tasks on time	Understand
CO.3 Explain the concept of wellness and its importance to be successful in career and life	Understand
CO.4 Explain the dimensions of wellness and practices that can promote wellness	Understand
CO.5 Demonstrate the practices that can promote wellness	Understand

Text Book(s):

T1.   Reading material, workbook and journal prepared by PS team of the college.

Reference Book(s):

R 1.   Stephen R Covey, "First things first", Simon & Schuster Uk, Aug 1997.

R 2.   Sean Covey, "Seven habits of highly effective teenagers", Simon & Schuster Uk, 2004.

R 3.   Vethathiri Maharishi Institute for Spiritual and Intuitional Education, Aliyar, "Value education for harmonious life (Manavalakalai Yoga)", Vethathiri Publications, Erode, I Ed. (2010).

R 4.   Dr. R. Nagarathna, Dr.H.R. Nagendra, "Integrated approach of yoga therapy for positive health", Swami Vivekananda Yoga Prakashana, Bangalore, 2008 Ed.

R 5.   Tony Buzan, Harper Collins, The Power of Physical Intelligence (English).

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	1	1	-	1	-	-
CO2	-	-	-	-	-	-	-	-	1	-	1	1	-	-
CO3	-	-	-	-	-	-	-	-	1	-	-	1	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	1	-	-
CO5	-	-	-	-	-	1	1	-	1	-	-	1	-	-

High-3; Medium-2; Low-1

Course offering: (Annual Pattern)

CO1, CO2 and CO5   Can be conducted in Odd semester
CO3, CO4 and CO5   Can be conducted in Even semester
Student journal writing (interim reviews)   CO1 to CO5

Assessment Pattern:

	Assessment Component	CO. No.	Marks	Total
	Personal Effectiveness	1,2,5	35	
	Yoga and physical Exercise: Physical Exercises Meditation Assessment of student's workbook	3,4,5	20 10 10	75
End Semester Examination	Written test (MCQ and short answers) Physical exercises Viva-voce	1,2,3,4,5	30 50 20	Marks out of 100 is reduced to 25
			Total	100

Course Code: 19CHMG6201	Course Title: ENVIRONMENTAL SCIENCES (Common to all B.E/B.Tech Programmes)		
Course Category: Mandatory Non-Credit Course		Course Level: Introductory	
L:T:P (Hours/Week) 1: 0: 0	Credits: 0	Total Contact Hours:15	Max Marks:100

Pre-requisites

> ➤ NIL

Course Objectives

The course is intended to:

1. Create awareness for conservation and equitable use of natural resources.

2. Impart knowledge on measures for prevention of pollution and disaster management.

3. Facilitate the understanding of environmental legislations in India.

4. Familiarize the environmental issues relevant to human health.

5. Know the innovative measures for day to day environmental issues.

UNIT I - NATURAL RESOURCES   2 Hours

Role of individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.

UNIT II - ENVIRONMENTAL POLLUTION AND DISASTER MANAGEMENT   2 Hours

Role of an individual in prevention of pollution; Disaster management : floods, earthquake, cyclone and landslides.

UNIT III - ENVIRONMENTAL ETHICS AND LEGISLATIONS   2 Hours

Environmental ethics : Environment Protection Act; Air Act; Water Act ; Wildlife Protection Act; Forest Conservation Act; Issues involved in enforcement of environmental legislation.

UNIT IV - ENVIRONMENTAL ISSUES AND PUBLIC AWARNESS   2 Hours

Public awareness - Environment and human health

UNIT V - ENVIRONMENTAL ACTIVITIES   2 Hours

(a) Awareness Activities*:*
    i) Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
    ii) Slogan making event
    iii) Poster making event.

(b) Actual Activities:
  i) Plantation
  ii) Cleanliness drive
  iii) Drive for segregation of waste
  iv) To know about the different varieties of plants
  v) Shutting down the fans and ACs of the campus for an hour or so

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Describe the role of individual in conservation of water resources and equitable use of natural resources for sustainability.	Understand
CO.2 Explain the role of individual in prevention of pollution and disaster management.	Understand
CO.3 Illustrate the importance of environmental legislations in India and the issues involved in its enforcement.	Understand
CO.4 Explain the general environmental issues relevant to human health.	Understand
CO.5 Demonstrate innovative measures for day to day environmental issues such as waste disposal and deforestation.	Understand

Text Book(s):

T 1.   Benny Joseph, "Environmental Studies", Tata McGraw Hill, New Delhi, 2006.

T 2.   Mackenzie Davis and Susan Masten, "Principles of environmental engineering and science", Mc-Graw Hill, 3rd Edition, 2014.

Reference Book(s):

R 1.   Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol.I and II, Enviro Media.

R 2.   Cunningham, W.P.Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	3	3	-	-	-	-	2	3	-
CO2	2	1	-	-	-	3	3	-	-	-	-	2	3	-
CO3	2	1	-	-	-	3	3	-	-	-	-	2	3	-
CO4	2	1	-	-	-	3	3	-	-	-	-	2	3	-
CO5	2	1	-	-	-	3	3	-	-	-	-	2	3	-

High-3; Medium-2;Low-1

Assessment Pattern

Component	Marks	Details
Attendance	10	Minimum 80% and 1 mark for every 2% observed
Knowledge Test	40	Objective type questions
Activity(ies)	50	Report on the activity performed
Total	**100**	

NON-LETTER GRADES

Marks Scored	Performance Level
70 & above	Good
30 – 69	Average
< 30	Fair

Course Code: 19MABN1301	Course Title: TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS		
Course Category: Basic Science		Course Level: Practice	
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours: 60	Max Marks:100

Pre-requisites

 ➢ Matrices and Calculus
 ➢ Ordinary Differential Equation and Complex variables

Course Objectives

The course is intended to:

1.   Determine the solution of first and higher order partial differential equations.
2.   Compute the Fourier series expansion
3.   Solve one dimensional wave equation.
4.   Solve one dimensional and two-dimensional heat flow equation.
5.   Calculate the Fourier transformation for a periodic function

UNIT I - PARTIAL DIFFERENTIAL EQUATIONS   **9+3 Hours**

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

UNIT II - FOURIER SERIES   **9+3 Hours**

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

UNIT III - SOLUTION OF ONE-DIMENSIONAL WAVE EQUATION   **9+3 Hours**

Method of separation of variables - Classification of second order linear partial differential equations, Solutions of one-dimensional wave equation by Fourier series method.

UNIT IV - SOLUTION OF ONE AND TWO-DIMENSIONAL HEAT FLOW EQUATION   **9+3 Hours**

One dimensional equation of heat conduction - Steady state solution of two-dimensional equation of heat conduction (Insulated edges excluded), Solution by Fourier series method.

UNIT V - FOURIER TRANSFORMS   **9+3 Hours**

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

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Determine the solution of first and higher order partial differential equations.	Apply
CO.2 Compute the Fourier series expansion	Apply
CO.3 Solve one dimensional wave equation.	Apply
CO.4 Solve one dimensional and two-dimensional heat flow equation.	Apply
CO.5 Calculate the Fourier transformation for a periodic function	Apply

Text Book(s):

T 1. Erwin kreyzig, Advanced Engineering Mathematics, 10th edition, John Wiley& Sons, 2015.

T 2. Veerarajan T., "Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., New Delhi, Second reprint, 2012.

T 3. Ramana B.V., higher Engineering Mathematics, Tata McGraw-Hill, New Delhi, 11thReprint, 2010.

Reference Book(s):

R 1. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2007).

R 2. N.P.Bali and Manish Goyel, A text book of Engineering Mathematics, Laxmi Publication, Reprint, 2008.

R 3. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

Web References:

1. http://nptel.ac.in/courses/122107037/19 2

   http://nptel.ac.in/video.php?subjectIId=108106075

   https://nptel.ac.in/courses/111103021/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO2	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO3	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO4	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO5	3	2	1	1	-	-	1	1	-	1	-	1	-	-

High-3; Medium-2; Low-1

Assessment pattern:

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorial/Quiz/Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Course Code: 19CECN1301	Course Title: CONSTRUCTION MATERIALS AND PRACTICES			
Course Category: Professional Core		Course Level: Practice		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45		Max Marks:100

Pre-requisites

➢ NIL

Course Objectives

The course is intended to:

1. Acquire basic knowledge on various building materials used in construction.
2. Discuss the importance of metals, timber and other materials.
3. Study the specifications, details and sequence of sub structure construction activities.
4. List the concepts and techniques used in super structure construction.
5. Identify the equipment required in various levels of construction.

UNIT I - BASIC CONSTRUCTION MATERIALS   9 Hours

Stones –Bricks – Classification – Manufacturing of Clay Bricks –Bricks for Special Use – Cement Concrete blocks – Considerations for use – Lime – Types – Properties and Uses – Cement: Manufacture – Types – Characteristics – Properties – Fly ash. Aggregates – Characteristics – Types – Mortar: Classification – Preparation – Selection.

UNIT II - METALS, TIMBER AND OTHER MATERIALS   9 Hours

Steel – Types – Manufacturing process– Tests – Structural steel – Rebar – Alloy steels – Aluminium – Properties and Uses – Timber – Types –Characteristics – Seasoning – Defects – Timber products – Paints – Types– Glass – Characteristics – Selection – Ceramics – Composite materials – Geo-synthetics – properties and applications.

UNIT III - SUB STRUCTURE CONSTRUCTION PRACTICES   9 Hours

Specifications, details and sequence of activities - Site Clearance - Marking - Earthwork - Excavation – Dewatering - Building foundations – Types of foundations - Plinth beam – Filling in foundation trenches– Anti-termite treatment – Damp-proofing and Waterproofing – Sand filling in basement.

UNIT IV - SUPER STRUCTURE CONSTRUCTION PRACTICES   9 Hours

Masonry – Formwork - Scaffolding - Roofs and roof covering - Flooring - types of flooring - Joints in Concrete - Staircase: Types and Construction – Plastering – Plastering methods - Pointing – Types - Painting – Preparation and Process – Defects.

UNIT V - CONSTRUCTION EQUIPMENTS   9 Hours

Earthwork equipments- tractors, motor graders, scraper, front end loader, earth mover - Concreting equipments - batching, mixing, transportation, concreting and compaction - Equipment for material handling and erection of structures - Dewatering and pumping equipments.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Identify the building materials used for construction based on its properties, characteristics, classification and manufacturing methods, also explain the selection and preparation process of mortar.	Understand
CO.2 Elucidate the manufacturing process, properties and tests to be performed for metals, timber and composite materials for various civil engineering applications.	Understand
CO.3 Explain the specifications, details and sequence of sub structure construction activities of civil engineering projects.	Understand
CO.4 Identify appropriate scaffoldings for super structure construction activities as well as various super structure construction processes.	Understand
CO.5 Identify and illustrate the construction equipment for various applications in construction project.	Understand

Text Book(s):

T 1. Punmia B.C., Ashok Kumar Jain, Arun Kumar Jain, "Building Construction", LaxmiPublications Pvt. Ltd., 2016

T 2. Bindra and Arora, "Building Materials and Construction", DhanpatRai& Sons, NewDelhi, 2015

T 3. Varghese. P.C, "Building Materials", 2ndRevised edition (2015)PHI Learning Pvt. Ltd, New Delhi.

Reference Book(s):

R 1. Roy Chudley, Roger Greeno, Advanced Construction Technology, Pearson Prentice Hall, 2006.

R 2. Rangwala S.C., "Engineering Materials" Charotar Publishing House, Anand, India, 2014

R 3. P.C. Varghese, "Building Construction", PHI Learning Private Limited, New Delhi, 2010.

R 4. M.S. Shetty, "Concrete Technology Theory and Practice", S. Chand and Company Ltd., 2008.

Web References:

1. www.understandconstruction.com
2. www.engineeringcivil.com

Course Articulation Matrix*

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High-3; Medium-2; Low-1

Assessment pattern:

	Assessment Component	CO. No.	Marks	Total
Continuous Comprehensive Evaluation	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorial/Quiz/Assignment	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Course Code: 19CECN1302	Course Title: TRANSPORATION ENGINEERING		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ NIL

Course Objectives

The course is intended to:
1. Understand the concept of highway alignment.
2. Comprehend the geometrics of highway.
3. Gain knowledge on the various pavement materials and its properties.
4. Understand the design procedure of the flexible and rigid pavement according to the IRC codes, specifications and methods.
5. Comprehend the elements of highway construction.

UNIT I - HIGHWAY ALIGNMENT   **9 Hours**

Different Modes of Transportation; Highway Development in India; Highway Alignment, Survey- Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, and Detailed Project Report

UNIT II - GEOMETRIC DESIGN OF HIGHWAYS   **9 Hours**

Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves. introduction to Elements of Traffic Engineering

UNIT III - PAVEMENT MATERIALS   **9 Hours**

Properties and testing of Sub grade soil, aggregates, bituminous binders

UNIT IV - PAVEMENT DESIGN   **9 Hours**

Types of Pavements, Design factors, Design of bituminous paving mixes; Design of Flexible Pavement by CBR method (IRC : 37- Latest revision), Design of rigid pavement, Westerguard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2015)

UNIT V - ELEMENTS OF HIGHWAY CONSTRUCTION   **9 Hours**

Embankment, subgrade, subbase and base courses, bituminous surface courses, concrete pavements, soil stabilization; Drainage; Evaluation and Maintenance of highways.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the concepts of highway planning as well as highway alignment for transportation infrastructural projects.	Understand
CO.2 Elucidate the geometrics of highway and calculate the super elevation, sight distance and widening of curves.	Apply
CO.3 Illustrate the various pavement materials for highway construction projects.	Understand
CO.4 Design the flexible and rigid pavement according to the IRC codes.	Apply
CO.5 Illustrate the various elements of highway construction as per the standards.	Understand

Text Book(s)

T 1.   Khanna, S. K. and Justo, C.E.G., Highway Engineering, Nem Chand & Bros, 10th Edition 2015

T 2.   Kadiyali, L.R., Traffic Engineering and Transport Planning, Khanna Publishers, Eighth edition,2013

T 3.   Subhash C Saxena, Textbook of Highway and Traffic Engineering., CBS Publishers, 2014

Reference Book(s):

R 1.   C. Venkatramaiah., Transportation Engineering-Highway Engineering, Universities Press (India) Private Limited, Hyderabad, 2015

R 2.   Partha Chakroborty and Animesh Das Principles of Transportation Engineering, PHI Learning Pvt. Ltd., 2005

R 3.   IRC: 37- Latest revision, "Tentative Guidelines for the design of Flexible Pavements" Indian Roads Congress, New Delhi

R 4.   IRC:58-2015 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways (Fourth Revision) (with CD)

Web References:

1.   https://www.vidyarthiplus.com/vp/attachment.php?aid=10395

2.   https://www.scribd.com/doc/119865487/Pavement-Engineering

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High-3; Medium-2; Low-1.

Assessment pattern:

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials /Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Course Code: 19CECN1303	Course Title: SURVEYING		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 4: 0: 0	Credits: 4	Total Contact Hours: 60	Max Marks:100

Pre-requisites

> ➤ NIL

Course Objectives

The course is intended to:

1. Conventional surveying techniques [Chain, Compass and Plane table]

2. Levelling

3. Theodolite Surveying

4. Tacheometric Surveying

5. Curves and Modern Surveying

UNIT I - BASICS OF SURVEYING   12 Hours

Definition - Principles – Classification. Introduction to Chain, Compass, Plane table – Errors and corrections in Chain/Tape, Compass – bearing, meridian – Open and closed traverse – Closing errors

UNIT II - LEVELLING   12 Hours

Principles and theory of levelling - Types of levels, levelling staff and their types - Effect of curvature and refraction - Longitudinal, cross-sectional and reciprocal levelling - Reducing levels by rise and fall and height of collimation methods and check. Definition - Contour interval and horizontal equivalent - Characteristics - Uses of contour maps - Computation of area and volume from contour map

UNIT III - THEODOLITE SURVEYING   12 Hours

Theodolite - types, features and fundamental axes - Adjustments; horizontal angles - Vertical angles - Heights and distances of inaccessible points - Methods of traversing - Problems on omitted measurements – Gale's Traversing method for closing error correction.

UNIT IV - TACHEOMETRIC SURVEYING   12 Hours

Methods - Determination of constants of the tacheometer - Use of anallactic lens - Distance and elevation formulae for inclined sights with vertical and normal holding staff - Movable hair method - principles of tangential tacheometry - Problems in tacheometry - Subtense bar method.

UNIT V - CURVES AND MODERN SURVEYING   12 Hours

Elements of simple curve - Location of tangent points - Setting out of simple curve by offset and Rankine's methods. Vertical curves – Types – grades. Total Station – Electronic Theodolite – Laser alignment instrument – Global Positioning System. Introduction to remote sensing (RS) and Geographical Information System (GIS).

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the concepts of surveying for linear and angular measurements through conventional techniques to arrive solutions to basic surveying problems.	Understand
CO.2 Illustrate the levelling methods, calculate reduce levels for the give area as well as compute the area and volume from contour map.	Apply
CO.3 Explain the concepts of theodolite surveying to arrive solutions to find omitted measurements and closing error correction in traverse.	Apply
CO.4 Calculate the elevation and distance using tacheometric principles.	Apply
CO.5 Calculate the important parameters of curves for setting out of alignments in transport planning as well as explain the principles of modern surveying techniques.	Apply

Text Book(s)

T 1.   Punmia B C, "Surveying" - vol. 1, vol. 2 and vol 3, Laxmi Publications (P) Ltd., New Delhi, 2016.

T 2.   Agor. R, "A Text Book of Surveying and Levelling", Khanna Publishers, 2009.

T 3.   Duggal R K, "Surveying", Vol I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017.

Reference Book(s):

R 1.   Kanetkar T P, "Surveying and Levelling", Part I and II, Pune Vidyarthi Griha Prakashan, 2006.

R 2.   Bannister A and Raymond S, "Surveying", 7th Edition, Addison Wesley Longman ltd, England, 1998.

R 3.   Gopi. S, Sathikumar. R, Madhu. N, "Advanced Surveying", Dorling Kindersley (India) Pvt. Ltd.., 2008.

R 4.   Chandra. A.M., "Surveying", New Age International Private Ltd Publishers, 2015.

Web References:

1.   http://www.aboutcivil.org/surveying-levelling%20II.html

2.   http://civil.engineering.webservices.utoronto.ca/Assets/Civil+Engineering+Digital+Assets/

3.   http://www.nptel.ac.in/courses/105107122/

4.   http://www.vssut.ac.in/lecture_notes/lecture1428642587.pdf

5.   www.scribd.com/doc/63716977/Surveying-1-Lecture-Notes

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2; Low-1.

Assessment Pattern

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Course Code: 19CESN1301	Course Title: SOLID MECHANICS		
Course Category: Engineering Science	Course Level: Practice		
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites
➢ Engineering Mechanics

Course Objectives

The course is intended to:
1. Learn the concept of slope and deflection in determinate beams
2. Understand the stresses in oblique plane and to study continuous beams.
3. Study the energy theorems.
4. Gain knowledge on columns and cylinders.
5. Acquire the knowledge on shafts and springs

UNIT I – DEFLECTION OF STATICALLY DETERMINATE BEAMS   9+3 Hours

Deflection and slope of cantilever, simply supported and overhanging beams – Double integration method, Macaulay's method, Moment area method and Conjugate beam method.

UNIT II – PRINCIPAL STRESSES AND STATICALLY INDETERMINATE   9+3 Hours BEAMS

Biaxial state of stress – Stress at a point – Stress on inclined plane – Principal stresses and principal planes – Mohr's circle of stresses. Theorem of three Moments – Analysis of continuous beam (up to two spans)-Shear force and B.M diagrams for continuous beams.

UNIT III – ENERGY PRINCIPLES   9+3 Hours

Strain energy and Strain energy density - Strain energy in axial load, flexure, Shear and Torsion - Strain energy and complimentary energy - Castigliano's and Engessor's Energy theorems - Principle of virtual work - Application of Energy theorem for computing deflection - Simple beams, plane trusses and simple rigid plane frames - Maxwell's reciprocal theorem-Williot Mohr diagram.

UNIT IV – COLUMNS AND CYLINDERS   9+3 Hours

Type of columns, eccentrically loaded short columns, combined bending and direct stresses, crushing load – middle third rule – Euler's theory – Limitations of Euler's theory - critical loads for prismatic columns with different end conditions; Rankine's formula - Thin cylinders - Circumferential stress, longitudinal stress, volumetric strain under internal pressure – Thick cylinders.

UNIT V – TORSION OF SHAFTS AND SPRINGS   9+3 Hours

Elastic theory of torsion - Stresses and deformation in circular solid and hollow shafts - Combined bending moment and torsion of shafts - Strain energy due to torsion - Modulus of Rupture – Power transmitted to shaft – Shaft in series and parallel - Design of shafts - Closed coiled and open coiled helical springs subjected to axial load, leaf springs, deflection of springs.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1 Compute slope and deflection for different types of beams using appropriate method.	Apply
CO2 Calculate the stresses in oblique plane and to draw the shear force and bending moment for continuous beam for various support conditions.	Apply
CO3 Apply energy theorems to compute the deflection for beams, trusses and frames	Apply
CO4 Calculate the critical load for various end conditions of columns as well as the stresses in thin and thick cylinders.	Apply
CO5 Calculate the design parameters of shaft and springs for various applications.	Apply

Text Book(s)

T 1.   R.K. Rajput, "Strength of Materials", Sixth Edition, S. Chand & Company Pvt. Ltd., New Delhi, 2015.

T 2.   R.K. Bansal, "A Text Book of Strength of Materials", Sixth Edition, Laxmi Publications (P) Ltd., New Delhi, 2017.

T 3.   Egor P Popov, Engineering Mechanics of Solids, Second Edition, Prentice Hall of India, New Delhi, 2005.

Reference Book(s):

R.1   Timoshenko. S.P. and Young D.H., "Elements of Strength of Materials", 5th edition (SI Units), Affiliated East-West Press Ltd., New Delhi, 2012

R.2   Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf and David F. Mazurek "Mechanics of Materials", Seventh Edition, McGraw Hill Education, New York, 2015.

R.3   R.C. Hibbeler, "Mechanics of Materials", Nineth Edition, Pearson-Prentice Hall, New Delhi, 2014.

Web References:

1.   http://nptel.ac.in/courses/105106116

2.   http://web.mit.edu/emech/dontindex-build/

3.   http://www.aboutcivil.org/solid-mechanics.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2; Low-1.

Assessment pattern:

	Assessment Component	CO .No.	Marks	Total
Continuous Comprehensive Evaluation	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Course Code: 19CECN3301	Course Title: SURVEYING PRACTICE LABORATORY			
Course Category: Professional Core		Course Level: Practice		
L:T:P (Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45		Max Marks:100

Pre-requisites

> ➢ NIL

Course Objectives

The course is intended to:

- Impart the field knowledge of surveying measurements and a broad overview of surveying instruments and their applications.

List of Experiments:

1. Study of Instruments – chains, compass, plane table and dumpy levels.
2. Determination of the area of a closed traverse after eliminating the closing error using Compass Surveying
3. Determination of RL of different points on the earth surface using dumpy level
4. Verifying the accuracy of levelling using method of Check Levelling
5. To plot the LS & CS of a given length of road using Profile levelling.
6. Determination of horizontal angles by Method of repetition and reiteration.
7. Determination of elevation of an object whose base is inaccessible by Single Plane method
8. Determination of elevation of an object whose base is inaccessible by Double Plane method
9. Determination of gradients between given points by stadia method
10. Set out a simple circular curve by Rankine's method.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Survey the given plot using chain and compass to determine the area through linear and angular measurements.	Apply
CO.2 Record the levels using various methods of levelling to calculate the reduced levels of given points and plot the level profile as well as contour maps.	Apply
CO.3 Determine the elevation of an object by single and double plane methods.	Apply
CO.4 Set out the simple curves using Rankines method.	Apply
CO.5 Demonstrate and determine the measurements with the help of modern surveying instruments for real time applications.	Apply

Reference(s):

R 1. Punmia B C, "Surveying" - vol. 1, vol. 2 and vol 3, Laxmi Publications (P) Ltd., New Delhi, 2016.

R 2. Agor. R, "A Text Book of Surveying and Levelling", Khanna Publishers, 2009.

R 3. Duggal R K, "Surveying", Vol I & II, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017.

R 4. Surveying Practice Laboratory Manual, Department of Civil Engineering, MCET, Pollachi.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	3	-	-	-	1	2	2	-	2	2	-
CO2	1	-	-	3	-	-	-	1	2	2	-	2	2	-
CO3	1	-	-	3	-	-	-	1	2	2	-	2	2	-
CO4	1	-	-	3	-	-	-	1	2	2	-	2	2	-
CO5	1	-	-	3	-	-	-	1	2	2	-	2	2	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19CECN3302	Course Title: MATERIALS LABORATORY		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Pre-requisites

- ➢ NIL

Course Objectives

The course is intended to:

- Provide an understanding of the basic properties of construction materials and presents current field and laboratory standards and testing requirements for these materials.

List of Exercises

1. Determination of modulus of elasticity for a given metal specimen
2. Determine the properties of bricks
3. Determine the properties of cement
4. Determine the properties of coarse aggregates
5. Determination of torsional strength and modulus of rigidity for a given metal specimen.
6. Verification of Maxwell reciprocal theorem
7. Determination of hardness and impact strength
8. Determination of spring constant on a given spring specimen
9. Determination of slope and deflection of a beam by moment area theorems
10. Determination of Flexural Rigidity (EI) for a given specimens
11. Determination of shear strength of metals (Double Shear test).
12. Determination of buckling load for a given end condition of a column.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Determine the important mechanical properties of materials.	Apply
CO.2 Demonstrate the different theorems of beam as well as column members.	Apply
CO.3 Calculate the hardness of various metals.	Apply
CO.4 Calculate the impact strength of various metals.	Apply
CO.5 Determine the Flexural Rigidity (EI), shear strength of a beam and buckling load for a given end condition of a column.	Apply

Reference Book(s):

R 1. Bansal, R.K., "A Text Book of Strength of Materials", Laxmi Publications (P) Ltd., New Delhi 2010.

R 2. Timoshenko. S.P. and Young D.H., "Elements of Strength of Materials", 5th edition (SI Units), Affiliated East-West Press Ltd., New Delhi, 2012.

R 3. 19CELN3302 - Materials Laboratory Manual

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	3	-	-	-	1	2	2	-	2	2	-
CO2	1	-	-	3	-	-	-	1	2	2	-	2	2	-
CO3	1	-	-	3	-	-	-	1	2	2	-	2	2	-
CO4	1	-	-	3	-	-	-	1	2	2	-	2	2	-
CO5	1	-	-	3	-	-	-	1	2	2	-	2	2	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19MABG1401	Course Title: PROBABILITY AND STATISTICS (Common to EE,EC,AU,CS,ME,IT & CE)		
Course Category: Basic Science	Course Level: Practice		
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

> ➢ Nil

Course Objectives

The course is intended to:

1. Calculate expectations and variances of random variables
2. Apply the concepts of standard distributions to solve practical problems
3. Calculate the correlation and regression for two variables
4. Test the samples based on hypothesis
5. Analyse the samples based on variance

UNIT I - PROBABILITY AND RANDOM VARIABLES   9+3 Hours

Axioms of Probability- Conditional Probability- Total Probability -Baye's Theorem- Random Variables- Probability Mass Function- Probability Density Functions- Properties - Moments- Moment generating functions and their properties.

UNIT II - STANDARD DISTRIBUTIONS   9+3 Hours

Binomial- Poisson- Uniform –Exponential- Normal Distributions and their properties- Functions of a random variable.

UNIT III - TWO DIMENSIONAL RANDOM VARIABLES   9+3 Hours

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and regression – Transformation of random variables.

UNIT IV - TESTING OF HYPOTHESES   9+3 Hours

Sampling Distributions- Testing of hypotheses for mean, variance, proportions and differences using Normal, t, Chi-Square and F distributions – Tests for independence of attributes and Goodness of fit.

UNIT V - DESIGN OF EXPERIMENTS   9+3 Hours

Analysis of Variance (ANOVA)- One way Classification – Completely Randomized Design (CRD) – Two-way Classification – Randomized Block Design (RBD) – Latin square

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Calculate expectations and variances of random variables	Apply
CO.2 Apply the concepts of standard distributions to solve practical problems	Apply
CO.3 Calculate the correlation and regression for two variables	Apply
CO.4 Test the samples based on hypothesis	Apply
CO.5 Analyse the samples based on variance	Apply

Text Book(s):*

T 1. Veerajan T, "Probability, Statistics and Random process", 4th Edition, Tata McGraw-Hill, New Delhi, 2013.

T 2. Dr.J.Ravichandran, "Probability and Statistics for Engineers", 1st Edition, Wiley India Pvt.Ltd.2010.

Reference Book(s):

R 1. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", 9thEdition Pearson Education, Asia, 2016.

R 2. M.R. Spiegel,J. Schiller and R.A. Srinivasan, "Schaum's Outlines Probability and Statistics", 3rd Edition,Tata McGraw Hill edition, 2009.

R 3. Morris DeGroot, Mark Schervish, "Probability and Statistics", Pearson Educational Ltd, 4th Edition, 2014.

R 4. Johnson and C.B. Gupta, "Probability and Statistics for Engineers", 9th Edition, Pearson Education, Asia, 2016.

Web References:

1. https://onlinecourses.nptel.ac.in/111105041/
2. https://nptel.ac.in/downloads/111105041/
3. https://nptel.ac.in/courses/111105090/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO2	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO3	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO4	3	2	1	1	-	-	1	1	-	1	-	1	-	-
CO5	3	2	1	1	-	-	1	1	-	1	-	1	-	-

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN1401	Course Title: HYDRAULICS ENGINEERING		
Course Category: Professional Core	**Course Level: Practice**		
L:T:P (Hours/Week) **3: 1: 0**	**Credits:4**	**Total Contact Hours:60**	**Max Marks:100**

Pre-requisites

> ➤ NIL

Course Objectives

The course is intended to:

1. Introduce the concepts of static pressure, buoyant force and metacentric height.
2. Know the flow properties through velocity potential function and stream function and apply the Bernoulli's theorem for pipe flow.
3. Understand the major and minor losses in pipe flow.
4. Study the principles of most economical channel section.
5. Impart knowledge on the performance of pumps and turbines.

UNIT I - FLUID PROPERTIES AND FLUID STATICS   12 Hours

Fluid – definition, distinction between solid and fluid – Units and dimensions – Properties of fluid. Fluid statics – concepts of fluid static pressure, absolute and gauge pressure – Pressure measurements using manometers and pressure gauges – Forces on planes – centre of pressure – Buoyancy – Metacentric height - Floatation.

UNIT II - FLUID KINEMATICS AND DYNAMICS   12 Hours

Fluid kinematics: Flow visualization – Lines of flow – Types of flow- Velocity field and acceleration – Continuity (one dimensional and three-dimensional form)- stream function – velocity potential function – flow net
Fluid dynamics: Euler's equation along a streamline – Bernoulli's equation – Applications – Venturimeter, orificemeter. Linear momentum equation and its applications. Boundary layer concept- displacement, energy and momentum thickness.

UNIT III - FLOW THROUGH PIPES   12 Hours

Laminar flow through circular pipes(Hagen Poiseulle's equation)- Hydraulic and energy gradient – flow through pipes – Darcy Weisbach equation – friction factor – Moody's diagram – Major and minor losses of flow in pipes – Pipes in series and in parallel.

UNIT IV - FLOW THROUGH OPEN CHANNELS   12 Hours

 Definition - Differences between pipe flow and open channel flow –Types open channels - Types of Flow – Properties of open channel - Fundamental equations - Velocity distribution in open channel – Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

UNIT V - PUMPS AND TURBINES   12 Hours

Centrifugal pump – components – working principle – priming of centrifugal pump – specific speed- reciprocating pump – components – working principles – single and double acting reciprocating pump – discharge through a pump- work done – pump efficiency – negative slip. Turbines – classification – impulse and reaction turbines – head and efficiencies of hydraulic turbines – components and functions of Pelton wheel turbine, Francis turbine, Kaplan turbine – Velocity triangle – specific speed.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Determine the fluid properties and its behaviour in static conditions.	Understand
CO.2 Apply the conservation laws for fluids in fluid kinematics and dynamics.	Apply
CO.3 Estimate losses in pipelines and analysis of pipes connected in series and parallel.	Apply
CO.4 Describe the basics of open channel flows, analysis of uniform flow with specific energy concept and estimate the most economical channel section.	Apply
CO.5 Explain the working principle of pumps and turbines, and estimate their performance.	Apply

Text Book(s):

T 1.   R.K. Rajput, "A text book of fluid mechanics", S. Chand Publishing, 2019

T 2.   Subramanya, K., "Flow in open channels", Tata McGraw Hill Publishing Company Ltd, New Delhi (2015)

T 3.   Som S., Biswas G., and Chakraborty S., "Introduction to fluid mechanics and fluid machines", Tata McGraw Hill Education private Ltd.,New Delhi, 2011.

T 4.   R.K. Rajput,"A text book of hydraulic machines", S. Chand Publishing, 2019.

Reference Book(s):

R 1.   Chow VenTe, "Open Channel hydraulics", Tata McGraw Hill Book company Ltd, New Delhi (2009)

R 2.   Modi, P.N., and Seth, S.M., "Hydraulics and Fluid Mechanics", Standard book house, New Delhi (2019)

R 3.   Srivastava, R., "Flow through open channels", Oxford University Press, New Delhi (2007)

R 4.   Chanson, H., "The Hydraulics of open channel flow: An Introduction", Elsevier (2013)

R 5.   Frank M White, "Fluid mechanics", Tata McGraw Hill, New Delhi, 2008.

R 6.   John F Douglas, Janusz M, Gasiorek and John A. Swaffield. "Fluid mechanics", Fourth edition, Pearson education limited, New Delhi, 2001.

Web References:

1.   http://nptel.ac.in/courses/105103095

2.   http://www.vidhyarthiplus.com/vp/Thread-ME2204-Fluid-Mechanics-and-Machinery-

3.   http://www.et.byu.edu/~2014/che374/lectureNotes/lectureNotes.html

4. http://www.annaunivupdates.com/2015/01/ce6403-applied-hydraulic-engineering-
5. http://nptel.ac.in/courses/105106114/
6. http://web.itu.edu.tr/~bulu/hydraulics_files/lecture_notes_05.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN1402	Course Title: CONCRETE TECHNOLOGY			
Course Category: Professional Core		Course Level: Practice		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45		Max Marks:100

Pre-requisites

> Construction Materials and Practices
> Materials Laboratory

Course Objectives

The course is intended to:

1. Understand the theoretical concept of concrete materials which includes Cement, Aggregate and Water.
2. Study the different types of admixtures.
3. Study the concrete mix design.
4. Study the behavior of concrete at its fresh and hardened state.
5. Know the different types of special concrete and its applications.

UNIT I - CONCRETE CONSTITUENTS   **9 Hours**

Composition of cement - Hydration of cement - Structure of hydrated cement - Aggregate - Classification - Testing - Methods of combining aggregates - Grading requirements as per BIS - Quality of water.

UNIT II - ADMIXTURES   **9 Hours**

Chemical admixture - Accelerators, Retarders, Plasticisers, Super plasticisers, Water proofers - Effects on fresh and hardened properties - Mineral admixture - Fly ash, Silica fume, Ground granulated blast furnace slag, Metakaoline - Effects on fresh and hardened properties.

UNIT III - CONCRETE MIX PROPORTIONING   **9 Hours**

Basic considerations - Principles of mix proportioning – Quality control - Methods of mix proportioning - BIS and ACI mix design procedure - Mix design examples - Correction for moisture content and bulking.

UNIT IV - PROPERTIES OF CONCRETE   **9 Hours**

Fresh concrete properties - Workability and factors affecting it - Segregation - Bleeding - Hardened concrete properties - Factors affecting strength - curing - methods of curing - Dimensional stability - Creep, Shrinkage, Permeability - Tests on permeability - RCPT, Half cell - Non Destructive Testing - Rebound hammer test, Ultrasonic pulse velocity method.

UNIT V - SPECIAL CONCRETES   **9 Hours**

Light weight concrete - High strength concrete - High performance concrete - Fibre reinforced concrete - Ferrocement - Polymer Concrete - Ready mix concrete - Shotcrete - Self compacting concrete - their production, properties and application.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the properties of the constituent materials of concrete.	Understand
CO.2 Explain the effect of admixtures on fresh and hard state of concrete.	Understand
CO.3 Calculate the mix proportions of concrete as per BIS and ACI standards	Apply
CO.4 Explain the properties and perform various test on fresh and hardened concrete	Understand
CO.5 Explain the properties of special concrete, their real time applications.	Understand

Text Book(s):

T 1. Shetty. M.S, "Concrete Technology", S. Chand and Company Ltd., New Delhi, 2010.

T 2. Gambhir. M.L, "Concrete Technology", Tata Mc-Graw Hill Company, New Delhi, 2013.

Reference Book(s):

R 1. Santhakumar. A.R, "Conrete Technology", Oxford university press, New Delhi, 2007.

R 2. Neville A.M "Properties of Concrete", Pearson Education Asia Pvt Ltd., New Delhi, 2012.

R 3. Povindar K. Mehta, Paulo J. M. Monteiro, "Concrete: Microstructure, Properties, and Materials", Mc-Graw Hill Company, 2011.

Web References:

1. http://nptel.ac.in/courses/105102012/

2. http://freevideolectures.com/Course/3357/Concrete-Technology/1

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO3	3	-	-	-	-	-	-	-	-	-	-	2	3	-
CO4	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	-	-	-	-	-	-	-	-	-	-	2	2	-

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN1403	Course Title: STRUCTURAL ANALYSIS		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

  ➢ Solid Mechanics

Course Objectives

The course is intended to:

1. Gain knowledge on Consistent deformation and flexibility matrix method.
2. Understand the Moment distribution and stiffness matrix method.
3. Know the Influence line diagrams.
4. Know the Arches and cables.
5. Understand the Plastic analysis

UNIT I - CONSISTENT DEFORMATION AND FLEXIBILITY MATRIX METHOD　　　　　　　　　　　　　　　　**9+3 Hours**

Analysis of statically indeterminate structures by the method of consistent deformations-analysis of rigid frames - Analysis of statically indeterminate trusses by the method of consistent deformations - Flexibility Matrix method Concept of flexibility matrix - analysis of continuous beams - plane frames and pin jointed plane trusses.

UNIT II - MOMENT DISTRIBUTIONAND STIFFNESS MATRIX METHODS　　　　　　　　　　　　　　　　**9+3 Hours**

Analysis of Statically indeterminate Structures; Distribution and carryover of moments - Stiffness and carry over factors - Analysis of continuous beams - Plane rigid frames with and without sway. Stiffness Matrix method Stiffness matrix for beam element - analysis of continuous beams - plane frames & pin jointed plane trusses.

UNIT III - INFLUENCE LINES FOR MOVING LOAD　　　　　　**9+3 Hours**

System of moving loads- Equivalent UDL – Influence lines for reactions, shear force and bending moment in statically determinate beams for concentrated and uniformly distributed moving loads – Influence lines for member forces in statically determinate pin-jointed plane frames – Influence lines for three hinged arches.

UNIT IV - ARCHES AND CABLE STRUCTURES　　　　　　　　**9+3 Hours**

Arches as structural forms - Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches - Settlement and temperature effects. Cables, Suspension bridges and Space frames: Suspension cables – Cables with two and three hinged stiffening girders.

UNIT V - PLASTIC ANALYSIS   9+3 Hours

True and idealized stress - strain curve for mild steel in tension, stress distribution in elastic, elasto-plastic and plastic stage - Plastic moment of resistance — Plastic modulus — Shape factor — Load factor — Concept of plastic hinge and collapse mechanism - Static and kinematic methods - Upper bound, lower bound and uniqueness theorems - Plastic analysis of determinate and indeterminate beams, single bay single storied portal frames.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Analyse the statically indeterminate structures using consistent deformation and flexibility matrix methods to plot SFD and BFD.	Analyse
CO.2 Analyse the statically indeterminate structures using moment distribution and stiffness matrix methods to plot SFD and BMD.	Analyse
CO.3 Analyse the effect of moving loads acting on the beams, arches and frames using influence line diagrams.	Analyse
CO.4 Calculate the internal forces, moments and displacement for various types of arches and cables.	Apply
CO.5 Explain the concepts of plastic analysis and calculate the plastic moments for determinate and indeterminate structures.	Apply

Text Book(s):

T 1. Vaidyanadhan, R and Perumal, "Comprehensive Structural Analysis - Vol. 1 & Vol. 2", P, Laxmi Publications, New Delhi, 2008

T 2. B. C. Punmia, Ashok Kumar Jain, Arun K. Jain, "Theory of Structures", Laxmi Publications Pvt. Ltd, 2003.

T 3. S.S. Bhavikatti, Structural Analysis, Vol I & II, Vikas Publishing House Pvt. Ltd, 2011.

Reference Book(s):

R 1. Wang, C.K., Intermediate Structural Analysis, McGraw Hill, 2017
R 2. Vazirani, V.N. and Ratwani, M.M., Analysis of Structures Vol-1, Vol-2, Khanna Publishers, 2009
R 3. Ramamrutham, S. and Narayan, R., Theory of Structures, Dhanpat Rai Publishing Co (P) Ltd, 2020

Web References:

1. https://nptel.ac.in/courses/105101085/
2. https://nptel.ac.in/courses/105105109/
3. http://www.iste.co.uk/book.php?id=1367

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN3401	Course Title: HYDRAULICS ENGINEERING LABORATORY	
Course Category: Professional Core	Course Level: Practice	
L:T:P (Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Nil

Course Objectives

The course is intended to:

- Provide hands-on experience of the application of flow measuring devices and performance characteristics of pumps and turbines.

List of Exercises

1. Determination of metacentric height of a floating body
2. Classification of flow based on Reynolds number
3. Verification of Bernoulli's theorem
4. Measurement of flow using venturi meter and orifice meter
5. Measurement of flow through orifice
6. Determination of friction factor of various pipe materials
7. Determination of losses of different pipe fittings
8. Measurement of flow through notches
9. Measure the performance of centrifugal pump
10. Measure the performance of reciprocating pump
11. Measure the performance of Kaplan turbine
12. Measure the performance of Pelton Wheel turbine

Experiments beyond syllabus

1. Measure the efficiency of a multistage centrifugal pump
2. Measure the performance of Francis turbine
3. Measure the efficiency of a submersible pump

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Differentiate between laminar, transition and turbulent flow using Reynolds apparatus.	Apply
CO.2 Verify the Bernoulli s Theorem using the given apparatus.	Apply
CO.3 Determine the major and minor losses for pipes made of different materials.	Apply
CO.4 Measure the flow through pipes and open channel.	Apply
CO.5 Calculate the efficiency and draw the characteristic curves of the hydraulic machines.	Apply

Reference Book(s):

R 1. R.K. Rajput., "A textbook of hydraulic machines", S. Chand Publishing, New Delhi, 2019.

R 2. Bansal, R.K., "Fluid mechanics and hydraulic machines", Laxmi Publications Ltd, New Delhi, 2010.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO2	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO3	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO4	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO5	1	-	-	3	-	-	-	1	2	2	-	2	3	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19CECN3402	Course Title: CONCRETE AND TRANSPORTATION ENGINEERING LABORATORY		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Construction Materials and Practices

➢ Transportation Engineering

The course is intended to:

• To gain hands on experience of the various tests to be conducted for fresh and hardened concrete as well as highway materials.

List of Exercises

1. Preparation of concrete mix design using IS code of practice.
2. Determination of workability of fresh concrete.
3. Determination of compressive, split tensile and flexural strength on hardened concrete.
4. Determination of modulus of elasticity of concrete.
5. Determination of strength & quality of concrete using NDT.
6. Determination of workability of self-compacting concrete.
7. Determination of specific gravity of bitumen.
8. Determination of softening point of bitumen.
9. Determination of ductility test on bitumen.
10. Determination of flash and fire point of bitumen.
11. Determination of binder content of bitumen using binder recovery extraction test.
12. Determination of optimum bitumen content using Marshall Stability test.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Calculate the concrete mix proportions as per IS method for different types of concrete.	Apply
CO.2 Demonstrate and determine the various fresh concrete properties as per IS standards	Apply
CO.3 Demonstrate and determine the various hardened concrete properties as per IS standards.	Apply
CO.4 Demonstrate and determine the basic properties of bitumen for highway projects.	Apply
CO.5 Determine optimum bitumen content as per IS standards.	Apply

Reference Book(s):

R 1. M. S. Shetty & A K Jain, "Concrete Technology: Theory and practice", S. Chand publishers, 2018.

R 2. S.K.Khanna and C.E.G Justo, "Highway Engineering" Nem Chand & Brothers publishers, 2015.

R 3. Concrete and transportation engineering laboratory manual, MCET, Pollachi

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO2	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO3	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO4	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO5	1	-	-	3	-	-	-	1	2	2	-	2	3	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19PSHG6002	Course Title: Universal Human Values 2: Understanding Harmony		
Course Category: Humanities	**Course Level: Practice**		
L:T:P (Hours/Week) 2:1: 0	**Credits:3**	**Total Contact Hours:45**	**Max Marks:100**

Pre-requisites

> ➢ Induction Program (UHV 1)

Course Objectives

The course is intended to:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2. Strengthening of self-reflection
3. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
4. Development of commitment and courage to act
5. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

UNIT I - INTRODUCTION TO VALUE EDUCATION   9 Hours

Need for the Value Education; Self -exploration as the process for value education; Continuous Happiness and Prosperity: A look at basic Human Aspirations; Right understanding: Relationship and Physical Facilities; Happiness and Prosperity: current scenario; Method to fulfill the Basic human aspirations

UNIT II - HARMONY IN HUMAN BEING   9 Hours

Human being as a co-existence of self ('I') and the material 'Body'; needs of Self ('I') and 'Body'; The Body as an instrument of 'I'; Harmony in the self ('I'); Harmony of the self ('I') with body; Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

UNIT III - HARMONY IN THE FAMILY AND SOCIETY   9 Hours

Harmony in the Family the basic unit of human interaction; Values in human to human relationship; Trust as the foundational values of relationship; Respect as the right evaluation ;Understanding harmony in the society (society being an extension of family); Vision for the universal human order.

UNIT IV - HARMONY IN THE NATURE   9 Hours

Understanding the harmony in the Nature Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature; Existence as Co-existence at all levels; Holistic perception of harmony in existence.

UNIT V - HARMONY ON PROFESSIONAL ETHICS   **9 Hours**

Natural acceptance of human values; Definitiveness of Ethical Human Conduct; Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order; Competence in professional ethics; Case study: holistic technologies, management models and production systems; Strategy for transition towards value-based life and profession

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Reflect on values, aspiration, relationships and hence identify strengths and weaknesses.	Responding
CO.2 Appraise physical, mental and social wellbeing of self and practice techniques to promote wellbeing.	Responding
CO.3 Value human relationships in family and society and maintain harmonious relationships.	Valuing
CO.4 Respect nature and its existence for survival and sustainable of all life forms and hence practice conservation of nature	Valuing
CO.5 Appreciate ethical behaviour as a result of value system in personal and professional situations	Receiving

Text Book(s):

T 4. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.

Reference Book(s):

R 1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
R 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
R 3. The story of stuff, Annie Leonard, Free Press, New York 2010.

Web References:

1. https://aktu.ac.in/hvpe/ResourceVideo.aspx

2. http://hvpenotes.blogspot.com/

3. https://nptel.ac.in/courses/109/104/109104068/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	1	2	2	-	-	2	-	-
CO2	-	-	-	-	-	1	2	2	2	1	-	2	-	-
CO3	-	-	-	-	-	2	2	2	2	1	-	2	-	-
CO4	-	-	-	-	-	2	2	2	2	-	-	2	-	-
CO5	-	-	-	-	-	1	2	2	2	-	-	2	-	-

High-3; Medium-2;Low-1

Assessment Pattern

	Assessment component	CO No.	Marks	Total marks weightage
Continuous assessment	Socially relevant project/Group Activities/ Assignments	1,2,3,4,5	20	75%
	Assessment by faculty mentor		10	
	Self-assessment		10	
	Assessment by peers		10	
End Semester Examination	Part A – Objective type 20x1=20 marks Part B – Short answer questions 15x 2 = 30 marks Part C – Descriptive Type Questions (Either or Pattern) 5 x 10 = 50 marks	1,2,3,4,5	100	25%
			Total	100%

Course Code: 19CEPN6401	Course Title: MINI-PROJECT
Course Category: Project	Course Level: Practice

L:T:P (Hours/Week) 0:0: 4	Credits:2	Total Contact Hours:60	Max Marks:100

Pre-requisites

> ➢ Nil

Course Objectives

The course is intended to:
- Know how to prepare the layout of the buildings, which includes architectural drawing by using building by-laws.
- Provide opportunity for the students to demonstrate their independence, individuality and originality to plan and organize projects within a specified time frame by way of applying, and implementing the principles/techniques that they have learnt through the courses.

The student should plan a residential building by applying principles of planning, local building bye laws, vastu and draw the section as well as elevation. The mini project work shall be carried out individually by the student. The progress of the project is evaluated based on a minimum of three reviews by the project review committee. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners.

Course Outcomes At the end of this course, students will be able to:	Cognitive Level
CO.1 Comprehend local building bye-laws and provisions of National Building Code in respect of building and town planning.	Apply
CO.2 Explore building drawing as a way of discovering and developing ideas for designing residential, commercial and public buildings.	Apply
CO.3 Prepare working drawings, foundation plans and other executable drawings with proper details for residential buildings.	Apply
CO.4 Organize and present the findings effectively through written and oral mode with the aid of multimedia tools	Apply

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	3	-	3	3	-	-	3	-	3
CO2	3	3	-	3	3	-	3	-	3	3	-	3	-	3
CO3	3	3	-	3	3	-	3	-	3	3	-	3	-	3
CO4	3	3	-	-	3	-	3	-	3	3	-	3	-	3

High-3; Medium-2;Low-1

Assessment Criteria:

Continuous Assessment (CA) (75 marks)			End Semester Examination (ESE) (25 marks)	
Description	Guide (Max.Marks)	Review Committee (Max.Marks)	Description	Max.Marks
Review 1	10	15	Report*	10
Review 2	10	15	Presentation/Demo	10
Review 3	10	15	Viva	05
Total	**75 marks**		**25 marks**	

Course Code: 19CESN1501	Course Title: GEOLOGY AND SOIL MECHANICS		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

> ➢ NIL

Course Objectives

The course is intended to:

Understand the nature and origin of soil, petrology and structural geology in relevance to civil engineering applications.

1. Understand the soil properties, classification of soil and soil compaction.

2. Understand the concept of effective stress, permeability of soil and flownets.

3. Understand the stress distribution and consolidation of soil.

4. Understand the importance of shear strength of soil.

UNIT I – INTRODUCTION TO GEOLOGY   9 + 3 Hours

Geology in Civil Engineering – Weathering of Rocks – Classification of rocks – Engineering properties of rocks, distinction between Igneous, Sedimentary and Metamorphic rocks. Geological maps – attitude of beds, study of structures – folds, faults and joints – relevance to civil engineering.

UNIT II – SOIL PROPERTIES, CLASSIFICATION AND COMPACTION   9 + 3 Hours

Types of soil – Basic soil properties – Three phase system – Sieve Analysis including Hydrometer Analysis – Determination of consistency limits and their significance to the field behaviour of Soil – Unified Soil Classification System & IS Soil Classification system – Plasticity Charts

Soil compaction – Concept of OMC and dry density– Factors affecting compaction – Field compaction methods.

UNIT III – EFFECTIVE STRESS AND PERMEABILITY   9 + 3 Hours

Soil water – Various forms – Capillary rise – Effective stress concepts in soil – Total, neutral and effective stress distribution in soil – Pressure diagrams.

Permeability – Darcy's Law – factors affecting permeability – Determination of Permeability– Liquefaction and Quicksand Condition – Seepage – Introduction to flow nets – properties and uses – Application to simple problems.

UNIT IV – STRESS DISTRIBUTION AND CONSOLIDATION $\qquad$ 9 + 3 Hours

Stress distribution in soil media – Boussinesq's theory (Point Load, UDL and Line Load) – Use of Newmark influence charts – Westergaard's equation for point load–pressure bulb.

Consolidation – Definition – Concepts of coefficient of compressibility –Terzaghi's theory of one–dimensional consolidation – Coefficient of volume change and compression index – e-log p curves – Determination of coefficient of consolidation by curve fitting methods – Calculation of Consolidation settlement – Pre-consolidation pressure.

UNIT V – SHEAR STRENGTH $\qquad$ 9 + 3 Hours

Shear strength of cohesive and cohesion less soils – Mohr–Coulomb theory – shear strength parameters and their measurements – Direct shear, Triaxial compression, Unconfined Compression and Vane shear tests – Types of shear tests based on drainage and their applicability – Factors influencing shear strength – pore pressure parameters.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1 Explain the different types of minerals, rocks, structure of rocks and geological investigations needed for construction of civil engineering structures	Understand
CO2 Classify soils with respect to their properties, calculate soil parameters through phase diagram and calculate optimum moisture content of soil through application of compaction process.	Apply
CO3 Explain the effects of water in the soil and solve complex problems related to seepage of water in soil.	Apply
CO4 Explain the stress distribution in soil, consolidation process and solve problems related to stress distribution and consolidation settlement for design of foundation.	Apply
CO5 Classify the shear test based on drainage conditions, calculate shear strength parameters as well as draw shear strength envelopes for cohesive and non-cohesive soil.	Apply

Text Book(s):

T 1.   Murthy V.N.S., "Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi,

T 2. Venkatramaiah. C, "Geotechnical Engineering", New Age International (P) Ltd. Publishers, New Delhi, 2019.

T 3. Dr. Arora. K.R, "Soil Mechanics and Foundation Engineering (Geotechnical Engineering)", Standard Publishers Distributors, Nai Sarak, New Delhi, 2020.

T 4. Parbin Singh "Engineering and General Geology" S.K Kataria & Sons, October 2013.

Reference Book(s):

R 1. Varghese P.C., "Foundation Engineering", PHI Learning Private Limited, New Delhi,2012.

R 2. GopalRanjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, New Delhi, 2020.

R 3. Dr. B.C Punmia, Er. Ashok K Jain, Dr. Arun K Jain., "Soil Mechanics and Foundations", Laxmi Publications, 17th Edition, 2018.

R 4. N. Chenna Kesavulu, "Textbook of Engineering Geology", Laxmi Publication, January 2018.

IS Code Book:

1. IS: 2720– Part 1 to Part 40

Web References:

3. http://nptel.ac.in/courses/105103097/
4. http://home.iitk.ac.in/~pkbd/A%20preview%20of%20soil%20Behaviour.pdf
5. https://www.aboutcivil.org/soil–mechanics–html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN1502	Course Title: DESIGN OF RC STRUCTURES		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

> ➢ Structural Analysis

Course Objectives

The course is intended to:

1. Learn to design Reinforced Concrete beam.
2. Learn to design Reinforced Concrete slabs and staircase
3. Learn to design Reinforced Concrete columns.
4. Learn to design Reinforced Concrete footings.
5. Learn to design Reinforced Concrete water tanks

Unit I-INTRODUCTION AND DESIGN OF BEAMS   **9+3 Hours**

Objective of RC design - Code of practices and specifications-Properties of concrete and reinforcing steel - Design methodologies - Limit state method of design for singly and doubly reinforced rectangular and flanged sections - Design for shear, torsion, bond and anchorage of reinforcement

Unit II- DESIGN OF SLABS AND STAIRCASE   **9+3 Hours**

Design of One-way, two-way and flat slabs - Types of staircases - Design of dog-legged staircase.

Unit III - DESIGN OF COLUMNS   **9+3 Hours**

Design of columns for axial load with uniaxial bending-Design of short columns under axial compression, axial compression with uni-axial and bi-axial bending-Design of slender columns.

Unit IV - DESIGN OF FOOTINGS   **9+3 Hours**

Types of footings and foundation - Design of isolated and combined footings - Design of Raft foundation.

Unit V -DESIGN OF WATER TANKS   **9+3 Hours**

Types of water tanks - Design of ground and underground tanks (square, rectangular and circular)

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Identify and compute the stress strain behavior of steel and concrete, as well as analyse and design reinforced concrete beams as per BIS codal provisions.	Apply
CO.2 Analyse and design different types of RC slabs and dog-legged staircase as per BIS codal provisions.	Create
CO.3 Analyse and design the columns for various loading conditions as per BIS codal provisions.	Create
CO.4 Analyse and design different types of footings for load bearing as well as framed structure as per BIS codal provisions.	Create
CO.5 Analyse and design water tanks as per BIS codal provisions.	Create

Text Book(s):

T 1. S. Unnikrishna Pillai and Devdas Menon, Reinforced concrete design, Tata Mc-Graw HillPublication.,2019

T 2. P.C. Varghese, Limit State Design of Reinforced Concrete, Prentice Hall of India, Pvt.Ltd., New Delhi, 2013

T 3. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, RCC Designs (Reinforced Concrete Structures), Laxmi Publications Pvt. Ltd., New Delhi, 2019

Reference Book(s):

R 1. M.L. Gambhir, Design of Reinforced Concrete structures, Prentice Hall of India Private limited, New Delhi, 2012

R 2. N. Subramanian, Design of Reinforced Concrete Structures, Oxford University Press, NewDelhi, 2014

Web References:

1. https://nptel.ac.in/courses/105/105/105105104/
2. https://nptel.ac.in/courses/105/105/105105105/

IS Code Book

1. IS 456:2000 Plain and Reinforced Concrete - Code of Practice.
2. SP 16:1980 Design Aids for Reinforced Concrete to IS 456:1978.
3. IS 875(1-5):1987 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures.
4. IS 3370(Part 1-4): 1965 Code of Practice for Concrete Structures for the Storage of Liquids

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	-	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	-	-	-	-	-	-	-	-	2	-	3
CO3	3	3	3	-	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	-	-	-	-	-	-	-	-	2	-	3
CO5	3	3	3	-	-	-	-	-	-	-	-	2	-	3

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN1503	Course Title: ENVIRONMENTAL ENGINEERING		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 4: 0: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

> ➢ Hydraulics Engineering

Course Objectives

The course is intended to:

1. Study the public water supply schemes and sources of water.

2. Study the quality and distribution of water.

3. Understand the concept of water treatment.

4. Study the quantity, collection and conveyance of wastewater.

5. Understand the sewage treatment process.

UNIT I - PUBLIC WATER SUPPLY SCHEMES AND SOURCES OF WATER   **12 Hours**

Necessary and objectives of water supply schemes. Quantity of water and its requirements - continuous and intermittent supply - Rate of demand and variations - effect on design period - population growth and forecast. Sources of water - infiltration galleries - storage reservoirs - storage capacity by mass curve methods. Types of wells - tests for yield of a well

UNIT II - QUALITY AND DISTRIBUTION OF WATER   **12 Hours**

Definitions - quality of water - portable water, pure water, mineral water, etc. Physical, chemical, biological impurities in water- quality standards of water. Transportation of water - types of conduits - Hydraulics of pipe flow - design-materials of pressure pipes and pipe corrosion. Laying and testing of pipelines. Pumps - types, selection of pumps. Distribution of water - requirements of good distribution system - method of distribution - layout - pressure in the distribution system - Hardy cross method

UNIT III - TREATMENT OF WATER   **12 Hours**

Water treatment - screening, plain sedimentation - coagulation sedimentation - filtration - disinfection - water softening - removal of colour, odour and taste - Removal of iron and manganese- Fluoridation and defluoridation(Only theoretical concepts will be covered, no design)

UNIT IV - QUANTITY, COLLECTION AND CONVEYANCE OF WASTEWATER
12 Hours

Necessity and objectives of sanitary engineering projects - Definitions - Design period - Systems of sewerage - quantity of sewage - Fluctuation in the flow pattern- Estimation of storm runoff - Dry and Wet weather flow - Hydraulics of sewers - Self cleansing velocities - Full/partial flow conditions - Sewer appurtenances - Materials of sewers - sewer joints - sewer laying - sewer cleaning and maintenance

UNIT V - QUALITY OF SEWAGE AND TREATMENT
12 Hours

Characteristics and composition of sewage - physical and chemical analysis - DO, BOD, COD and their significance - Objectives and basic principles of sewage treatment - primary treatment - screens - grit chamber - settling tank - principles of sedimentation. Principles and Functions of Aeration, Activated Sludge Process and Trickling filter, Other treatment methods - Oxidation ditches, UASB - Waste Stabilization Ponds
(Only theoretical concepts will be covered, no design)

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the concept of water supply system, sources of water, calculate population forecast by different approaches and estimate the storage capacity of reservoir as well as tube well.	Apply
CO.2 Explain the quality standards of water, type of conduits, laying and testing of pipelines, selection of pumps and concepts of water distribution system as well as construction of distribution of networks through Hardy cross methods.	Apply
CO.3 Elucidate the fundamental scientific processes underlying for design of water treatment processes.	Understand
CO.4 Explain the quantity, collection and conveyance of wastewater as well as estimate the dimensions of sewer and self-cleaning velocity of sewers.	Apply
CO.5 Elucidate the fundamental scientific processes underlying for design of waste water treatment processes.	Understand

Textbook(s):

T1.   Garg, S.K., Environmental Engineering Vol. I and Vol.II, Khanna Publishers, NewDelhi, 2019.

T2.   Mark J Hammer, Mark J. Hammer Jr., Water and wastewater technology, Prentice Hall of India, 2012.

Reference Book(s):

R.1   Birdie, G.S., Water supply and sanitary engineering, Dhanpat Rai and Sons, 2018.

R.2   Shah, C.S., Water supply and sanitation, Galgotia publishing company, New Delhi, 2016.

R.3 Manual on wastewater and treatment CPHEEC, Ministry of urban affairs and employment, Govt of India., New Delhi, 2013.

Web References:

1. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-85-water-and-wastewater-treatment-engineering-spring-2006/lecture-notes/
2. http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code:19CECN3501	Course Title: SOIL MECHANICS LABORATORY		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Pre-requisites

> ➤ NIL

Course Objectives

The course is intended to:

* attain adequate knowledge in assessing both index and engineering properties of soils, through hands on experience.

List of Experiment

1. Determination of Water content and Specific Gravity of Soil Solids.

2. Determination of Grain Size distribution using Sieve Analysis and Hydrometer Analysis.

3. Determination of Liquid Limit, Plastic Limit and Shrinkage Limit using Casagrande Apparatus.

4. Determination of Field Density by Sand replacement method and core cutter method.

5. Determination of Moisture-density relationship using Standard Proctor compaction Test.

6. Determination of Relative density of Cohesion less soil.

7. Determination of soil permeability by Constant head and falling head methods.

8. Determination of Coefficient of Consolidation using One Dimensional Consolidation Test.

9. Determination of Shear strength using Direct Shear Test in Cohesion less soil.

10. Determination of Shear strength parameters by Unconfined compression test in cohesive soil.

11. Determination of Shear strength using Laboratory vane shear test in cohesive soil.

12. Determination of Shear strength and stiffness parameters of soil using Tri-axial compression test in cohesion-less soil (Demonstration only).

13. Determination of Soil strength by CBR test for roads and pavements.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the soil sample procedure for various soil tests as per the IS: 2720 (Part 1) – 1983 specifications.	Apply
CO.2 Demonstrate the tests and determine the index properties of soils for soil classification.	Apply
CO.3 Determine the Insitu density and compaction characteristics of soils for pavement design.	Apply
CO.4 Determine the compressibility and permeability to Analyse the seepage characteristics of soils.	Apply
CO.5 Demonstrate and determine the shear strength parameters of soil and plot shear strength envelopes.	Apply

Reference Book(s):

R 1. Soil Mechanics Laboratory Manual, Department of Civil Engineering, MCET,

R 2. Soil Mechanics Laboratory Manual, Braja M. Das, 8th Edition, Oxford University

R 3. Soil Mechanics Laboratory Manual, Michael E Kalinski, 2nd Edition.

R 4. I.S Code of Practice (2720) Relevant parts.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO2	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO3	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO4	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO5	1	-	-	3	-	-	-	1	2	2	-	2	3	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code:19CECN3502	Course Title: ENVIRONMENTAL ENGINEERING LABORATORY		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Pre-requisites

 ➢ Nil

Course Objectives

The course is intended to:

- learn how the common environmental experiments relating to water and wastewater quality are performed.

List of Experiments

1. Determination of pH and Electrical Conductivity

2. Determination of Dissolved solids, Suspended Solids, Volatile Solids (VS), and Turbidity

3. Determination of Sulphates

4. Determination of Chlorides

5. Determination of Dissolved Oxygen

6. Determination of Chemical Oxygen Demand

7. Determination of Acidity

8. Determination of Alkalinity

9. Determination of Total Hardness

10. Determination of Available chlorine in Bleaching powder

11. Determination of Residual Chlorine, Chloride and Fluoride

12. Determination of Optimum amount of Coagulant

13. Determination of Biological Oxygen Demand (Demonstration)

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Determine physical and chemical characteristics of water.	Apply
CO.2 Determine physical and chemical characteristics of wastewater.	Apply
CO.3 Determine the optimum dosage of coagulant.	Apply
CO.4 Determine break-point chlorination.	Apply
CO.5 Demonstrate the method to estimate biological oxygen demand.	Apply

Reference Book(s):

R 1.   Environmental engineering Laboratory manual of Civil Engineering Department, MCET, Pollachi.

R 2.   Csuros Maria, Environmental sampling and analysis for technicians, Lab Manual, 1st edition, CRC Press, 1997.

Web References:

1.   http://vlabs.iitb.ac.in/vlabs-dev/labs/nitk_labs/Environmental_Engineering_1/index.html

2.   https://vlab.amrita.edu/?sub=2&brch=193&sim=1548&cnt=6

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO2	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO3	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO4	1	-	-	3	-	-	-	1	2	2	-	2	3	-
CO5	1	-	-	3	-	-	-	1	2	2	-	2	3	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19PSHG6501	Course Title: EMPLOYABILITY SKILLS 1: TEAMNESS AND INTERPERSONAL SKILLS (Common to all B.E/B.Tech Programmes)		
Course Category: Humanities	Course Level: Practice		
L: T:P (Hours/Week): 0: 0: 2	Credit :1	Total Contact Hours: 30	Total Marks: 100

Pre-requisites:

➢ **NIL**

Course objectives:

The course is intended to

1. Enrich effective communicative attributes as part of the skills and Facilitate presentation and public speaking skills.
2. Handle negativities and explore the true self.
3. Inculcate interpersonal skills and to groom as a professional.
4. Educate the importance of Nonverbal skill set to attain perfection
5. Build teamness and its ethics to facilitate corporate working

UNIT I: EFFECTIVE COMMUNICATION & PRESENTATION SKILLS   6 Hours

Barriers of Communication -Fear Of English -Handling Social Factors - Handling Psychological Factors -Handling Practical Problems -Do's & Don'ts - Effective Presentation - Presentation - Importance of Presentation Slide orientation - Introduction in a presentation - Styles of a slide - Slide Templates- Font ,color, Background -Graph Diagrammatic representation - Delivery of presentation - Body Language &Gestures - Verbal Attributes - Communication -Handling stammers and breaks - Handling fear of stage - Maintaining Confidence - Content delivery methods- Do's and Don'ts in a presentation- Tips to handle it-Effective Conclusion

UNIT II: POSITIVE ATTTITUDE &HANDLING REJECTIONS   6 Hours

A,B,C's Of Attitude -Influencing Factors -Individual Factors -Character Comparison - Strategies to Handle ourselves-Benefits of Positive Attitude - Do's& Don'ts - Handling Rejections - Identifying Negativities -Nuances of handling it -Necessary changes -To do List -Creating One's self -Self Qualifiers

UNIT III - INTERPERSONAL SKILLS   6 hours

Life skills -Core IP Skills -Importance of IP Skills -Tips to improve IP Skills-Necessity of IP Skills

UNIT IV - BODY LANGUAGE, DRESSING & GROOMING   6 Hours

Unconscious Physical moments - Metrics of Body Language - Good Posture -Head Motion -Facial Expression - Eye contact -Gestures -Dressing -Grooming & Outlook - Necessity of good Body Language

UNIT V : TEAM ETHICS   6 Hours

Team Ethics-Necessity of Team Work- Teams Everywhere - Benefits of team culture - Reason for team failure -Conflicts -Handling Conflicts -Being a team player -Work difference from college

COURSE OUTCOMES:

Course Outcomes	Cognitive Level
CO.1 Demonstrate effective communicative attributes as part of their skills and facilitate presentation & public speaking skills	Apply
CO.2 Identify and explore the true self and handle negatives.	Apply
CO.3 Develop interpersonal skills and to groom as a professional.	Apply
CO.4 Explain the importance of Nonverbal skill set to attain perfection.	Understand
CO.5 Build teamness and its ethics to facilitate corporate working.	Apply

Textbook(s):
T 1.   John C Maxwell, " The 17 Indisputable Laws of Teamwork: Embrace Them and Empower Your Team", Harper Collins Leadership Publishers, 2013
Reference Books

R 1.   Patrick Lencioni, " The Five Dysfunctions of a Team: A Leadership Fable" Jossey Bass Publishers, 2006

R 2.   Malcolm Gladwell, "Talking to Strangers: What We Should Know about the People We Don't Know" Penguin Publishers, 2019

R 3.   Harvey Segler, " Body Language: Discovering & Understanding the Psychological secrets behind reading & Benefiting from Body Language" Kindle Edition, 2016

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	3	-	1	-	-
CO2	-	-	-	-	-	-	-	-	2	-	-	1	-	-
CO3	-	-	-	-	-	-	-	-	2	-	1	1	-	-
CO4	-	-	-	-	-	-	-	-	-	1	-	1	-	-
CO5	-	-	-	-	-	-	-	2	1	-	-	1	-	-

High -3, Medium - 2, Low-1

Assessment Pattern

Mode of Delivery:

1. Continuous learning and reviews guided by faculty

2. Guided Learning Workshop

Assessment	Details	Weight (%)	Remarks
Continuous Assessment	Diagnostic assessment of a student's communication skills, cognitive abilities, and behavioural traits during the course	25	Continuous
	MCQs/Diagnostic tests and Viva-voce	25	Two per semester - After CCET1 and after CCET2
Final Assessment	MCQs/Diagnostic tests and Viva-voce	50	End of Semester

Course Code: 19CECN1601	Course Title: FOUNDATION ENGINEERING		
Course Category: Professional Core	Course Level: Practice		
L: T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

➢ Geology and Soil Mechanics

Course Objectives

The course is intended to:

1. Gain knowledge on Site investigation methods for selection of suitable foundation.

2. Gain Knowledge on Bearing capacity of soil and design of footings.

3. Gain Knowledge on Load carrying capacity and settlement of pile foundation.
4. Gain Knowledge on Earth pressure in retaining walls.

5. Gain Knowledge on Stability of slopes.

UNIT I - SUBSURFACE EXPLORATION AND SITE INVESTIGATION   9 + 3 Hours

Objectives - Methods of exploration - Boring - Depth of boring - Spacing of bore hole - In-situ penetration tests - SPT - SCPT - Geophysical methods- Electrical Resistivity Method- Seismic Refraction Method- Soil Sampling techniques -Sample Disturbance - Rock sampling- RQD- Core Recovery Ratio-Bore log.

UNIT II - SHALLOW FOUNDATION   9 + 3 Hours

Types of Shallow Foundation – function – requirements - Location and depth of foundation – bearing capacity of Soils – factors affecting bearing capacity - Terzaghi and IS bearing capacity theories - Plate load test and its limitations- Allowable bearing pressure - Contact Pressure – proportioning of footings - design of footings (Rectangular, combined and strap footing)- Settlement and types.

UNIT III - DEEP FOUNDATION   9 + 3 Hours

Types of piles and their function - Factors influencing the selection of pile - Estimating Load Carrying capacity of piles by Static formula and Dynamic formulae - Pile load test - Negative skin friction - Use of Under reamed piles in Expansive Soils-Group capacity - Pile group efficiency by Feld's rule, Converse Labarra formula - Group Capacity-Settlement of pile groups.

UNIT IV - LATERAL EARTH PRESSURE AND RETAINING WALLS   9 + 3 Hours

 Earth Pressure at rest - Active and Passive states - Rankine's theory for cohesionless and cohesive soil - Coloumb's wedge theory- Determination of Earth Pressure by Analytical methods - Culmann's Graphical method- Types of retaining walls - Design principles of Gravity and Cantilever retaining walls.

UNIT V - STABILITY OF SLOPES   9 + 3 Hours

Types of Slope Failure - Different factors of Safety- Stability analysis of Infinite and Finite Slopes- Swedish Circle Method - φ=0 analysis and c= 0 analysis - Friction circle Method - Taylor's stability number- Stability Charts- Slope Protection measures.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the various site investigation methods to select the suitable foundation.	Understand
CO.2 Explain the bearing capacity of soil, calculate the bearing capacity of soil using appropriate procedure and estimate the size of shallow foundation.	Apply
CO.3 Determine the load carrying capacity of pile foundation and efficiency of pile group.	Apply
CO4. Derive the lateral earth pressure theories and calculate the earth pressure for different backfill conditions.	Apply
CO.5 Derive the equation for slope stability of C and C-φ soils and calculate the stability number.	Apply

Textbook(s):

T 1. Murthy V.N.S., "Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New

T 2. Venkatramaiah. C, "Geotechnical Engineering", New Age International (P) Ltd. Publishers, New Delhi, 2019.

T 3. Dr. Arora. K.R, "Soil Mechanics and Foundation Engineering (Geotechnical Engineering)", Standard Publishers Distributors, Nai Sarak, New Delhi, 2019.

Reference Book(s):

R 5. Varghese P.C., "Foundation Engineering", PHI Learning Private Limited, New Delhi,2012.

R 6. Gopal Ranjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, New Delhi, 2020.

R 7. Dr. B.C Punmia, Er. Ashok K Jain, Dr. Arun K Jain., "Soil Mechanics and Foundations", Laxmi Publications, 17th Edition, 2018.

IS Code Book:

1. IS: 2720- Part 1 to Part 40

Web References:

1. http://nptel.ac.in/courses/105103097/
2. http://home.iitk.ac.in/~pkbd/A%20preview%20of%20soil%20Behaviour.pdf
3. https://www.aboutcivil.org/soil-mechanics-html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN1602	Course Title: DESIGN OF STEEL STRUCTURES		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 3: 1: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

➢ Mechanics of Solids

Course Objectives

The course is intended to:

5. Gain knowledge on design of steel structure connections.
6. Gain knowledge on design of tension member.
7. Gain knowledge on design of Compression member.
8. Gain knowledge on design of Flexure member.
9. Gain knowledge on design of Roof trusses.

UNIT I - INTRODUCTION   **9+3 Hours**

Steel structures- types - Properties of steel - Design philosophies - Analysis and Design Methods - Structural steel sections - Types of connections - Design of bolted and welded connections - Axial and Eccentric connections

UNIT II - TENSION MEMBERS   **9+3 Hours**

Classification of Tension members - Net area - Net effective sections - Concept of shear lag - Design strength of simple and compound members - Use of lug angles - Design of tension splices.

UNIT III - COMPRESSION MEMBERS   **9+3 Hours**

Classification of Compression members - Effective length of compression members - Slenderness ratio - Design strength of simple and compound members - Design of laced and battened columns - Design of column bases and column splicing.

UNIT IV - FLEXURAL MEMBERS   **9+3 Hours**

Effective span of beams - Design strength in bending - Laterally supported and unsupported beams - Intermediate and bearing stiffeners- Flange web splices - Effective length for lateral torsional buckling - Web crippling and buckling.

UNIT V -ROOF TRUSSES   **9+3 Hours**

Components of industrial structures - load specifications-calculation of dead, live and wind loads - Types of roof trusses - Design of purlins - need for bracings-design of bracings-Introduction to gantry girder.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Calculate the forces acting on bolted and welded connections to ensure efficiency of joints	Apply
CO.2 Design of tension members for various steel structures as per IS codal provisions.	Create
CO.3 Design of steel columns and column bases as per IS standards.	Create
CO.4 Design of laterally supported and unsupported beams under different loading conditions as per IS codal provisions.	Create
CO.5 Calculate the loads acting on roofs, design purlins as per IS standards as well as explain the design principles of gantry girder.	Create

Textbook(s):

T1. N. Subramanian, Design of Steel Structures, Oxford University Press 2015.

T2. S.S.Bhavakatti, Design of Steel Structures, IK publications, New Delhi, Third Edition 2017.

Reference Book(s):

R 1. S. K. Duggal, Limit State Design of Steel Structures, Tata, Mc Graw Hill Education Pvt Ltd, New Delhi, 2014.

R 2. Punmia B.C., Ashok Kumar Jain & Arun Kumar Jain, "Design of Steel Structures", Vol. I and II, Arihant Publications, Mumbai, 2015.

R 3. Dayaratnam P., "Design of Steel Structures", A.H. Wheeler & Co. Ltd., Allahabad, 2012.

IS Code Book

1. IS 800 - 2007, General Construction in Steel - Code of Practice, BIS, New Delhi

2. IS 875 (part 3) - 2015, Wind loads on Buildings and Structures, BIS, New Delhi

3. IS 808: 1989 - Steel Tables

Web References:

1. http://www.steel-insdag.org/TM_Contents.asp

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	3	-	-	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

	Assessment Component	CO.No.	Marks	Total

Course Code: 19CECN3601	Course Title: BUILDING DRAWING LABORATORY		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Pre-requisites

> ➢ Engineering Drawing for Civil Engineers
> ➢ Design of RC Structures

Course Objectives

The course is intended to:

- provide an understanding of plotting reinforcement details of various building components as well as other structures.

List of Experiments

1. Explain the requirements of a building along with minimum dimension as per NBC, requirement
2. Draft the section for foundation for load bearing structure
3. Draft the section for foundation and column of framed structure
4. Draft the Cross Section and Longitudinal Section of RCC roof slab (one way), and beam
5. Draft the Cross Section and Longitudinal Section of RCC roof slab (two way), and beam
6. Preparation of Cross Section and Longitudinal Section for Beam - column joints
7. Draft the Plan, Section, and elevation of dog legged staircase,
8. Draft the Plan, Section, and elevation of bifurcated staircase,
9. Draft the Plan, Section, and elevation of septic tank,
10. Draft the Plan, Section, and elevation Rainwater Harvesting Structure.
11. Prepare a scheme layout of a residential building section (G+1) for a load bearing Structure
12. Prepare a scheme layout of a residential building section (G+1) for a framed structure.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Draw the reinforcement details of basic components of buildings as per IS codal provisions.	Apply
CO.2 Draw the reinforcement details of staircases as per IS codal provisions.	Apply
CO.3 Design the septic tank and plot the plan, section and elevation.	Create
CO.4 Explain the NBC requirements for planning a residential building.	Understand
CO.5 Draw the plan, section and elevation of a residential building (G+1) for load bearing and framed structures.	Apply

Reference Book(s):

R 1. Computer Aided Building Drawing Manual, Department of Civil Engineering, MCET, Pollachi

R 2. Civil Engineering Drawing and House Planning, B. P. Verma, Khanna Publishers, New Delhi, 2010.

R 3. Illustrated Design of Reinforced Concrete Buildings, V. L. Shah and S. R. Karve, Assorted Editorial; 8th edition, 2017.

R 4. IS 456-2000 (Reaffirmed 2016), Plain and Reinforced Concrete code of practice (Fourth Revision), Bureau of Indian Standards.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	3	-	-	-	-	-	-	-	2	3	-
CO2	3	-	-	3	-	-	-	-	-	-	-	2	3	-
CO3	3	-	3	3	-	-	-	-	-	-	-	2	3	-
CO4	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO5	3	-	-	3	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2; Low-1

Assessment pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19CECN3602	Course Title: COMPUTER AIDED DESIGN AND DRAFTING LABORATORY		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 0: 0: 3	Credits:1.5	Total Contact Hours:45	Max Marks:100

Pre-requisites

> ➢ Design of RC structures

Course Objectives

The course is intended to:
1. Provide students with a solid background on the computer aided design and drafting of building elements.
2. Acquire the knowledge of designing components of buildings, retaining walls, water tanks and steel structures using software.

List of Exercises

1. Design simply supported, cantilever and continuous beams

2. Design short and long columns

3. Design isolated and combined footing

4. Design retaining walls

5. Design underground and elevated water tanks

6. Design two storey RC space frame

7. Design steel beams for flexure

8. Design steel roof truss

9. Design gantry girder

10. Design bridge deck slab

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Design and illustrate the reinforcement detailing of various structural elements such as beams, columns, footing as well as the framed structures by a software.	Create
CO.2 Design and draw the structural detailing of RCC water tanks using a software	Create
CO.3 Design and demonstrate the structural detailing of RCC Retaining wall by a software	Create
CO.4 Design and draw the structural drawing of steel beams and trusses by a software	Create
CO.5 Design and detail the sectional view of bridge deck slab and gantry grider using a software	Create

Reference Book(s):

R 1. Computer Aided Design and Drafting Laboratory manual of Civil Engineering Department, MCET, Pollachi.

R 2. S. Unnikrishna Pillai and Devdas Menon, Reinforced concrete design, Tata Mc-Graw Hill Publication., 2019

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	3	3	-	-	1	2	2	-	2	-	3
CO2	1	-	-	3	3	-	-	1	2	2	-	2	-	3
CO3	1	-	-	3	3	-	-	1	2	2	-	2	-	3
CO4	1	-	-	3	3	-	-	1	2	2	-	2	-	3
CO5	1	-	-	3	3	-	-	1	2	2	-	2	-	3

High-3; Medium-2;Low-1

Assessment pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	100

Course Code: 19PSHG6601	Course Title: EMPLOYABILITY SKILLS 2: CAMPUS TO CORPORATE		
Course Category: Humanities	Course Level: Introductory		
L: T:P (Hours/Week): 0:0:2	Credit :1	Total Contact Hours: 30	Total Marks: 100

Pre-requisites:

➢ **NIL**

Course objectives:

The course is intended to:

1. Understand emotions and necessity to handle it to evolve as an effective social animal
2. Build effective resumes to project the positives to be employable
3. Facilitate working in a collaborative work environment and to engage in healthy agreements for building person's professional facet
4. Formulate the growth attribute to outperform, initiate and grow in professional arena
5. Explain time management and impart leadership skills.

UNIT I: EMOTIONAL INTELLIGENCE   6 Hours

Nature of Emotions - Importance of EI - EQ vs IQ - Behavioral difference between EQ & IQ - Acquiring Emotional Intelligence - Benefits of high EI - Steps to develop EI - Role of EI in Interviews

UNIT II: RESUME PREPARATION   6 Hours

Importance of Resume - Good Resume - Planning Resume -Organizing Resume -Spell check - Benefits of good resume - Resume Writing

UNIT III: GROUP DISCUSSION   6 Hours

Purpose of GD -Prerequisites of GD - Benefits of GD-Features of GD-Do's & Don'ts in GD-Accept Criticism & Feedback - Accepting Suggestions - GD Phrases - Effective Introduction& Conclusion - Preferred Etiquette of GD.

UNIT IV: INTERVIEW ETIQUETTE(NETIQUETTE)   6 Hours

Definition of Interview - Types of Interview - Prior interview - Know the Company - Employer's perspective in interview - Non-Verbal etiquette - Dressing - Verbal Communication in Interview - Facing Rejection in Interview - Do's & Don'ts in an Interview - Common Interview Questions - Handling Stress Questions - Handling Telephonic Interviews.

UNIT V: LEADERSHIP SKILLS& TIME MANAGEMENT   6 Hours

Leadership - Leadership Traits - Leadership styles - Types of Leaders - Qualities of a leader -Developing Perspectives

Time Management - Necessity of Time Management - Types of time -Estimation of time - Process of Time management - Efficient utilization of Time - Time wasting culprits - Tips to manage time - Goal setting in Time Management

Course Outcomes	Cognitive Level
CO.1 Understand the emotions and necessity to handle them	Understand
CO.2 Build effective resumes to project the positives to be employable	Apply
CO.3 Facilitate collaborative work environment and to engage in healthy agreements for building person's professional facet	Understand
CO.4 Formulate the growth attribute to outperform, initiate and grow in professional arena	Apply
CO.5 Explain time management and impart leadership skills	Understand

Textbook(s):
 T 1.   Thea Kelley, "Get That Job! The Quick and Complete Guide to a Winning Interview " Plover crest Press, 2017
Reference Books
 R 1.   Daniel Goleman, " Emotional Intelligence Reader's Guide", BANTAM PUBLISHERS, 1997
 R 2.   Daniel Goleman, Richard Boyatzis & Annie McKee, " Primal Leadership: Unleashing the Power of Emotional Intelligence" Harvard Business Review Press; Anniversary edition, 2013
 R 3.   Stephen R Covey, " The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change" Simon & Schuster; Anniversary edition, 2013

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	1	-	1	-	1	-	-
CO2	-	-	-	-	-	-	-	-	-	2	-	1	-	-
CO3	-	-	-	-	-	-	-	-	1	1	-	1	-	-
CO4	-	-	-	-	-	-	-	-	1	-	-	1	-	-
CO5	-	-	-	-	-	-	-	1	-	-	1	1	-	-

High -3, Medium - 2, Low-1

Assessment Pattern

Mode of Delivery:

1. Continuous learning and reviews guided by faculty

2. Guided Learning Workshop

Assessment	Details	Weight (%)	Remarks
Continuous Assessment	Diagnostic assessment of a student's communication skills, cognitive abilities, and behavioural traits during the course	25	Continuous
	MCQs/Diagnostic tests and Viva-voce	25	Two per semester - After CCET1 and after CCET2
Final Assessment	MCQs/Diagnostic tests and Viva-voce	50	End of Semester

Course Code: 19CEPN6601	Course Title: INNOVATIVE AND CREATIVE PROJECT		
Course Category: Project		Course Level: Practice	
L:T:P (Hours/Week) 0:0: 4	Credits:2	Total Contact Hours:60	Max Marks:100

Pre-requisites

> ➤ Nil

Course Objectives

The course is intended to

- Gain knowledge on problem identification and to formulate the methodology to arrive a suitable solution.
- Enhance students' skills pertaining to scientific and technical report writing and presentation.

     The student should carry out the literature survey, identification of the problem, development of the methodology and execution of their project in the civil engineering discipline. The project work can be allotted to either an individual student or a group of students comprising of not more than three. The progress of the project is evaluated based on a minimum of three reviews by the project review committee. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Analyze and compile information from various resources relevant to the specific area of project to be undertaken and relate with societal and global issues.	Analyse
CO.2 Analyze regional, national and international scenarios and compose the problem statements and the objectives of the project towards a sustainable development.	Analyse
CO.3 Formulate project methodology integrating clear fundamentals, theories and standards governing the project as well as project planning.	Analyse
CO.4 Apply relevant engineering principles and theories to design, built, operate, simulate and analyze the development of a system or concept.	Create
CO.5 Plan and mange time effectively as a team or individually.	Apply
CO.6 Organize and present technical and scientific findings effectively through written and oral mode with the aid of multimedia tools and appropriate code of ethics.	Analyse

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	3	-	-	-	-	-	3	3	-
CO2	3	3	-	-	-	-	3	-	-	-	-		3	-
CO3	3	-	-	-	-	-	-	-	-	-	3		3	3
CO4	3	3	3	3	3	-	-	-	-	-	-		3	3
CO5	-	-	-	-	3	-	-	-	3	-	-		3	-
CO6	-	-	-	-	3			3	-	3	-	-	3	-

High -3, Medium - 2, Low-1

Assessment Criteria:

Continuous Assessment (CA) (75 marks)			End Semester Examination (ESE) (25 marks)	
Description	Guide (Max.Marks)	Review Committee (Max.Marks)	Description	Max.Marks
Review 1	10	15	Report*	10
Review 2	10	15	Presentation/Demo	10
Review 3	10	15	Viva	05
Total	**75 marks**		**25 marks**	

Course Code: 19CECN1701	Course Title: WATER RESOURCES AND IRRIGATION ENGINEERING		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 4: 0: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre-requisites

➤ Hydraulics Engineering

Course Objectives

The course is intended to:

1. Understand the fundamentals of water resources engineering.
2. Know about the principles of irrigation.
3. Comprehend the methods of irrigation water management.
4. Familiarize with the concepts of canal head works and cross drainage works.
5. Facilitate the understanding of storage reservoirs.

UNIT I - WATER RESOURCES ENGINEERING AND MANAGEMENT   12 Hours

Water resources survey - Water resources of India and Tamil Nadu - Description of water resources planning - Economics of water resources planning, physical and socio-economic data - National Water Policy - Interlinking of rivers – Consumptive and non-consumptive use of water- Conjunctive use of surface and groundwater.

UNIT II – PRINCIPLES OF IRRIGATION   12 Hours

Irrigation – Need, mode and Influence of irrigation – Crop and crop seasons – Consumptive use of water – Duty - Factors affecting duty - Relationship between Duty, Delta, Base period - Irrigation efficiencies - Irrigation scheduling – Planning and Development of irrigation projects.

UNIT III – METHODS OF IRRIGATION   12 Hours

Tubewell irrigation - Lift irrigation – Flooding methods – Irrigation methods - Surface and Sub-Surface - Micro Irrigation – Drip and Sprinkler Irrigation - Merits and demerits

UNIT IV – CANAL IRRIGATION   12 Hours

Classification of canals - Alignment of canals - Silt theories - Water logging - Canal losses - Weirs - Canal Head works - Canal regulators - Canal drops – Trapezoidal and Siphon well drop - Cross drainage works - Lining and maintenance of canals.

UNIT V – RESERVOIR PLANNING AND MANAGEMENT   12 Hours

Reservoirs & dams - Single and multipurpose - Multi objective - Factors to be considered in selection of site for a dam - Fixation of storage capacity - Strategies for reservoir operation - Sedimentation of reservoirs - Design flood and its estimation - Flood control & mitigation methods - Levees and flood walls - Channel improvement - Flood warning.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the fundamentals of water resources planning and the national water policy.	Understand
CO.2 Describe the importance of irrigation, its scheduling and estimation of their efficiencies.	Understand
CO.3 Explain the methods of irrigation adopted in the field.	Understand
CO.4 Elucidate the various aspects of canal irrigation including canal head works and cross drainage works.	Understand
CO.5 Estimate the storage capacity of reservoirs and describe the strategies for flood control measures.	Apply

Text Book(s):

T1.   Asawa. G.L, "Irrigation and water resources engineering", New Age International Publishers.1st Edition, reprint 2012.

T2.   Singh, G., "Irrigation engineering", Standard Book House, 2018.

T3.   Sharma, S.K., "Irrigation engineering and hydraulic structures", S. Chand Publishers, New Delhi, 2017.

Reference Book(s):

R.1   Basak, N.N, "Irrigation Engineering", Tata McGraw-Hill Publishing Co, Edition:2011-2012

R.2   Garg, S.K., "Irrigation Engineering", Khanna Publishers, 2006

R.3   H.M., Ragunath, "Irrigation Engineering", Wiley India Pvt Ltd., 2011

Web References:

1. http://nptel.ac.in/downloads/105105110/
2. http://www.civilenggforall.com/2015/09/irrigation-and-water-resources-engineering-gl-asawa-free-download-pdf-civilenggforall.html
3. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-731-water-resource-systems-fall-2006/lecture-notes/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN1702	Course Title: CONSTRUCTION PROJECT MANAGEMENT		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 4: 0: 0	Credits:4	Total Contact Hours:60	Max Marks:100

Pre–requisites

- ➢ Nil

Course Objectives

The course is intended to:

1. Understand the concepts of project formulation in construction projects.

2. Know the different stages of construction planning.

3. Learn the different scheduling procedures and techniques required for project planning in construction projects.
4. Study different cost control measures to be adopted in construction projects.

5. Understand the purpose of resource levelling in construction projects.

UNIT I – CONSTRUCTION PROJECT FORMULATION   12 Hours

Construction participants – Roles and responsibilities of client, construction management consultants, architect – Engineering associates and contractors – Different types of construction projects – Project life cycle – Phases in project life cycle – Pre – feasibility report and clearance – Techno economic feasibility report – Detailed project report

UNIT II – CONSTRUCTION PLANNING   12 Hours

Basic concepts in the development of construction plans – Choice of technology and construction method – Importance of planning in construction project – Different periods of planning – Pretender data collection – Charts for labour, staff, material and plant requirements – BOQ and cost estimates – Types of contract – Contract procedures – Contract agreement – Principal clauses and conditions.

UNIT III – SCHEDULING PROCEDURES AND TECHNIQUES   12 Hours

Construction schedules – CPM – Activities, their duration and interdependence – Construction of network diagram – forward and backward pass – critical path – float – PERT – three-time aspects and their identification based on statistical data and Beta distribution – Probability of achieving desired time targets for projects.

UNIT IV – CONSTRUCTION PROJECT CONTROL   12 Hours

Inventory control – Types and tools – EOQ model – Direct cost and indirect cost and their relation to project duration – Time cost trade off – Quality and safety concerns in construction – Total quality control – Quality control by statistical methods – Sampling by attributes and variables.

UNIT V – RESOURCE ALLOCATION   12 Hours

Resource aggregation diagrams as per early start and late start – smoothing by activity start time manipulation – Levelling of resources according to constraints – priorities of activities – sort rules – Minimum project duration subject to resource constraint.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the phases of project life cycle with the roles and responsibilities of construction participants.	Understand
CO.2 Explain the basic concepts of construction planning and explain the different types of contracts.	Understand
CO.3 Calculate the project duration using different network techniques.	Apply
CO.4 Explain the quality and safety concerns in construction projects and compute the minimum project duration using time cost trade off.	Apply
CO.5 Compute the resources with different constraints and illustrate the resource levelling in construction projects.	Apply

Text Book(s):

T1. Chitkara. K.K, "Construction Project Management: planning, Scheduling and control", Tata McGraw Hill Publishing Company, New Delhi, 4th edition, 2019

T2. Chris Hendrickson and Tung Au, Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, ~~Pittsburgh, 2000~~

Reference Book(s):

R1. Kumar Neeraj Jha, "Construction Project Management: Theory and Practice", second edition, Pearson Education India, 2015

R2. B.C Punmia and K.K Khandelwal "Project Planning and Control with PERT and CPM", Laxmi Publications Private Limited, 2016

R3. Srinath L S, "PERT/CPM Principles and Applications", Affiliated East West Press (P) ltd, 2002.

Web References:

1. http://nptel.ac.in/courses/105103093/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	3	2	-	3
CO2	2	1	-	-	-	-	-	-	-	-	3	2	-	3
CO3	3	2	-	-	-	-	-	-	-	-	3	2	-	3
CO4	3	2	-	-	-	-	-	-	-	-	3	2	-	3
CO5	3	2	-	-	-	-	-	-	-	-	3	2	-	3

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CECN3701	Course Title: QUANTITY SURVEYING AND ESTIMATION LABORATORY		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 0: 0: 4	Credits:2	Total Contact Hours:60	Max Marks:100

Pre–requisites

> ➢ Building Drawing Laboratory

Course Objectives

The course is intended to:

1. Know the quantities and to learn how to calculate the cost abstract for the given load bearing structure.
2. Learn to estimate the quantities and cost abstract for the given framed structure.
3. Learn to estimate the quantities and cost abstract for irrigation and environmental structures.
4. Know how to calculate the volume of earthwork and cost abstract for bituminous and concrete roads.
5. know how to calculate the rent for different types of buildings.

List of Exercises

1. Introduction to building components with detailed drawing.
2. Determine the rate for Damp proof course, RCC and plain concrete for various mix proportions with reference to the current schedule of rate.
3. Estimation of quantities for the given simple load bearing structures and give the cost abstract statement.
4. Estimation of quantities for the given G+1 framed structures and give the cost abstract statement.
5. Estimation of quantities for the given simple industrial building and give the cost abstract statement.
6. Estimation of quantities for the given retaining wall and give the cost abstract statement.
7. Estimation of quantities for the given culvert and give the cost abstract statement.
8. Estimation of quantities for the given septic tank and soak pit and give the cost abstract statement.
9. Estimation of quantities for bituminous and cement concrete roads and give the cost abstract statement.
10. Estimate the quantities and calculate the rate for shuttering and form work for the given the building.
11. Determination of rent for different types of building.
12. Preparation of plan and costing using software for duplex residential building.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Estimate the quantities and cost abstract for the given load bearing structure.	Apply
CO.2 Estimate the quantities and cost abstract for the given framed structure.	Apply
CO.3 Estimate the quantities and cost abstract for irrigation and environmental structures.	Apply
CO.4 Estimate the volume of earthwork and cost abstract for bituminous and concrete roads.	Apply
CO.5 Calculate the rent for different types of buildings.	Apply

Reference Book(s):

R1. Quantity Surveying and Estimation Lab Manual, Department of Civil Engineering, MCET, Pollachi

R2. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 28th Edition, 2016.

R3. Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S. Chand & Company Ltd, 2012.

R4. Chakraborti. M., "Estimating, Costing, Specification and Valuation in Civil Engineering", 24th edition 2012 (Reprint 2013).

R5. Schedule of Rate for the current year, Section I – Civil Engineering Section, Coimbatore Corporation.

R6. Schedule of Rate for the current year, Section II – Road Works, Coimbatore

R7. Methods of Measurement of Building and Civil Engineering works, Bureau of Indian Standards.

R8. IS 1200 (Part-1 to 28), Methods of Measurement of Building and Civil Engineering works, Bureau of Indian Standards.

Web References:

1. https://nptel.ac.in/courses/105/103/105103093/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	2	2	-	2	3	-
CO2	3	2	-	-	-	-	-	1	2	2	-	2	3	-
CO3	3	2	-	-	-	-	-	1	2	2	-	2	3	-
CO4	3	2	-	-	-	-	-	1	2	2	-	2	3	-
CO5	3	2	-	-	-	-	-	1	2	2	-	2	3	-

High–3; Medium–2; Low–1

Assessment pattern

Continuous Assessment	Assessment Component	CO. No.	Marks	Total
	Each Lab Experiment	1,2,3,4,5	75	75
	Cycle Test 1	1,2,3	50	25
	Cycle Test 2	3,4,5	50	
			Total	**100**

Course Code: 19CEPN6801	Course Title: PROJECT		
Course Category: Project		**Course Level: Practice**	
L:T:P (Hours/Week) 0: 0: 16	**Credits:8**	**Total Contact Hours: 240**	**Max Marks:200**

Pre-requisites

➢ Nil

Course Objectives

The course is intended to:

• Impart and improve the manual design capability of the student as well as using civil engineering software.

This course conceives purely a design problem in any one of the disciplines of Civil Engineering; e.g., Design of an RC structure, Design of a waste water treatment plant, Design of a foundation system, Design of traffic intersection etc. The design problem can be allotted to either an individual student or a group of students comprising of not more than three. The students will be guided by internal and external supervisors (if any). The external supervisor will be appointed by head of the department after consultation with Industry-Institute interaction cell. The progress of the project is evaluated based on a minimum of three reviews by the project review committee. At the end of the semester after completing the work to the satisfaction of the supervisor and review committee, course the student should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Apply the principles of planning to plan different types of structures considering futuristic need of an area with reference to different codes	Create
CO.2 Evaluate load calculation and load transfer phenomena of the structure.	Analyse

CO		
CO.3	Analysis the different component of structure based on SFD and BMD	Analyse
CO.4	Design the elements of a building manually and design software as per codal provisions	Create
CO.5	Develop structural drawings with all necessary measurements and details of the structure to be constructed.	Create
CO.6	Organize and present technical and scientific findings effectively through written and oral mode with the aid of multimedia tools and appropriate code of ethics.	Analyse

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	3	3	3	3	3	-	-	-	3	-	3
CO2	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	-	3	-	-	-	-	3	-	-	-	-	-	3
CO5	3	-	-	3	3	-	-	-	3	-	3	-	-	3
CO6	3	-	-	-	3	-	-	3	-	3	-	-	-	-

High–3; Medium–2; Low–1

Assessment Criteria:

Continuous Assessment (CA) (150 marks)			End Semester Examination (ESE) (50 marks)	
Description	Guide (Max.Marks)	Review Committee (Max.Marks)	Description	Max.Marks
Review 1	20	30	Report*	20
Review 2	20	30	Presentation/Demo	20
Review 3	20	30	Viva	10
Total	**150 marks**		**50 marks**	

Course Code: 19CEEN1001	Course Title: ADVANCED CONSTRUCTION TECHNIQUES		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Construction Materials and Practices

Course Objectives

The course is intended to:

1. Study the design concepts of Retaining walls for different backfill conditions.
2. Study the design concepts of Flat-bottomed elevated square and circular water tanks along with staging.
3. Study the design concepts of Solid slab bridge and box culvert.
4. Study the design concepts of Portal frames by substitute frame method.
5. Study the design concepts of Prestressed concrete.

UNIT I – SUB STRUCTURE   **9 Hours**

Box jacking – Pipe jacking – Diaphragm walls and basement – Tunneling techniques – Piling techniques – Caissons – types – sinking process – Cofferdam – Cable anchoring and grouting – Shoring for deep cutting – Dewatering for underground open excavation.

UNIT II – SUPER STRUCTURE   **9 Hours**

Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Slipform technique – Suspended formwork – Construction sequence in cooling towers, silos, chimney, sky scraper – In–situ pre–stressing in high rise structures – Post tensioning – Aerial transporting – handling and erecting lightweight components on tall structures – Erection of lattice towers – Rigging of transmission line structures.

UNIT III – SPECIAL STRUCTURE   **9 Hours**

Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – Laying operations for built up offshore system – Vacuum dewatered flooring – Concrete paving technology – Large span structures – launching techniques for heavy decks – Support structure for heavy equipment and conveyor – Construction sequence and methods in domes – Erection of articulated structures and space decks.

UNIT IV – PRECAST AND PREFABRICATION   **9 Hours**

Pre–casting techniques – handling techniques – transportation, storage and erection of structures – Curing techniques – steam curing, hot air blowing – Skeletal and large panel constructions – Pre-cast and pre-fabricating technology for low cost and mass housing schemes – Ferro–cement in housing – quality control – Repairs and economical aspects on prefabrication.

UNIT V – REPAIR AND DEMOLITION   9 Hours

Mud Jacking and grouting for foundation – micro piling and underpinning for strengthening floor and shallow profile – Sub grade water proofing – Repair techniques for cracks in concrete – Demolition techniques – sequence of operation – Dismantling – Safety precaution in demolition and dismantling.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the various techniques adopted for substructure construction.	Understand
CO.2 Explain the construction techniques for commercial and modern engineering structures	Understand
CO.3 Elucidate the construction techniques to be adopted for special structures.	Understand
CO.4 Describe the process involved in construction of prefabricated structures, precast structures and ferrocement.	Understand
CO.5 Explain the repair and demolition techniques.	Understand

Text Book(s):

T 1. Subir K. Sarkar and Subhajit Saraswati, "Construction Technology", Oxford University Press, New Delhi, 2008.

T 2. R. Chudley, Roger Greeno, "Advanced Construction Technology" Prentice Hall, 2006

Reference Book(s):

R 1. Jerry Irvine, "Advanced Construction Techniques" CA Rockers, 1984.

R 2. Peter.H.Emmons, "Concrete repair and maintenance illustrated", Galgotia Publications Pvt. Ltd., 2001.Press, 2008

R 3. Robertwade Brown, "Practical Foundation Engineering Hand Book", McGraw Hill Publications, 1995.

Web References:

1.   http://nptel.ac.in/video.php?subjectId=105102088

2.   https://sites.google.com/a/venusict.org/actech/lecture–notes

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1002	Course Title: ADVANCED CONCRETE STRUCTURES		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Design of RC Structures

Course Objectives

The course is intended to:

1. Study the design concepts of Retaining walls for different backfill conditions.

2. Study the design concepts of Flat-bottomed elevated square and circular water tanks along with staging.

3. Study the design concepts of Solid slab bridge and box culvert.

4. Study the design concepts of Portal frames by substitute frame method.

5. Study the design concepts of Prestressed concrete.

UNIT I –DESIGN OF RETAINING WALLS   9 Hours

Design of cantilever and counter fort retaining walls.

UNIT II – DESIGN OF ELEVATED WATER TANKS   9 Hours

Types of elevated water tanks– Design of flat–bottomed elevated water tanks (square and circular)

UNIT III – DESIGN OF RCC BRIDGES   9 Hours

Introduction, Classification of bridges – IRC Loadings – Effective width of load dispersion – Design of solid slab Bridge – Box culverts.

UNIT IV – DESIGN OF PORTAL FRAMES   9 Hours

Portal frames – Analysis of portal frames – substitute frame method – cantilever method – portal method (concept only) – Design of single bay portal frame by substitute frame method.

UNIT V – INTRODUCTION TO PRESTRESSED CONCRETE ELEMENTS   9 Hours

Introduction– Principles of prestressing–types and methods of prestressing–Need for high strength materials– Losses in prestress–long term and short–term deflection– anchorage zone

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Design the retaining walls for various backfill conditions as per IS codal provisions.	Create
CO.2 Design the flat bottomed circular and square elevated water tanks with staging as per IS codal provisions.	Create
CO.3 Design the solid slab bridge and box culverts as per IRC standards.	Create
CO.4 Analyse the portal frame using substitute frame method and design a single bay portal frame.	Create
CO.5 Explain the basic concepts in prestressing and calculate the losses and deflections in the prestressed concrete.	Apply

Text Book(s):

T1. Gambhir, M.L., "Reinforced Concrete Structures", PHI Learning Private Ltd., New Delhi, 2012.

T2. Unnikrishna Pillai S. and DevdasMenon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 3rd Edition, New Delhi, 2019.

T3. Krishna Raju N, "Prestressed Concrete", Tata McGraw Hill Company, 6th Edition, New Delhi, 2018.

Reference Book(s):

R.1 Punmia, B.C., Ashok. K. Jain and Arun. K. Jain, "Reinforced Concrete Structures" Vol. II, Laxmi Publications,5thEdition New Delhi, 2019.

R.2 Varghese, P. C., Limit State Design of Reinforced Concrete, 2nd Edition, PHI Learning Private Ltd., New Delhi, 2013.

R.3 Subramanian N, Design of Reinforced Concrete Structures, Oxford University Press, New Delhi, 2014.

IS Code Books

1. IS 456:2000 Plain and Reinforced Concrete – Code of Practice.
2. SP 16:1980 Design Aids for Reinforced Concrete to IS 456:1978
3. IS 875(1–5):1987 Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures.
4. IRC 6 – 2014, Standard Specification and Code of practice for road bridges.
5. IRC 21 – 2000, standard specifications and Code of practice for Road bridges.
6. IRC 112 –2011, Code of Practice for Concrete Road Bridges.
7. IS 3370(Part 1–4): 1965 Code of Practice for Concrete Structures for the Storage of Liquids.
8. IS 1343–2012 Code of Practice for Prestressed Concrete.

Web References:

1. https://nptel.ac.in/courses/105/105/105105104/
2. http://www.ce.memphis.edu/4135/PDF/Notes/Chapter1–0%20.pdf
3. https://nptel.ac.in/courses/105/105/105105165/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	3	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1003	Course Title: AIR POLLUTION MANAGEMENT		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Nil

Course Objectives

The course is intended to:
1. Understand the sources and effects of air pollution
2. Understand the Dispersion of Pollutants
3. Understand the Air pollution control
4. Understand the Air quality management
5. Understand the Noise pollution

UNIT I – SOURCES AND EFFECTS OF AIR POLLUTANTS   9 Hours

Sources and classification of air pollution – Effects of air pollution on human beings, materials, vegetation, animals – Global warming– Ozone layer depletion, Sampling and Analysis – Basic principles of sampling – Source and ambient sampling – Stack sampling

UNIT II – DISPERSION OFPOLLUTANTS   9 Hours

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate – Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Inversion, Introduction to air quality modeling.

UNIT III – AIR POLLUTION CONTROL   9 Hours

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment – gaseous pollutant control by adsorption, absorption, condensation, combustion – Biofiltration (Only theory and working of equipments only)

UNIT IV – AIR QUALITY MANAGEMENT   9 Hours

Air quality standards – Air quality monitoring – Preventive measures – Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement– National Ambient Air quality standards – Air quality management in India

UNIT V – NOISE POLLUTION   9 Hours

Sources of noise pollution – Effects – Assessment– Standards – Control methods (at the source and transmission) – Prevention– Protection of exposed people

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Classify and identify the sources of air pollutants and predict the effects of air pollutant on human health and environment.	Understand
CO.2 Explain and relate the significance of various air pollution dispersion models.	Understand
CO.3 Explain the methods available for controlling of air pollution from point, line and area sources.	Understand
CO.4 Elucidate the air quality and relate with air pollution regulation.	Understand
CO.5 Explain sources, effects and control of noise pollution.	Understand

Text Book(s):

T 1. Anjaneyulu, Y., Air Pollution: Prevention and Control Technologies, B.S. Publications, 2ndedition, 2020.

T 2. Rao, C.S. Environmental Pollution Control Engineering, New Age International publishers, Third Edition, 2018.

T 3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata McGraw Hill, New Delhi, 2017.

T 4. Garg, S.K., "Environmental Engineering Vol. II", Khanna Publishers, New Delhi, 2019.

Reference Book(s):

R 1. Heumann, W.L., "Industrial Air Pollution Control Systems", McGraw Hill, New Yark, 1997.

R 2. Mahajan, S.P., "Pollution Control in Process Industries", Tata Mc–Graw Hill Publishing Company, New Delhi, 2017.

R 3. Peavy, S.W., Rowe, D.R. and Tchobanoglous, G. "Environmental Engineering", Tata Mc-Graw Hill, New Delhi, 2017.

Web References:

1.   https://metnet.imd.gov.in/imdetp/lecture_notes/course11/LN_11_61_Air%20Pollution%20Measurment.pdf
2.   https://web.iitd.ac.in/~arunku/files/CVL212_Y18/Airpollutioneffects.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1004	Course Title: BUILDING SERVICES		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Nil

Course Objectives

The course is intended to:

1. Understand the different types of machineries used in the buildings.

2. understand the fundamentals of electrical systems in buildings.

3. know the concepts of lighting and air conditioning systems in buildings.
4. study the fixtures and fittings of plumbing and sanitary systems in buildings.

5. understand the importance and systems of fire safety installation.

UNIT I – MACHINERIES   **9 Hours**

Hot Water Boilers – Lifts and Escalators – Special features for physically handicapped and elderly – Conveyors – Vibrators – Concrete mixers – DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity

UNIT II – ELECTRICAL SYSTEMS IN BUILDINGS   **9 Hours**

Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations

UNIT III – PRINCIPLES OF ILLUMINATION AND REFRIGERATION   **10 Hours**

Visual tasks – Modern theory of light and colour – Classification of lighting –Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Special features for physically handicapped and elderly – Pressure temperature relationship for liquids – Refrigerants – Vapour compression cycle – Refrigerant control devices – Air conditioning systems for different types of buildings – Protection against fire caused by A.C. Systems

UNIT IV – PLUMBING AND SANITARY SYSTEMS IN BUILDINGS   **8 Hours**

 Plumbing system components – Water supply and distribution system – plumbing valves – plumbing fixtures – Piping systems – Valves – Sanitary piping systems – Soil piping system – Ventilation system – House drain.

UNIT V – FIRE SAFETY INSTALLATION   **9 Hours**

Causes of fire in buildings – Safety regulations – NBC – Planning considerations in buildings like non–combustible materials, construction of staircases and lift lobbies, fire escapes and A.C. systems. Special features for physically handicapped and elderly in building types – Heat and smoke detectors – Fire alarm system, snorkel ladder –Dry and wet risers – Automatic sprinklers.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the working principle and functions of boilers, conveyors, motors and generators used in building.	Understand
CO.2 Describe the elements of electrical systems and the different types of earthing & wiring adopted in building.	Understand
CO.3 Explain the types of lighting, air conditioning systems and its control devices used in building.	Understand
CO.4 Explain the various fixtures and fittings of plumbing and sanitary systems used in building.	Understand
CO.5 Describe the planning considerations for fire safety and the various fire-fighting equipments used in building.	Understand

Text Book(s):

T 1.   Fred Hall and Roger Greeno, "Building Services Handbook", Routledge and CRC Press, 2017.

T 2.   Subhash M. Patil, "Building services", Standard publishers, 2014.

Reference Book(s):

R 1.   Thomas Everitt Coleman, "Sanitary House Drainage: Its Principles and Practice: A Handbook", Wentworth Press publishers, 2019

R 2.   William Paul Gerhard, "House–Drainage and Sanitary Plumbing", General Books publishers, 2012

R 3.   R. Udayakumar, "A text book on Building Services", Eswar Press, Chennai, 2011

Web References:

1.   https://www.scribd.com/doc/55417572/Building–Services–Notes

2.   https://lecturenotes.in/download/material/47960–note–of–building–services–by–

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

	Assessment Component	CO. No.	Marks	Total

Course Code: 19CEEN1005	Course Title: ELECTRONIC SURVEYING		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Surveying

Course Objectives

The course is intended to:

1. Know the fundamental principles of EDM
2. Know the basic concepts about the electronics related to measuring devices
3. Learn the basics of electromagnetic waves and their properties for the application of measuring technology.
4. Learn the measuring technology using the EDM compared with the traditional methods.
5. Understand the concepts of EDM technology and other modern instruments with field applications.

UNIT I – FUNDAMENTALS   **9 Hours**

Methods of measuring distance, Basic Principles of Electronic Distance Measurement, Historical Development Classifications, applications and comparison with conventional surveying.

UNIT II – BASIC ELECTRONICS   **9 Hours**

Oscillators (Crystal controlled and Gunn diode) Kerrcell / Pockel's modulator, Frequency mixing, modulation and Demodulation Measurement of phase differences, reflectors (Corner, Antenna), Transducers and power sources.

UNIT III – ELECTROMAGNETIC WAVES   **9 Hours**

Classification and applications of Electromagnetic waves, propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting RI, Computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions. Computation of RI for microwaves – Reference refractive index – Real time application of first velocity correction. Measurement of atmospheric parameters – Mean refractive index, Second velocity correction, Total atmospheric correction, Use of temperature and pressure transducers.

UNIT IV – ELECTROMAGNETIC DISTANCE MEASURING SYSTEM   **9 Hours**

Electro–optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser EDM instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave EDM instruments. Comparison between Electro–optical and Microwave system.

UNIT V – FIELD STUDIES   9 Hours

Total station and its applications – Care and maintenance of EDM instruments – Modern positioning systems – EDM traversing, trilateration and base line measurement using EDM. Study of different EDM instruments and Total Station. EDM traversing, trilateration and base line measurement.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the fundamental principles of EDM.	Understand
CO.2 Explain the basic concepts about the electronics related to measuring devices.	Understand
CO.3 Explain the basics of electromagnetic waves and their properties for the application of measuring technology.	Understand
CO.4 Describe the measuring technology using the EDM compared with the traditional methods.	Understand
CO.5 Describe the EDM technology and other modern instruments with field applications.	Understand

Textbook(s):

T 1.   Satheesh Gopi, R. Sathikumar, N. Madhu, Advanced Surveying: Total Station, GIS And Remote Sensing, Dorling Kindersley (India) Pvt Ltd., © 2007

T 2.   Rueger, J.M. Electronic Distance Measurement, Springer–Verlag, Berlin, 4th Edition, 2012.

Reference Book(s):

R 1.   Chandra. A. M, Higher Surveying, New Age International Publishers, 2nd Edition, 2006.

R 2.   Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1993.

R 3.   Burnside, C.D. Electromagnetic distance measurement Crosby Lock wood staples, U.K. 1991

Web References:

1.   http://sociology.soc.uoc.gr/socmedia/papageo/electronic%20survey%20technique.pdf

2.   http://web.itu.edu.tr/~coskun/contents/lessons/structure/LECTURE_2_Theodolite.pdf

3.   http://www.lonestar.edu/departments/landsurveyingmapping/Surveying_Equipment.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1006	Course Title: GROUND IMPROVEMENT TECHNIQUES	
Course Category: Professional Elective	Course Level: Mastery	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Geology and Soil Mechanics
➢ Foundation Engineering

Course Objectives

The course is intended to:

1. Know the various problematic soils and understand the suitable techniques for ground improvement.
2. Understand the dewatering techniques.
3. Learn the methods of In-situ treatment of cohesionless and cohesive soil.
4. Understand the concepts of earth reinforcement.
5. Study the grouting techniques and stabilization in ground improvement.

UNIT I – PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES   9 Hours

Different types of problematic soils – Role of ground improvement in foundation engineering– Methods of ground improvement– Geotechnical problems in alluvial, laterite and black cotton soils.
Selection of suitable ground improvement techniques based on soil condition.

UNIT II – DEWATERING   9 Hours

Necessity of Dewatering – sumps and interceptor ditches – single and multi–stage well points – deep well – vacuum well points – Electro osmosis– Drains – criteria for choice for filler material around drains.

UNIT III – INSITU TREATEMENT OF COHESIONLESS AND COHESIVE SOILS   9 Hours

Insitu densification of Cohesion–less soils– Dynamic compaction–vibrofloatation– Sand Compaction piles– Deep compaction.
Consolidation– Preloading with sand drains– fabric drains, stone columns– Lime piles – installation techniques– relative merits of above methods and their limitations.

UNIT IV – EARTH REINFORCEMENT AND GEOTEXTILES   9 Hours

Concept of Earth reinforcement – Application of reinforced Earth– Geotextiles–Types–role of geotextiles for filtration, drainage, Separation and Construction Works – Soil nailing– Rock Anchoring– Micro–piles.

UNIT V – GROUTING TECHNIQUES   9 Hours

Objectives of Grouting– Types of Grout– Grouting Equipment's and machinery–Injection Methods– Grout Monitoring–Stabilization with cement, lime and chemicals – Stabilization of Expansive Soils.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the characteristics of problematic soil and identify the suitable techniques for ground improvement.	Understand
CO.2 Explain various dewatering techniques for ground improvement.	Understand
CO.3 Explain the different methods of In-situ treatment of cohesionless and cohesive soil.	Understand
CO.4 Explain the concepts of earth reinforcement and identify suitable material for various applications.	Understand
CO.5 Explain the grouting techniques and select appropriate stabilization methods for expansive soils.	Understand

Text Book(s):

T 1.   Purushothama Raj. P, Ground Improvement Techniques, Lakshmi Publications, 2nd Edition, 2016.

T 2.   Koerner, R.M. Construction and Geotechnical Methods in Foundation Engineering, McGraw Hill, 1994.

T 3.   Nihar Ranjan Patra, Ground Improvement Techniques, Vikas Publishing House, First Edition, 2012.

T 4.   Mittal.S, An Introduction to Ground Improvement Engineering, Medtech Publisher, First Edition, 2013.

Reference Book(s):

R 1.   Moseley, M.P and Kirsch. K., Ground Improvement, Spon Press, Taylor and Francis Group, London, 2nd Edition, 2004.

R 2.   Jones C.J.F.P. Earth Reinforcement and Soil Structure, Thomas Telford Publishing, 1996.

R 3.   Winterkorn, H.F. and Fang, H.Y. Foundation Engineering Hand Book. Van Nostrand Reinhold, 1994.

R 4.   Koerner, R.M., Designing with Geosynthetics (Sixth Edition), Xlibris Corporation, U.S.A, 2012.

IS Code Books:

1.   IS Code 9759: 1981
2.   IS Code 15284 (Part 1): 2003

Web References:

1.   http://nptel.ac.in/courses/105103097/

2.   http://home.iitk.ac.in/

3.   https://nptel.ac.in/courses/111103021/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1007	Course Title: INDUSTRIAL WASTE MANAGEMENT		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢   Environmental Engineering

Course Objectives

The course is intended to:
1. Learn Industrial pollution prevention.
2. Learn Industrial wastewater treatment.
3. Learn Zero liquid discharge concepts.
4. Learn Sludge and hazardous waste management.
5. Learn Wastewater treatment process of selected industries.

UNIT I – INDUSTRIAL POLLUTION PREVENTION   **9 Hours**

Industrial scenario in India – Uses of water by Industry – sources, generation rates and characteristics of Industrial wastewaters – Toxicity of Industrial Effluents and Bioassay Tests – Environmental Impacts of Industrial Wastewaters – Regulatory requirements for Industrial wastewaters– Prevention Vs Control of Industrial Pollution – Benefits and Barriers – Waste Minimization Strategies – Evaluation of Pollution Prevention Options – Cost benefit analysis – Pay back period.

UNIT II – INDUSTRIAL WASTEWATER TREATMENT   **9 Hours**

Physico–Chemical Treatment Processes – Equalisation, Neutralisation, Oil Seperation, Flotation – Precipitation, Aerobic and Anaerobic Biological Treatment Processes – Sequencing batch reactors, membrane bioreactors, Advanced oxidation and Tertiary Treatment processes for removal of dissolved organics and inorganics– Ozonation, photocatalysis, Evaporation and membrane Technologies

UNIT III – ZERO LIQUID DISCHARGE   **9 Hours**

Individual and Common Effluent Treatment Plants – Zero Effluent Discharge Systems and Management of RO Rejects, Quality requirements for wastewater reuse – Industrial reuse, Disposal on water and land.

UNIT IV – SLUDGE AND HAZARDOUS WASTE MANAGEMENT   **9 Hours**

Residuals of Industrial Wastewater treatment – Quantification and Characteristics of Sludge – Thickening, Digestion, Conditioning, Dewatering and Disposal of Sludge – Solidification – Incineration – Secured Landfills – Hazardous waste management.

UNIT V – CASE STUDIES   **9 Hours**

Industrial manufacturing process description, Wastewater characteristics, Pollution Prevention Options and Treatment Flow sheets for selected Industries – Tanneries– Textiles– Pulp and Paper – Metal finishing – Sugar and Distilleries.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the significance of industrial pollution prevention in today life.	Understand
CO.2 Explain the industrial wastewater treatment processes such as physical, chemical and biological treatment for effective removal of pollutants.	Understand
CO.3 Illustrate the concept of zero effluent discharge and quality requirements for disposal of effluent on land and water bodies.	Understand
CO.4 Explain the concepts of sludge and hazardous waste management techniques.	Understand
CO.5 Illustrate the wastewater treatment process of selected industries through.	Understand

Textbook(s):

T 1. S.C. Bhatia, Handbook of Industrial Pollution and Control, Volume I & II, CBS Publishers, New Delhi,2003.

T 2. Mahajan, S.P. Pollution Control in Process Industries, Tata McGraw Hill Publishing Co., New Delhi, 2017.

Reference Book(s):

R 1. Eckenfelder, W.W., „Industrial Water Pollution Control" , Mc–Graw Hill,2000.

R 2. Frank Woodard, „ Industrial waste treatment Handbook" , Butterworth Heinemann, NewDelhi,2005.

R 3. Wang L.K., Yung–Tse Hung, Howard H.Lo and Constantine Yapijakis, „Handbook of Industrial and Hazardous Wastes Treatment" , Marcel Dekker, Inc., USA, 2004.

Web References:

1. http://nptel.ac.in/courses/105106119/36

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1008	Course Title: MAINTENANCE AND REHABILITATION OF STRUCTURES		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3:0:0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢   Construction Materials and Practices

➢   Concrete Technology

Course Objectives

The course is intended to:

1. Understand the different types of maintenance and repair strategies.

2. Understand the characterization of concrete under different environments.

3. Know the different repair materials and repair techniques.
4. Learn the various parameters for rehabilitation and retrofitting of structures.

5. Understand the various demolition methods and its preventive measures adopted in buildings.

UNIT I – MAINTENANCE AND REPAIR STRATEGIES   9 Hours

Maintenance – repair and rehabilitation, facets of maintenance, importance of maintenance – Various aspects of inspection – Assessment procedure for evaluating a damaged structure – Causes of deterioration.

UNIT II – QUALITY CONTROL   9 Hours

Quality assurance for concrete construction – Concrete properties – strength, permeability, thermal properties and cracking – Effects due to climate, temperature, chemicals, corrosion – Design and construction errors – Effects of cover thickness and cracking.

Unit III – REPAIR MATERIALS AND TECHNIQUES   9 Hours

Special concretes and mortar – Concrete chemicals, Special elements for accelerated strength gain – Expansive cement – Polymer concrete – Sulphur infiltrated concrete – Ferro cement – Fibre reinforced concrete – Rust eliminators and polymers coating for rebars – Foamed concrete – Mortar and dry pack – Vacuum concrete – Gunite and shotcrete – Epoxy injection – Mortar repair for cracks.

UNIT IV – REHABILITATION AND RETROFITTING OF STRUCTURES   9 Hours

Strengthening of super structures, sub structures – Increasing the load carrying capacity of footing – Repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure – Shoring and underpinning – Methods of corrosion protection – Corrosion inhibitors – Corrosion resistant steels – Coatings and cathodic protection.

UNIT V – DEMOLITION TECHNIQUES   **9 Hours**

Introduction – planning, precautions and protective measures in demolition works – Sequences of operations – Demolition of structural elements – Engineered demolition techniques for dilapidated structures – Case studies.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the different types of maintenance and various aspects of inspection.	Understand
CO.2 Explain the serviceable and durable characterization of concrete under thermal and corrosive environment.	Understand
CO.3 Describe the properties of various repair materials and its method of application in building.	Understand
CO.4 Elucidate the various aspects in strengthening of buildings and the various corrosion protection methods adopted in building.	Understand
CO.5 Describe the planning and precautionary measures during demolition works and the sequence involved in demolition of building.	Understand

Textbook(s):

T 1. Dr.R.P.Rethaliya, "Maintenance and Rehabilitation of Structures", Atul Prakashan publications, 2019

T 2. Dayarathnam. P and Rao. R,"Maintanence and Durability of Concrete Structures", University Press,India 2015

Reference Book(s):

R 1. Gambhir. M.L, "Concrete Technology", Tata Mc–Graw Hill Company, New Delhi, 2013.

R 2. Gupta B.L. and Amit Gupta, "Maintenance and Repair of Civil Structures", Standard Publishers Distributors, 2009

R 3. CPWD and Indian Building Concepts, Hand Book on Seismic Retrofit of Buildings, Narosa Publishers, 2008.

Web References:

1. http://fmcet.in/CIVIL/CE2071_uw.pdf

2. https://theconstructor.org/concrete/repair–rehabilitation–concrete–structure–failure–

3. https://nptel.ac.in/courses/105/106/105106202/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1009	Course Title: MUNICIPAL SOLID WASTE MANAGEMENT		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Environmental Engineering

Course Objectives

The course is intended to:

1. Learn the Sources and characteristics of municipal solid wastes.
2. Learn on-site storage and processing of municipal solid waste.
3. Learn about the collection and transfer of MSW.
4. Learn the offsite processing of MSW.
5. Learn the disposal methods of MSW.

UNIT I – SOURCES AND CHARACTERISTICS   9 Hours

Sources and types of municipal solid wastes–waste generation rates–factors affecting generation, characteristics–methods of sampling and characterization; Effects of improper disposal of solid wastes–Public health and environmental effects. Elements of solid waste management –Social and Financial aspects – I solid waste (M&H) rules – integrated solid waste management–Public awareness; Role of NGO" s– Public Private participation

Unit II – ON-SITE STORAGE AND PROCESSING   9 Hours

On–site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and environmental aspects of open storage – waste segregation and storage – case studies under Indian conditions – source reduction of waste – Reduction, Reuse and Recycling of plastic waste –Construction and Demolishing waste

Unit III – COLLECTION AND TRANSFER   9 Hours

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of collection systems; Transfer stations – Selection of location, operation & maintenance; options under Indian conditions – Field problems– solving.

Unit IV – OFF–SITE PROCESSING   9 Hours

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and bio-methanation; Thermal processing options – case studies under Indian conditions.

Unit V – DISPOSAL   9 Hours

Land disposal of solid waste; Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas– Landfill bioreactor – Dumpsite capping –Biomining.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the sources, types and composition of solid wastes as well as elements of integrated solid waste management plan.	Understand
CO.2 Illustrate the on-site storage and processing of municipal solid waste for Indian conditions.	Understand
CO.3 Select the appropriate method for solid waste collection, and transportation of waste and solve simple problems in transfer of solid wastes.	Apply
CO.4 Illustrate the off-site processing of municipal solid waste for waste recovery under Indian conditions.	Understand
CO.5 Explain the appropriate methods for municipal solid waste disposal.	Understand

Textbook(s):

T 1. Cherry P M, Solid and Hazardous Waste Management, CBS publishers and distributors Pvt Ltd, 2018

T 2. Rao M.N, Razia Sultana, Sri Harsha Kota, solid and hazardous waste management – Science and Engineering, Butterworth–Heinemann, 2016

Reference Book(s):

R 1. George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, "Integrated Solid Waste Management, Mc–Graw Hill India, First edition, 2015.

R 2. CPHEEO, "Manual on Municipal Solid waste management,Vol I, II and III, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2016.

R 3. William A. Worrell, P. Aarne Vesilind, Christian Ludwig, Solid Waste Engineering – A Global Perspective, 3rd Edition, Cengage Learning, 2017.

R 4. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and "Environmental Resources Management, Hazardous waste Management", Mc–Graw Hill International edition, New York,2010.

R 5. John Pitchtel,Waste Management Practices, CRC Press,Taylor and Francis Group,2014.

R 6. Gary C. Young, Municipal Solid Waste to Energy Conversion Processes: Economic, Technical, and Renewable Comparisons, Wiley, 2010

Web References:

1. https://nptel.ac.in/courses/120/108/120108005/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
		Total		100

Course Code: 19CEEN1010	Course Title: NUMERICAL METHODS	
Course Category: Professional Elective	Course Level: Mastery	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Transforms and Partial Differential Equations.

Course Objectives

The course is intended to:

1. Learn how to solve the non–linear equations and system of linear equations and calculate the dominant Eigenvalue.
2. Learn about methods of interpolation and approximation
3. Learn about numerical techniques to find derivatives and to evaluate integrals.
4. Learn how to solve first order differential equation using numerical techniques
5. Learn to solve partial differential equations using numerical techniques.

UNIT I – SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS   9 Hours

Solution of algebraic and transcendental equations – Regula Falsi method – Newton Raphson method– Solution of linear system of equations – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel –Dominant Eigen values of a matrix by Power method.

UNIT II – INTERPOLATION AND APPROXIMATION   9 Hours

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

UNIT III – NUMERICAL DIFFERENTIATION AND INTEGRATION   9 Hours

Approximation of derivatives using interpolation polynomials – Numerical integration using Trapezoidal, Simpson's 1/3 rule –Simpson's 3/8 rule– Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal rule.

UNIT IV – INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS   **9 Hours**

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

UNIT V – BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIALDIFFERENTIAL EQUATIONS   **9 Hours**

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

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Solve the non–linear equations and system of linear equations and calculate the dominant Eigenvalue.	Apply
CO.2 Predict the unknown values for the given set of data.	Apply
CO.3 Determine derivatives using numerical techniques and to evaluate integrals.	Apply
CO.4 Solve first order differential equation using numerical techniques	Apply
CO.5 Solve partial differential equations using numerical techniques.	Apply

Textbook(s):

T 1. Srimanta Pal and Subodh C. Bhunia, "Engineering Mathematics", First Edition, Oxford University Press, New Delhi, 2015

T 2. Grewal, B.S. and Grewal, J. S., "Numerical methods in Engineering and Science", 9th Edition, Khanna Publishers, New Delhi, 2007

T 3. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley Publications, 2015.

Reference Book(s):

R1. Chapra. S.C., and Canale. R.P., "Numerical Methods for Engineers", Tata McGraw Hill, 5th Edition, New Delhi, 2007.

R2. Brian Bradie. "A friendly introduction to Numerical analysis", Pearson Education, Asia, New Delhi, 2007.

R3. SankaraRao. K., "Numerical methods for Scientists and Engineers", Prentice Hall of India Private, 3rd Edition, New Delhi, 2007.

Web References:

1. http://nptel.ac.in/syllabus/syllabus.php?subjectId=103101009

2. http://nptel.ac.in/courses/122107037/19

3. http://nptel.ac.in/video.php?subjectId=108106075

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1011	Course Title: PREFABRICATED STRUCTURES		
Course Category: Professional Elective		Course Level: Mastery	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Design of RC Structures

Course Objectives

The course is intended to:

1. Know the Importance of prefabrication
2. Learn the Components of prefabricated structures
3. Know the design principles of prefabrication
4. Joints in structural members
5. Design of prefabricated structure for abnormal loads

UNIT I – INTRODUCTION TO PREFABRICATION   **9 Hours**

Prefabrication– Need of prefabrication – Comparison with monolithic construction – Advantages and Disadvantages – Methods of prefabrication – Types of precast systems – Materials – Modular coordination – Standardization– Systems – Production – Transportation – Erection.

UNIT II – PREFABRICATED COMPONENTS   **9 Hours**

Planning for components of prefabrication structures– Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs, Wall panels – Columns – Shear walls– Provisions for non–structural fastenings

UNIT III – DESIGN PRINCIPLES   **9 Hours**

Disuniting of structures – Design of cross section with the efficiency of material used – Problems in design due to joint flexibility – Allowance for joint deformation.

UNIT IV –JOINTS IN STRUCTURAL MEMBERS   **9 Hours**

Joints for different structural connections – Dimensions and detailing – Design of expansion joints–Jointing Materials.

UNIT V – DESIGN FOR ABNORMAL LOADS   **9 Hours**

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., – Importance of avoidance of progressive collapse.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Describe the principles of prefabrication as well as production and erection techniques.	Understand
CO.2 Explain the behaviour and construction methods of prefabricated structural components.	Understand
CO.3 Illustrate the design principles for prefabricated sections based on efficiency of members used.	Understand
CO.4 Classify joints for different structural connections in prefabricated system.	Understand
CO.5 Illustrate the importance of avoidance of progressive collapse using Indian codal provisions for prefabricated concrete.	Understand

Text book(s):

T1. K.M. Elliott, "Precast concrete structures", CRC Press, Second edition, 2019.

T2. "Handbook on Precast Concrete Buildings", Indian Concrete Institute, 2016.

T3. L. Mokk, "Prefabricated Concrete for Industrial and Public Structures", Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.

T4. Gorostiza C.Z., Hendrikson C. and Rehak D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 2012.

Reference Book(s):

R 1. Building Materials and Components, CBRI, India, 1990.

R 2. Koncz T., Manual of Precast Concrete Construction, Vols. I, II and III, Bauverlag, GMBH, 1976.

R 3. Glover C.W, "Structural Precast Concrete", Asia Publishing House, 1965

R 4. M. Levitt, "Precast Concrete Material, Manufacture, Properties and Usage" CRC Press, Second Edition, 2019.

R 5. Structural Design Manual, "Precast Concrete Connection Details", Society for the Studies in the use of Precast Concrete, Netherland Betor Verlag, 2009.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1012	Course Title: PRESTRESSED CONCRETE STRUCTURES		
Course Category: Professional Elective	Course Level: Practice		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Design of RC Structures

Course Objectives

The course is intended to:

1. Understand the concept of pre-stressing.
2. Understand the design of pre-stress members for flexure and shear.
3. Understand the deflection and design of anchorage zones.
4. Understand the design of tension and compression member.
5. Understand the design of composite members.

UNIT I – Introduction   **9 Hours**

Principles of Pre–stressing – Classification and types – Advantages over reinforced concrete – Materials– high strength concrete and high tensile steel – Methods of Pre–stressing – Freyssinet, Magnel Blaton, Lee Mc Call and Killick anchorage systems – Analysis of sections for stresses by stress concept, strength concept and load balancing concept – Losses of pre–stress

UNIT II – Design for Flexure and Shear   **9 Hours**

Basic assumptions – Permissible stresses in steel and concrete – Design of sections of Type I and Type II post tensioned and pre tensioned beams – Check for strength – Layout of cables in post–tensioned beams – Location of wires in pre–tensioned beams – Design for shear

UNIT III – Deflection and Design of Anchorage Zone   **9 Hours**

Factors influencing deflections – Short term deflections of uncracked members – Prediction of long–term deflections due to creep and shrinkage – Check for serviceability limit state of deflection– Determination of anchorage zone stresses in post – tensioned beams by Magnel's method, Guyon's method and I.S code – Design of anchorage zone reinforcement

UNIT IV – Design of Tension and Compression Members   **9 Hours**

Design of tension members –pre–stressed trusses– application in the design of pre–stressed pipes and pre–stressed concrete cylindrical water tanks – Design of compression members with and without flexure –its application in the design piles and flag masts.

UNIT V – Design of Composite Members   **9 Hours**

Composite beams – design, longitudinal shear transfer, ultimate strength – applications – Partial pre–stressing – advantages and applications.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the concepts of pre-stressing in concrete structures, identify the materials for pre-stressing and estimate losses of pre-stressing	Apply
CO.2 Design pre-tensioned and post tensioned girders for flexure and shear.	Create
CO.3 Calculate the short term and long-term deflections of pre-stressed members and design the anchorage zone for post-tensioned members.	Create
CO.4 Design pre-stressed pipes and water tanks.	Create
CO.5 Analyze and design of composite members.	Create

Text Book(s):

T 1. Krishna Raju N., "Prestressed concrete", 6th Edition, Tata McGraw Hill Company, New Delhi, 2018

T 2. Pandit. G.S. and Gupta. S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.

Reference Book(s):

R 1. Dayaratnam. P., "Prestressed Concrete Structures", Oxford and IBH, 2013.

R 2. Karuna Moy Ghosh, "Prestressed Concrete: Analysis and Design Practice Of Members", PHI Learning Pvt. Ltd.,2014.

R 3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", 3rd Edition, Wiley India Pvt. Ltd., New Delhi, 2013.

IS Code Book

1. IS 1343 – 2012: Code of practice for Pre–stressed concrete

2. IS 784 – 2001: Code of practice for Pre–stressed concrete pipes

3. IS 3370 – 1999: Code of practice for concrete structures for the storage of liquids

Web References:

1. http://www.nptel.ac.in/courses/105106118/

2. http://www.nptel.ac.in/courses/105106118/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	-	-	-	-	-	-	-	-	2	3	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1013	Course Title: PRINCIPLES OF MANAGEMENT		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢   NIL

Course Objectives

The course is intended to:

1. Learn the development of management and types of organizations.
2. Understand the importance of planning in coining the objectives and policies related to management.
3. Know the importance of organizational management and HR.
4. Study the behavioral characteristics for an organization.
5. Learn the importance of control techniques for an organization.

UNIT I – INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS   9 Hours

Definition of Management – Science or Art – Manager Vs Entrepreneur – Types of managers – Managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches – Types of Business organization – Sole proprietorship, partnership, company – Public and private sector enterprises – Organization culture and Environment – Current trends and issues in Management.

UNIT II – PLANNING   9 Hours

Nature and purpose of planning – Planning process – Types of planning – Objectives – Setting objectives – Policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III – ORGANISING   9 Hours

Nature and purpose – Formal and informal organization – Organization chart – Organization structure – Types – Line and staff authority – Departmentalization – Delegation of authority – Centralization and decentralization – Job Design – Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management, Career planning and management.

UNIT IV – DIRECTING   9 Hours

Foundations of individual and group behaviour – Motivation – Motivation theories – Motivational techniques – Job satisfaction – Job enrichment – Leadership – types and theories of leadership – Communication – Process of communication – Barrier in communication – Effective communication – Communication and IT.

UNIT V– CONTROLLING   9 Hours

System and process of controlling – Budgetary and non – Budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive control – Reporting.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the fundamentals for various management and organization	Understand
CO.2 Explain the decision-making process based on the tools and techniques in planning.	Understand
CO.3 Illustrate the structure of an organization and HR management	Understand
CO.4 Explain the management prinicples for effective communication.	Understand
CO.5 Explain the techniques for project management controlling.	Understand

Text Book(s):

T 1.   Harold Koontz and Heinz Weihrich "Essentials of Management" Tate McGraw Hill Publishing Company Limited, 2012.

T 2.   Stephen P. Robbins, Mary Coulter and Agna Fernandez, "Management", Pearson Education Limited, Fourteenth Edition, 2019.

Reference Book(s):

R 1.   Stephen P. Robbins, Mary Coulter and David A. De Cenzo, "Fundamentals of Management", Pearson Education Limited, Tenth Edition, 2017.

R 2.   PC Tripathy and PN Reddy, "Principles of Management", Sixth Edition, McGraw Hill Education, 2012.

R 3.   Robert Kreitner and Mamata Mohapatra, "Management", Biztantra, 2008

Web References:

1. https://nptel.ac.in/courses/110/105/110105146/

2. https://www.classcentral.com/course/swayam–principles–of–management–19977

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1014	Course Title: BASICS OF PYTHON PROGRAMMING		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/ Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre–requisites

➢ C Programming

Course Objectives

The course is intended to:

1. Learn the console application using variables, expressions, statements and iterations.
2. Know the applications using file and function concepts.
3. Know the application using strings, list, tuple and dictionary.
4. Learn the console applications using object–oriented programming concepts.
5. Understand the console applications for population estimation, risk assessment, traffic patterns.

UNIT I – INTRODUCTION TO PYTHON   **9 Hours**

Variables, Expressions and Statements: Assignment statements – Variable names – Expressions and statements – Conditionals and Recursion: Floor division and modulus – Boolean expressions – Logical operators – Conditional execution – Iterations – Reassignment – Updating variables – The while statement – break.

UNIT II – FILES AND FUNCTIONS IN PYTHON   **9 Hours**

Files: Reading and writing– Format operator – Filenames and paths – Catching exceptions – Functions – Function calls – Math functions – Adding new functions – Parameters and arguments – Fruitful Functions: Return values – Boolean functions

UNIT III – DATA STRUCTURES IN PYTHON   **9 Hours**

Strings: String slices – Searching – String methods – Lists: List operations – List methods – Dictionaries: Looping and dictionaries – Dictionaries and lists – Tuples: Tuple assignment –Lists and tuples

UNIT IV – OOPS CONCEPTS IN PYTHON   **9 Hours**

Classes and Objects – Classes and Functions – Classes and Methods – Inheritance.

UNIT V – APPLICATIONS OF PYTHON IN CIVIL ENGINEERING   **9 Hours**

Population estimation for urban planning and developing water supply, water treatment, and sewerage system for different types of population – Risk assessment and mitigation such as prediction of floods, earthquakes, cyclones – Structural Health Monitoring – To anticipate traffic patterns in Highway designing.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1. Explain console application using variables, expressions, statements and iterations.	Understand
CO2. Explain an application using file and function concepts.	Understand
CO3. Explain an application using strings, list, tuple and dictionary.	Understand
CO4. Explain console applications using object–oriented programming concepts.	Understand
CO5. Explain console applications for population estimation, risk assessment, traffic patterns.	Understand

Text Book(s):

T1. Allen Downey, "Think Python", 2nd Edition, Green Tea Press, 2012.

T2. Vittorio Lora, "Python for Civil and Structural Engineers", 2019

Reference Book(s):

R1. Jeffrey Elkner, Chris Meyers Allen Downey, "Learning with Python" , 4th Edition Dream Tech Press Publication, 2015

R2. Mark Summerfield, "A Complete Introduction to the Python Language", 2nd Edition Addison–Wesley Professional,2014

R3. Laura Cassell, Alan Gauld, "Python Projects", Wrox Publication, 2015

Web References:

1. https://www.coursera.org/learn/python

2. https://www.tutorialspoint.com/python/index.htm

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	-	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1015	Course Title: QUALITY CONTROL AND ASSURANCE		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢   NIL

Course Objectives

The course is intended to:

1.   To learn about the quality plan, quality management guidelines and responsibilities of the authorities.
2.   To know the quality standards, training, implementation and certification process.

3.   To study about the importance of quality planning, documentation and inspection procedures in execution of a project.
4.   To learn about the need of QA/QC, magnificent seven tools and FMEA for quality analysis.
5.   To know about the various factors influencing quality and the ways of improving quality.

UNIT I – QUALITY MANAGEMENT   9 Hours

Introduction – Definitions and objectives – Factor influencing construction quality – Responsibilities and authority – Quality plan – Quality management guidelines – Quality circles.

UNIT II – QUALITY SYSTEMS   9 Hours

Introduction – Quality system standard – ISO 9000 family of standards – Requirements – Preparing quality system documents – Quality related training – Implementing a quality system – Third party certification.

UNIT III – QUALITY PLANNING   9 Hours

Quality policy, Objectives and methods in construction industry –Consumer's satisfaction, Ergonomics – Time of completion – Statistical tolerance – Taguchi's concept of quality – Six Sigma – Codes and standards – Documents – Contract and construction programming – Inspection procedures – Cost implication.

UNIT IV – QUALITY ANALYSIS   9 Hours

Objectives – Regularity agent, owner, design, contract and construction-oriented objectives, methods – Techniques and needs of QA/QC – Different aspects of quality – Appraisals, factors affecting construction quality management – Critical, major failure aspects and failure mode analysis –Stability methods and tools, optimum design – Reliability testing, reliability coefficient and reliability prediction.

UNIT V – QUALITY IMPROVEMENT TECHNIQUES   9 Hours

Selection of new materials – Influence of drawings, detailing, specification, standardisation– Bid preparation – Construction activity, environmental safety, social and

environmental factors – Natural causes and speed of construction – Life cycle costing – Value engineering and value analysis.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the quality management principles.	Understand
CO.2 Explain the quality system standards.	Understand
CO.3 Describe the elements of quality planning and its implication.	Understand
CO.4 Elucidate the objectives and perform failure analysis related to QA/QC.	Understand
CO.5 Describe the quality improvement techniques.	Understand

Textbook(s):

T 1.   James J.O'Brien, "Construction Inspection Handbook: Quality Assurance and Quality Control", Third Edition, Van Nostrand Reinhold Company, 2012.

T 2.   J.L. Ashford, "The Management of Quality in Construction", E & FN SPON, 2003

Reference Book(s):

R 1.   Ram Babu Sao, "Perfect Quality Assurance & Quality Control", First Edition, Create space Independent Pub, 2016

Web References:

1.   http://nptel.ac.in/courses/116102019/
2.   http://pmbook.ce.cmu.edu/13_Quality_Control_and_Safety_During_Constructio n.html

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO2	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO3	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO5	2	1	-	-	-	-	-	-	-	-	-	2	-	2

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1016	Course Title: RAILWAYS, AIRPORTS AND HARBOUR ENGINEERING	
Course Category: Professional Elective	Course Level: Mastery	
L:T:P (Hours/Week)	Credits:3	Total Contact Hours:45	Max Marks:100

L:T:P (Hours/Week)	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Transportation Engineering

Course Objectives

The course is intended to:

1. Understand the functions of various components of railway track.
2. Learn the operation, construction, and maintenance of railway track.
3. Know the various factors considered for planning and design of airport.
4. Understand the importance of visual aids and air traffic control in airport.
5. Study the various components of harbour and dock.

UNIT I – RAILWAY PLANNING AND DESIGN   **9 Hours**

Role of Indian Railways in National Development –Factors controlling Alignment – Engineering Surveys for Track Alignment –Elements of permanent way and its functions – Rails, Sleepers, Ballast, rail fixtures and fastenings – Coning of wheels – Creep in rails – Defects in rails – Geometric design of railway tracks – gradient, super elevation, widening of gauge on curves.

UNIT II – RAILWAY TRACK OPERATION, CONSTRUCTION AND MAINTENANCE   **9 Hours**

Working Principle of Points and Crossing, Signaling, Interlocking and Track Circuiting – Lay outs of Railway Stations and Yards – Level Crossings – Earthwork – Stabilization of track on poor soil – Tunneling Methods, drainage and ventilation – Calculation of Materials required for track laying – Construction and maintenance of tracks – Track renewals – Passenger amenities

UNIT III – AIRPORT PLANNING AND DESIGN   **9 Hours**

Advantages and Limitations of Air Transport, Classification – Components of Airports – Airport Planning – Site Selection, Airport Obstructions and Zones – Runway Design – Orientation, Cross wind Component, Wind rose Diagram, Geometric Design and Corrections for Gradients (Problems), Elements of Taxiway Design, Clearance over Highways and Railways.

UNIT IV – AIRPORT LAYOUTS, VISUAL AIDS, AND AIR TRAFFIC CONTROL

9 Hours

Airport Layouts –Parking and Circulation Pattern–Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities–Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings–Air traffic control – primary functions, Air traffic control network.

UNIT V – HARBOUR AND DOCKS ENGINEERING

9 Hours

Advantages and Limitations of Water transport – Definition of terms –Requirements, Classification and location of harbour –planning and design considerations. Docks – classification – Mooring and Mooring accessories – Navigational aids – Coastal structures – Waves and their actions on Coastal structures – classifications of coastal regulation zones – coastal protection works.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Describe the various factors, surveys for track alignment and calculate the geometric design elements for railway track.	Apply
CO.2 Explain the operation, construction, and maintenance of railway track.	Understand
CO.3 Elaborate the various components of airports and the factors considered for geometric design of runway and taxiway.	Understand
CO.4 Describe the elements of airport building and the different types of visual aids and control devices.	Understand
CO.5 Describe the different types of harbour and dock and the various types of navigational aids and coastal protection works.	Understand

Textbook(s):

T 1. Subramaniam K.P., "Railway, Airport and Harbour Engineering", Scitech Publications (India) pvt Ltd. Chennai (2018)

T 2. Subhash C. Saxena, "Airport engineering Planning and Design", CBS publications, New Delhi, 2020

Reference Book(s):

R 1. Saxena, S.C. Arora, S. P. "A text book of Railway Engineering", Dhanpat Rai & Sons, New Delhi. 2015

R 2. Horonjeff, R. Mckelvey, F. X. "Planning & Design of Airports", McGraw hill, New York, 2010

R 3. Gautam H. Oza, Hasmukh P. Oza, "Dock & Harbour Engineering", Charotar Publishing House Pvt. Ltd, 2017.

Web References:

1. http://annauniversityweb.blogspot.com/2013/06/anna–university–civil–notes–3rd–5th–

2. https://easyengineering.net/ce6604–railways–airports–and–harbour/damage/13870/

3. http://nptel.ac.in/courses/105107123/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1017	Course Title: REMOTE SENSING AND GIS		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Surveying

Course Objectives

The course is intended to:

1. Learn the basic concepts and principles of Remote Sensing.
2. Know about the sensors in India and other countries with their characteristics.
3. Understand the various types of image processing used for different data products.
4. Learn the components of GIS and its practical applications in civil engineering.
5. Understand the raster and vector data analysis and application of GIS.

UNIT I – PHYSICS OF REMOTE SENSING   9 Hours

Introduction of Remote Sensing – Electro Magnetic Spectrum– Effects of Atmosphere Scattering – Different types –Absorption–Atmospheric window– Energy interaction with surface features – Spectral reflectance of vegetation, soil, and water –atmospheric influence on spectral response patterns.

UNIT II – BASICS OF SENSORS AND PLATFORM CONCEPTS   9 Hours

Passive and Active sensors – Across track and along track scanners – Multi spectral scanners and thermal scanners – Types of platforms – PSLV and GSLV – Resolution – Spatial, Spectral, Radiometric and temporal resolutions – Pay load description of LANDSAT, SPOT, IRS, INSAT, IKONOS, QUICKBIRD, CARTOSAT Series.

UNIT III – IMAGE PROCESSING   9 Hours

Data Products –image interpretation types – basic elements of image interpretation – visual interpretation keys – Digital Image Processing – Pre–processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised.

UNIT IV – INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEM   9 Hours

Introduction – Maps – Map projections – types of map projections – GIS definition – components of GIS – standard GIS softwares – Data type – Spatial and non–spatial data – measurement scales – Input and Output devices – Analysis Tools.

UNIT V –DATA ANALYSIS AND APPLICATION OF GIS   9 Hours

Data Analysis: Vector and raster data – Data input by analog and digital methods – attribute data analysis – integrated data analysis – Generation of DEM: Parameters – Application of DEM – DTM and DEM advantages.
Application of GIS in Ground water and runoff modelling, Landcover analysis, Regional & Urban planning, Agriculture & soil.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Describe the basic concepts and principles of Remote Sensing.	Understand
CO2: Classify the sensors in India and other countries with their characteristics.	Understand
CO3: Explain various types of image processing used for different data products.	Understand
CO4: Describe the components of GIS and its practical applications in civil engineering.	Understand
CO5: Distinguish raster and vector data analysis and application of GIS.	Understand

Text Book(s):

T 1. Thomas Lillesand, Ralph W. Kiefer, Jonathan Chipman, Remote Sensing and Image Interpretation. VI Edition. John Willey and Sons (Asia) Pvt. Ltd., New Delhi, 2008.

T 2. Anjireddy. M., Remote Sensing and Geographical Information Systems: An Introduction, BS Publications, 4th Edition, 2012.

T 3. Basudeb Bhatta, Remote Sensing and GIS, OUP Publications, 2nd revision Edition, 2011.

Reference Book(s):

R 1. Victor Mesev, Integration of GIS and Remote Sensing, John Wiley and Sons Ltd., 2007.

R 2. Dr. S. Kumar, Basics of Remote Sensing and GIS, Laxmi Publications, 2007.

R 3. Chandra. A. M, Ghosh. S. K., "Remote sensing and geographical information system", Alpha Science Publications, 2015

Web References:

1. http://www.wamis.org/agm/pubs/agm8/Paper–1.pdf

2. http://ags.geography.du.ac.in/Study%20Materials_files/Punyatoya%20Patra_AM.pdf

3. http://hydrologie.org/hsj/410/hysj_41_04_0593.pdf

4. http://www.wiley.com/legacy/wileychi/gis/Volume1/BB1v1_ch14.pdf

5. http://gis–lab.info/docs/books/aerial–mapping/cr1557_15.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment pattern:

	Assessment Component	CO.No.	Marks	Total
Continuous Comprehensive Evaluation	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorial/Quiz/Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
Total				100

Course Code: 19CEEN1018	Course Title: SAFETY IN CONSTRUCTION		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢   Nil

Course Objectives

The course is intended to:

1. Study the cases of constructional accidents and legal implications.

2. Acquire knowledge on safety programme.

3. List the safety considerations in a construction contract.

4. Study the importance of designing safety work culture.

5. Know the responsibility of owner and designers.

UNIT I – CONSTRUCTION ACCIDENTS AND SAFETY MANAGEMENT   9 Hours

Accidents – Types of accidents and their causes – Cost of Constructional Accidents – Direct and Indirect cost – Occupational and safety hazard assessment – Safety Management of Accidents – Human errors and their role in safety management – Legal Implications.

UNIT II – SAFETY PROGRAMMES   9 Hours

Construction Safety – Benefits – Safety meetings – Elements of effective safety programme – problem areas in construction site – Job–site safety assessment – Safety Incentives – approaches to Improve Safety – OSHA – Indian Standards and Acts.

UNIT III –CONTRACTUAL OBLIGATIONS   9 Hours

Safety in construction contracts – Obligations and Types – Sub contractual Obligations – Substance abuse – Drug Abuse, Alcohol Abuse, Tobacco Abuse – Safety record keeping– Safety Personnel.

UNIT IV – DESIGNING FOR SAFETY   9 Hours

Safety culture – Safe Workers – Role of Employee, safety officer and management in designing safety – Safety Personnel– Safety Checklist – Project coordination and safety Procedures –Workers' compensation

UNIT V –OWNER'S, ENGINEER AND DESIGNERS OUTLOOK   9 Hours

Owner's responsibility for safety – Owner preparedness – Role of Engineer and Designer in ensuring safety – Safety clause in design document.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Identify the types of construction accidents, effects and safety measures to be followed in construction projects.	Understand
CO.2 Explain the safety norms as per various acts and standards.	Understand
CO.3 Explain the types of obligations on contracts and sub contracts and to describe the types of substance abuse.	Understand
CO.4 Illustrate the role of employee in designing safety norms in construction industry.	Understand
CO.5 Illustrate the roles and responsibilities of owner, engineer and designers in a construction project.	Understand

Textbook(s):

T 1.   Jimmy W. Hinze, "Construction Safety", Prentice Hall Inc., 1997.

T 2.   Amarjit Singh, Jimmie Hinze, "Implementation of Safety and Health on Construction Sites" Taylor & Francis, 1999.

Reference Book(s):

R 1.   Richard J. Coble, Jimme Hinze and Theo C. Haupt, "Construction Safety and Health Management" Prentice Hall Inc., 2001

R 2.   Tim Howrath, Paul Watson "Construction Safety Management" John Wiley & Sons, 2008.

R 3.   Tamil Nadu Factory Act, Department of Inspectorate of factories, Tamil Nadu

IS Code Books:

1. IS 13415:1992
2. IS 7293:1974
3. IS 13416:1992(Part 1 to 5)
4. SP 70: 2001

Web References:

1. http://www.osha.gov/video/
2. http://www.youtube.com/watch?v=t–P6mMp23ug
3. https://nptel.ac.in/courses/114106017/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1019	Course Title: SEISMIC DESIGN OF STRUCTURES		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Solid Mechanics

➢ Geology and Soil Mechanics

Course Objectives

The course is intended to:

1. Study the Theory of vibration and single degree of freedom.

2. Study the Multiple degree of freedom.

3. Study the Elements of seismology
4. Know the Design principles of seismic design

5. Study about the Retrofitting of buildings

UNIT I – THEORY OF VIBRATIONS   9 Hours

Difference between static loading and dynamic loading – Degree of freedom – Single degree of freedom system – Formulation of Equations of motion for single degree of freedom (SDOF) system –Newtons Second Law – D'Alemberts principles – Effect of damping – Free and forced vibration of damped and undamped structures – Response to harmonic and periodic forces.

UNIT II – MULTIPLE DEGREE OF FREEDOM SYSTEM   9 Hours

Two degree of freedom system –Modes of vibrations –Formulation of equations of motion for multi –degree of freedom (MDOF) system – Eigen values and Eigen vectors–Response to free and forced vibrations – Damped and undamped MDOF system –Modal superposition methods.

UNIT III – ELEMENTS OF SEISMOLOGY   9 Hours

Elements of engineering seismology – Causes of earthquakes – Seismic waves – Magnitude – Intensity and Energy release – Indian seismology – Earthquake history – Catastrophes – Failures – Liquefaction–Lessons learnt from past earthquakes – Seismic zone map of India – Estimation of Earthquake Parameters, Microzonation – Strong ground motion characteristics

UNIT IV –SEISMIC DESIGN OF BUILDINGS   9 Hours

Introduction to methods of seismic analysis – Equivalent static analysis – IS code provisions – Design horizontal seismic coefficient – Design base shear distribution – Seismic resistant

design of – Ductile detailing of reinforcements in RC buildings – Behavior masonry structures – Behaviour of tall building under seismic and wind conditions.

UNIT V –REPAIRS AND RETROFITTING   9 Hours

Code of practices for repairs and retrofitting – Retrofitting of RC buildings and structural elements –Techniques of retrofitting – Improving structural integrity of masonry buildings – Tuned Mass Dampers –Retrofitting by seismic isolation – Case studies

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the fundamentals of vibrations and develop equation of motion for single degree of freedom systems.	Apply
CO.2 Explain the modes of vibration in two degree and multi degree of freedom and develop equations for MDOF system.	Apply
CO.3 Illustrate the elements of seismology to explain the ground motion characteristics.	Understand
CO.4 Identify the effects of earthquake on different types of structures and apply suitable IS codal provisions for seismic design of buildings.	Apply
CO.5 Explain the various techniques for retrofitting of structures.	Understand

Textbook(s):

T 1.   Pankaj Agarwal and Manish Shrikhande, Earthquake resistant design of structures, Prentice–Hall India Pvt. Ltd., 2012

T 2.   Duggal S.K, "Earthquake resistant design of structures", Oxford University Press, NewDelhi, 2015.

T 3.   Damodarasamy S.R, and Kavitha S, "Basics of Structural Dynamics and Aseismic Design", PHI Learning Pvt. Ltd, New Delhi. 2009

Reference Book(s):

R 1.   George G Penelis and Andreas J Kappos –"Earthquake Resistant Concrete Structures"

R 2.   Chopra Anil.K., "Dynamics of Structures – Theory and Applications to Earthquake Engineering", 5th Edition, Pearson Education, 2017.

R 3.   Park, R & Paulay, "Design of Reinforced Concrete Structure Elements", John Wiley & sons, 2009

IS Code Book

1. IS 1893 – 2002, Criteria for Earthquake Resistant Design of Structures
2. IS 4326 – 1993, Earthquake Resistant Design and Construction of Buildings – Code of Practice
3. IS 13920 – 1993, Ductile Detailing of Reinforced Concrete Structures to Seismic Forces –Code of Practice
4. IS 13935 – 1993, Repair and Seismic Strengthening of Buildings – Guidelines

Web References:

1. https://nptel.ac.in/courses/105102016/
2. https://nptel.ac.in/courses/105101004/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1020	Course Title: SMART MATERIALS AND STRUCTURES		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

➢ Nil

Course Objectives

The course is intended to:
1. Study the various types of smart materials used in the engineering application.
2. Acquire the fundamental knowledge of sensors and its application.
3. Learn the basic aspects, types and application of measuring techniques
4. Study basics of actuators and its application in engineering
5. Know the importance of data acquisition and signal processing.

Unit I – PROPERTIES OF MATERIALS 9 Hours

Introduction to Smart Materials and Structures –Piezoelectric Materials, Properties – Shape memory alloy, constitutive modelling, application – Vibration Control – Embedded actuators.

Unit II – SENSING TECHNOLOGY 9 Hours

Type of sensors – Physical measurement – Piezo Electric Strain – Transducers – Fiber Optic Techniques– Chemical and bio–Chemical sensing in Structural Assessment –Spectroscopes – Fiber Optic Chemical Sensing Systems – Distributed measurement.

Unit III – MEASURING TECHNIQUES 9 Hours

Measuring Techniques – Strain Measuring Techniques using Electrical strain gauges, Types – Resistance – Capacitance – Inductance – Wheatstone bridges – Pressure transducers – Load cells –Temperature Compensation – Strain Rosettes.

Unit IV – ACTUATOR TECHNIQUES 9 Hours

Actuator Techniques – Actuator and actuator materials – Piezoelectric and Electro strictive Material – Magneto structure Material – Shape Memory Alloys – Electro rheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials.

Unit V – SIGNAL PROCESSING AND CONTROL SYSTEMS 9 Hours

Data Acquisition and Processing – Signal Processing and Control for Smart Structures – Sensors as Geometrical Processors – Signal Processing – Control System – Linear and Non–Linear.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the properties and applications of piezoelectric materials, vibration control and embedded actuators.	Understand
CO.2 Illustrate the sensing techniques for structural assessment.	Understand
CO.3 Explain the measuring techniques for health monitoring of structures.	Understand
CO.4 Illustrate the principles of actuator for various applications in construction industry.	Understand
CO.5 Explain the basic concepts of signal processing and control system for civil engineering applications.	Understand

Textbook(s):

T1.   Srinivasan, A. V. and Michael McFarland, D., "Smart Structures: Analysis and Design" Cambridge University Press, 2009.

T2.   Michelle Addington and Daniel L. Schodek, "Smart Materials and Technologies: For the Architecture and Design Professions", Routledge 2004.

Reference Book(s):

R.1   Mel.M Schwartz, Encyclopedia of Smart Materials, John Wiley and Sons, inc 2002.

R.2   A. J. Moulson and J. M. Herbert, Electro ceramics: Materials, Properties, Application, 2nd Edition John Wiley& Sons, Chichester, West Susses, New York, 2003

Web References:

1. https://nptel.ac.in/courses/112/104/112104251/

2. https://nptel.ac.in/courses/112/104/112104173/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1021	Course Title: ARCHITECTURE AND TOWN PLANNING			
Course Category: Professional Elective	Course Level: Mastery			
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45		Max Marks:100

Pre-requisites

➢ Nil

Course Objectives

The course is intended to:

1. Understand the difference between architectural styles of eastern and western world.

2. Comprehend the principles of Architectural design

3. Gain knowledge on the concept of composing spaces of buildings using design concepts, planning principles.

4. Know about the town planning concepts in ancient India

5. Understand the standards, landscaping features and regulations controlling expansion of the towns and the cities.

UNIT I – HISTORY OF ARCHITECTURE   **9 Hours**

Western Architecture: Egyptian, Greek, Roman Architectures.
Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles– Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu.
Indo Sarsanic (Islamic) Architecture: Mosque – Palace – Fort – Tomb.

UNIT II – PRINCIPLES OF ARCHITECTURAL DESIGN   **9 Hours**

Principles of designing – Composition of Plan – relationship between plan and elevation– building elements, form, surface texture, mass, line, color, tone– Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression.

UNIT III – PRINCIPLES OF PLANNING   **9 Hours**

Principles of planning a residence– site selection, site orientation– aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.
Post–classic Architecture: Introduction of post–classic architecture contribution of eminent architects to modern period–Edward Lutyens, Le Corbusier, Frank Lloyd Wrigt, Walter Groping

UNIT IV – HISTORICAL BACKGROUND OF TOWN PLANNING   **9 Hours**

Town planning in India – Town plans of mythological Manasa–Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT V – MODERN TOWN PLANNING   9 Hours

Zoning – Roads and road traffic – Housing – Slums, Parks, Playgrounds – Public Utility Services – Surveys and maps for planning – Neighborhood Planning. Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation – planning regulations and limitations. Land scaping for the towns, horizontal and vertical expansion of towns – garden cities, satellite towns – floating towns – skyscrapers – pyramidal cities.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the architectural styles adopted in western architecture and Indian architecture.	Understand
CO.2 Illustrate the principles of architectural design for planning a building.	Understand
CO.3 Identify proper aligned dimensioning techniques, and spacing as per planning principles for planning a residential building.	Understand
CO.4 Describe the ancient town planning techniques adopted in India.	Understand
CO.5 Explain the standards, landscaping features and regulations controlling expansion of the towns and the cities towards modern town planning.	Understand

Textbook(s):

T 1. G. K. Hiraskar, "The Great Ages of World Architecture" (With Introduction to Landscape Architecture) (2018–2019), Session Paperback – 1 January 2018

T 2. G.K. Haraskar , 'Fundamentals of Town Planning', Dhanpat Rai Publishing Co Pvt Ltd, 2018.

Reference Book(s):

R 1. Hepler Drafting and Design for Architecture, Cengage Learning, 2012

R 2. John Patten Guthrie, Architect's Portable Handbook, Mc Graw Hill International Publications, 2010

R 3. R. S. Deshpande, Modern Ideal Homes for India, United book corporation digital library India,2017

Web References:

1. https://nptel.ac.in/courses/124/106/124106009/

2. https://nptel.ac.in/courses/124/107/124107001/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1022	3D CONCRETE PRINTING		
Course Category: Professional Elective	Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre–requisites

➢ Concrete Technology

Course Objectives

The course is intended to:

1. Learn the basics of additive manufacturing

2. Impart the knowledge materials for 3D printed concrete

3. Select the concrete mix proportion of 3D printed concrete

4. Gain the information on the properties of 3D printed concrete

5. Provide the application of 3D printed concrete

UNIT I – INTRODUCTION TO ADDITIVE MANUFACTURING (3D PRINTING)   9 Hours
Introduction, Process, Classifications, Equipment, Advantages, Conventional v/s Additive Manufacturing processes and applications. Development of CAD models for 3D printing. Application in construction industry

UNIT II – CHARACTERISATION AND MATERIALS   9 Hours
Introduction – Rheology of cementitious system – Assessment of phase separation – Properties of materials–cement, clay, fibers.

UNIT III – CONCRETE MIX DEVELOPMENT AND FLOWABILITY   9 Hours
Mixture design of 3D printable concrete – Flowability and fresh properties

UNIT IV – PROPERTIES OF CONCRETE MIXTURE   9 Hours
Mechanical and durability properties of 3D printable concrete

Unit V – APPLICATION IN CONSTRUCTION INDUSTRY   9 Hours
Case studies of 3D printed concrete elements and modular structures

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the process of additive manufacturing and create CAD models for 3D concrete printing.	Understand
CO.2 Explain the rheological properties of the materials for 3D concrete system.	Understand
CO.3 Describe the concept of concrete mix design for 3D concrete and fresh properties of concrete for 3D printing.	Understand

CO.4 Explain the mechanical and durability properties of 3D printed concrete	Understand
CO.5 Describe the applications of 3D concrete printing for modular structures.	Understand

Text Book(s):

T1.　　Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi., 2017

T2.　　A.R. Santhakumar Concrete Technology– Oxford university press., 2015

Reference Book(s):

R1. CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping– Principles and Applications", World Scientific, 2017

R2. Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2; Low–1

Assessment pattern:

	Assessment Component	CO.No.	Marks	Total
Continuous Comprehensive Evaluation	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEEN1023	Course Title: HYDROLOGY			
Course Category: Professional Elective		Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45		Max Marks:100

Pre-requisites

➢ Nil

Course Objectives

The course is intended to:
1. Define the key drivers on water resources, hydrological processes and their integrated behavior in catchments.
2. Apply the knowledge of hydrological models to surface water problems including basin characteristics, runoff and hydrograph
3. Explain the concept of hydrological extremes such as flood and drought and its management strategies
4. Describe the importance of spatial analysis of rainfall and design water storage reservoirs
5. Apply the concepts of groundwater for water resources management

UNIT I - PRECIPITATION AND ABSTRACTIONS   **9 Hours**

Hydrological cycle - Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges - Spatial analysis of rainfall data using Thiessen and Isohyetal methods - Interception - Evaporation. Horton‟s equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton‟s equation - double ring infiltrometer, infiltration indices.

UNIT II – RUNOFF   **9 Hours**

Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation using empirical - Strange‟s table and SCS methods – Stage discharge relationships flow measurements- Hydrograph – Unit Hydrograph – IUH

UNIT III – FLOOD AND DROUGHT   **9 Hours**

Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis-Drought Prone Area Programme (DPAP)

UNIT IV – RESERVOIRS   **9 Hours**

Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve

UNIT V – GROUNDWATER MANAGEMENT

Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Define the key drivers on water resources, hydrological processes and their integrated behavior in catchments.	Understand
CO.2 Apply the knowledge of hydrological models to surface water problems including basin characteristics, runoff and hydrograph	Understand
CO.3 Explain the concept of hydrological extremes such as flood and drought and its management strategies	Understand
CO.4 Describe the importance of spatial analysis of rainfall and design water storage reservoirs	Understand
CO.5 Apply the concepts of groundwater for water resources management	Understand

Text Book(s):

T 1.   Subramanya, K. "Engineering Hydrology"- Tata McGraw Hill, 2010

T 2.   Jayarami Reddy, P., "Hydrology", Tata McGraw Hill, 2008.

Reference Book(s):

R 1.   Garg. S. K., "Hydrology And Water Resources Engineering", Khanna Publishers- Delhi, 2010.

R 2.   Ven Te Chow, Maidment, D.R. and Mays, L.W., "Applied Hydrology", McGraw Hill

R 3.   International Book Company, 1998.

R 4.   Raghunath .H.M., "Hydrology", Wiley Eastern Ltd., 1998.

Web References:

1. http://nptel.ac.in/downloads/105105110/

2. http://www.civilenggforall.com/2015/09/irrigation-and-water-resources-engineering-gl-asawa-free-download-pdf-civilenggforall.html

3. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-731-water-resource-systems-fall-2006/lecture-notes/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High-3; Medium-2; Low-1

Assessment Pattern

	Assessment Component	CO. No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEOC1001	Course Title: ENVIRONMENTAL IMPACT ASSESSMENT		
Course Category: Open Elective		Course Level: Mastery	
L: T: P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre–requisites

  ➢ Environmental Sciences

Course Objectives

The course is intended to:

1. Understand the basic concepts involved in the EIA process.

2. Apprehend the methods of EIA adopted for various infrastructural projects.
3. Know the impacts of infrastructure projects on the environment.
4. Understand the steps involved in preparation of environmental management plans.

5. Familiarize with environmental impact assessment of infrastructural projects.

Unit I – INTRODUCTION   **9 Hours**

Impact of development projects under civil engineering on the environment– Environmental impact assessment (EIA) – Environmental impact statement (EIS) – EIA capability and limitations – EIA notifications – EIA consultants

UNIT II – METHODOLOGIES   **9 Hours**

Methods of EIA – Strength, weakness and applicability of EIA – Appropriate methodology – Process screening, Baseline studies, Mitigations. Types – Checklists, Matrices, Networks, Cost benefit analysis

UNIT III – AIR QUALITY, NOISE, ENERGY, WATER QUALITY,   **9 Hours**
VEGETATION AND WILDLIFE IMPACT

Background – typical consideration and factors, Air quality impact of industries, transport systems, human settlements. Effects of noise on people, noise scales and rating methods. Energy impact considerations – Water quality criteria and standards – Impact on flora and fauna – Socio economic impact – Rapid EIA – Environmental audit

UNIT IV – ENVIRONMENTAL MANAGEMENT PLAN   **9 Hours**

Plan for mitigation of adverse impact on the environment – options for mitigation of impact on water, air and land, flora and fauna – ISO 14001

UNIT V – CASE STUDIES   **9 Hours**

EIA for infrastructural projects – Highways and bridges – stadium – railways – dams –
multi–storey buildings – water supply and drainage projects – power plants.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO 1. Describe the objectives, capability, and limitations of EIA.	Understand
CO 2. Elucidate the methods of EIA with case studies.	Understand
CO 3. Explain the impacts of infrastructure projects on air quality, water quality, vegetation and wildlife.	Understand
CO 4. Explain and prepare an environmental management plan for an infrastructural project.	Apply
CO 5. Explain and prepare environmental impact assessment report for various infrastructural projects.	Apply

Textbook(s):

T1. Peter Morris and Riki Therivel, "Methods of Environmental Impact Assessment",
    Routledge Publishers, First edition, 1995.

T2. Y. Anjanayulu, "Environmental impact assessment methodologies", B.S.
    Publications, Hyderabad, Third edition, 2020.

T3. S.R. Khandeshwar, N.S. Raman, A.R. Gajbhiye, "Environmental impact
    assessment", Dreamtech Press, 2019.

Reference Book(s):

R1. John G. Rau and David C Hooten (Ed)., "Environmental impact analysis handbook",
    McGraw–Hill book company, 1990.

R2. "Environmental assessment source book", Vol. I, II and III. The world bank,
    Washington, D.C., 1991.

R3. Judith Petts, "Handbook of environmental impact assessment Vol. I and II", Blackwell
    science, 1999.

Web References:

1. http://nptel.ac.in/courses/120108004

2. http://environmentalclearance.nic.in/writereaddata/EIA%20Notifications

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	3	3	-	-	-	-	2	2	-
CO2	2	1	-	-	-	3	3	-	-	-	-	2	2	-
CO3	2	1	-	-	-	3	3	-	-	-	-	2	2	-
CO4	3	2	-	-	-	3	3	-	-	-	-	2	3	-
CO5	3	2	-	-	-	3	3	-	-	-	-	2	3	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code:19CEOC1002		Course Title: SAFETY ENGINEERING	
Course Category: Open Elective		Course Level: Mastery	
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45	Max Marks:100

Pre-requisites

> ➢ Nil

Course Objectives

The course is intended to:

1. Study the concepts in safety, safety policy and its techniques.

2. Study the concepts in Health and hygiene in the occupational environment.

3. Learn about Fire explosion control techniques in various industries.
4. Know the Safety standards in construction industry.

5. Know the Safety materials to be used in the field of work.

UNIT I – INTRODUCTION TO CONCEPTS   **9 Hours**

Concept of safety – Evolution of modern safety concept– Safety policy – Safety Organization – line and staff – functions for safety – Safety Committee– budgeting for safety. Techniques–Incident Recall Technique (IRT), disaster control, Job Safety Analysis (JSA), safety survey, safety inspection, safety sampling, Safety Audit.

UNIT II – OCCUPATIONAL HEALTH AND HYGIENE   **9 Hours**

Physical hazards – Noise, noise exposure regulation, occupational damage, risk factors, and permissible exposure limit. Ionizing radiation, types, effects, monitoring instruments, control programs, control measures. Chemical hazards – Recognition of chemical hazards–dust, fumes, mist, vapour, fog, gases, types, concentration, Exposure vs. dose, Methods of Control. Concept and spectrum of health – pre-employment and post–employment medical examinations –occupational related diseases, prevention of diseases.

UNIT III – FIRE ENGINEERING AND EXPLOSION CONTROL   **9 Hours**

Fire chemistry – Dynamics of fire behavior – Fire properties of solid, liquid and gas – Fire spread – Toxicity of products of combustion. Building evaluation for fire safety – Fire load – Fire resistance materials and fire testing – Structural Fire protection – Exits and egress. Statutory Rules and Techniques of firefighting – Indian Explosive acts and rules – Techniques of firefighting and demonstration.

UNIT IV – SAFETY IN CONSTRUCTION   **9 Hours**

General safety consideration – Analyzing construction jobs for safety–Contract document Safety certificate for statutory authorities for old building and construction.

Safety in Erection and closing operation – Construction materials – Specifications – suitability – Limitations. Safety in typical civil structures – Dams–bridges–water Tanks–Retaining walls – Critical factors for failure–Regular Inspection and monitoring.

UNIT V – SAFETY IN MATERIAL HANDLING   **9 Hours**

General safety consideration in material handling – Ropes, Chains, Sling, Hoops, Clamps, Arresting gears. Selection, operation and maintenance of Industrial Trucks – Mobile Cranes, Tower crane – Checklist – Competent persons.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the concepts of safety, techniques and safety audit procedure for industrial applications.	Understand
CO.2 Illustrate the types and effects of physical, chemical hazards and methods to control the hazards towards occupational health and hygienic.	Understand
CO.3 Explain the concepts of fire safety and control measures to be followed in industries.	Understand
CO.4 Illustrate the safety procedure to be adopted during construction of various civil engineering structures.	Understand
CO.5 Explain the safety considerations to be followed during handling of safety materials and machineries.	Understand

Textbook(s):

T 1.   R. K. Jain , Sunil S. Rao, Industrial Safety, Health and Environment Management Systems, Khanna Publisher, 2000

T 2.   D.S.S.Ganguly , C.S.Changeriya, Safety Engineering, Chetan Publication, 2016

Reference Book(s):

R 1.   Accident Prevention Manual for Industrial Operations: National Safety Council, Chicago

R 2.   Construction Industry Training Board (CITB); 2nd Revised edition,2018

R 3.   Safety Management System and Documentation Training Programme Handbook–2019

Web References:

1. https://nptel.ac.in/courses/110/105/110105094/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO2	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO3	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO5	2	1	-	-	-	-	-	-	-	-	-	2	-	2

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	
	CCET II	3,4	50	30
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEOC1003	Course Title: GEOGRAPHICAL INFORMATION SYSTEM			
Course Category: Open Elective		Course Level: Mastery		
L:T:P (Hours/Week) 3: 0: 0	Credits:3	Total Contact Hours:45		Max Marks:100

Pre-requisites

Course Objectives

The course is intended to:

1. Learn the basic concepts and principles of Remote Sensing.
2. Know about the sensors in India and other countries with their characteristics.
3. Understand the various types of image processing used for different data products.
4. Learn the components of GIS and its practical applications in civil engineering.
5. Understand the raster and vector data analysis and application of GIS.

UNIT I – FUNDAMENTALS OF GIS   **9 Hours**

Introduction to GIS – Basic spatial concepts – Coordinate Systems – GIS and Information Systems – Definitions – History of GIS – Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open–source Software – Types of data – Spatial, Attribute data types of attributes – scales/ levels of measurements.

UNIT II – SPATIAL DATA MODELS   **9 Hours**

Database Structures – Relational, Object Oriented – Entities – Entity Relationship (ER) diagram – data models conceptual, logical and physical models – spatial data models – Raster Data Structures – Raster Data Compression – Vector Data Structures – Raster vs Vector Models– TIN and GRID data models.

UNIT III – DATA INPUT AND TOPOLOGY   **9 Hours**

Scanner – Raster Data Input – Raster Data File Formats – Georeferencing – Vector Data Input –Digitiser–Datum Projection and reprojection –Coordinate Transformation – Topology – Adjacency, connectivity and containment – Topological Consistency – Non topological file formats – Attribute Data linking –Linking External Databases – ODBC – GPS (Global Positioning System) – GPS based mapping – GPS Data Integration

UNIT IV – DATA ANALYSIS   **9 Hours**

Vector Data Analysis tools – Raster Data Analysis tools – Network Analysis – Digital Education models – 3D data collection and utilisation.

UNIT V – APPLICATIONS   **9 Hours**

GIS Applicant – Natural Resource Management – Engineering – Navigation – Vehicle tracking and fleet management – Marketing and Business applications – Case studies

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Describe the basic concepts and principles of Remote Sensing.	Understand
CO.2 Classify the sensors in India and other countries with their characteristics.	Understand
CO.3 Explain various types of image processing used for different data products.	Understand
CO.4 Describe the components of GIS and its practical applications in civil engineering.	Understand
CO.5 Distinguish raster and vector data analysis and application of GIS.	Understand

Textbook(s):

T 1. Kang–Tsung Chang, Introduction to Geographic Information Systems with Data Set CD– ROM, 9thEdition, Mc Graw Hill, 2018

T 2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical Information Systems, 4th Edition, Pearson Education, 2012

Reference Book(s):

R.1 C.P. Lo, Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, 2ndEdition, Prentice Hall, 2017

R.2 Paul Bolstad, GIS Fundamentals: A First Text on Geographic Information Systems, NEW and UPDATED 6thEdition, 2019

Web References:

1. https://www.gislounge.com/open–source–gis–applications/

2. https://www.arcweb.com/blog/geographic–information–systems–gis–defined

3. http://www.fresnostate.edu/csm/ees/documents/facstaff/wang/gis200/lecture–notes/gis/chap11.pdf

4. https://geogra.uah.es/patxi/gisweb/GISModule/GIST_Vector.htm

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	1	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	1	-	-	-	-	-	-	-	-	-	2	2	-

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	CCET I	1,2	50	30
	CCET II	3,4	50	
	CCET III	5	50	
	Tutorials / Quiz / Assignments	1,2,3,4,5	30	10
End Semester Examination	ESE	1,2,3,4,5	100	60
			Total	100

Course Code: 19CEOC1004	Course Title: APPLIED DESIGN THINKING CONCEPTS		
Course Category: Open Elective		Course Level: Mastery	
L:T:P(Hours/Week) 3:0:0	Credits:3	Total Contact Hours: 45	Max Marks:100

Pre-requisites

➢ Nil

Course Objective

The course is intended to:

1. Apply a scientific method to define & test various hypotheses to mitigate the inherent risks in product innovations.
2. Design the solution concept based on the proposed value defined for the target customer exploring various alternate solutions to achieve value-price fit.
3. Develop Skills in empathizing, Critical thinking, analyzing, storytelling & Pitching.
4. Apply system thinking to reverse engineer a product/prototype and understand its internal components and their correlations.

UNIT I – DESIGN THINKING PRINCIPLES   **9 Hours**

Exploring Human centered Design – Understanding the Innovation process, Discovering areas of opportunity, Interviewing & empathy building techniques, Mitigate validation risk with FIR [Forge Innovation rubric] – Case studies

UNIT II – CUSTOMER-CENTRIC INNOVATION   **9 Hours**

Importance of customer centric innovation – Problem Validation and Customer Discovery – Understanding problem significance and problem incidence - Customer Validation. Target user, User persona &user stories. Activity: Customer development process – Customer interviews and field visits

UNIT III - APPLIED DESIGN THINKING TOOLS   **9 Hours**

Concept of Minimum Usable Prototype [MUP] – MUP challenge brief – Designing & Crafting the value proposition – Deriving the Solution concept [MUP] iteratively-Activity: Ideate, Proto type and Test.

UNIT IV – SYSTEM THINKING &REVERSE ENGINEERING   9 Hours

System Thinking, Understanding Systems, Examples and Understandings, Complex Systems, Reverse Engineering Methodology, Identify building blocks/Components - Re-Engineering a complex system.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Enlighten Scientific Methods in product innovation	Apply
CO2: Expertise on the target customer exploring various alternate solutions to achieve value-price fit.	Apply
CO3: Inculcate variety of applied design thinking tools	Apply
CO4: Describe various skills in system thinking	Apply

Web References:

1. https://www.ideou.com/pages/design-thinking#process.
2. https://blog.forgeforward.in/valuation-risk-versus-validation-risk-in-product-innovations-49f253ca8624.
3. https://blog.forgeforward.in/product-innovation-rubric-adf5ebdfd356.
4. https://blog.forgeforward.in/evaluating-product-innovations-e8178e58b86e.
5. https://blog.forgeforward.in/user-guide-for-product-innovation-rubric-857181b253dd.
6. https://blog.forgeforward.in/startup-failure-is-like-true-lie-7812cdfe9b85.

Course Articulation Matrix:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	2	1	-	2	2	-	-	2	1	2	-	1
CO2	2	1	-	2	2	-	-	2	1	2	-	1
CO3	2	1	-	2	2	-	-	2	1	2	-	1
CO4	2	1	-	2	2	-	-	2	1	2	-	1

High-3; Medium-2; Low-1

Assessment Pattern

Continuous Assessment	Assessment Component	CO. No.	Marks	Total
	Quiz / Assignment	1, 2, 3, 4	100	40
End Semester Examination	ESE	1, 2, 3, 4	100	60
			Total	100

Course Code: 19CEOC1005	Course Title: STARTUP FUNDAMENTALS FOR ENGINEERS		
Course Category: Open Elective	Course Level: Mastery		
L:T:P(Hours/Week) 3:0:0	Credits:3	Total Contact Hours: 45	Max Marks:100

Prerequisites

> ➢ Nil

Course Objectives

The course is intended to:

1. Develop an entrepreneurial mind-set that will help them identify, assess, shape & act on opportunities in a variety of contexts & organization.
2. Demonstrate the potential of an innovative idea to create economic value, as a startup.
3. Understand the scientific process to explore a viable business model to build a scale business.
4. Acquire knowledge on the fundamental concepts of Intellectual Property to Draft the Patent for a product.

UNIT I – **ENTREPRENEURIAL MINDSET & METHOD**   **9 Hours**

Introduction to Innovation-led, tech-powered entrepreneurship – Understand from research the attributes of an expert entrepreneur- Effectuation principles – Dealing with the unknowns – Case studies of startup failures.

UNIT II – **IDEA TO ENTERPRISE**   **9 Hours**

Design and Planning of Product Concept – Business Model – Business Planning – Building Proof of Product and Value Testing – Target Market and Revenue Planning.

UNIT III – **MINIMUM VIABLE BUSINESS**   **9 Hours**

Framework for Minimum Viable Business – Disruptive Innovation – Theory of Disruption – Competitive advantage – Building proof of viable business model –Demystifying Scalability – Pitch Clinic.

UNIT IV – **IPR AND PATENT DRAFTING**   **9 Hours**

Intellectual Property 101- Introduction and the need for Intellectual Property Rights, Prior Art Search &Case studies of IPR. Fundamentals of Patent Drafting - Invention as a concept - Keywords formation - Structure of patent - Key attributes in patent drafting - Drafting provisional specifications – Drafting complete specifications – Draft claims – Case studies on patent drafting.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1: Explain the diverse in Scientific entrepreneurial mindset & method	Apply
CO2: Expertise on the potential of an innovative idea	Apply
CO3: llustrate the Scientific process in business models	Apply
CO4: Exemplify fundamental concepts of Intellectual Property	Apply

Reference Book(s):

R1. Steven Blank and Bob Dorf, (2012), The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company, K&S Ranch.

R2. Dr. SarasSarasvathy, (2008), Effectuation: Elements of Entrepreneurial Expertise, New Horizons in Entrepreneurship series.

Web References:

1. https://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	2	2	-	-	2	1	2	-	1
CO2	2	1	-	2	2	-	-	2	1	2	-	1
CO3	2	1	-	2	2	-	-	2	1	2	-	1
CO4	2	1	-	2	2	-	-	2	1	2	-	1

High-3; Medium-2;Low-1

Assessment Pattern:

Continuous Assessment	Assessment Component	CO.No.	Marks	Total
	Quiz / Assignment	1, 2, 3, 4	100	40
End Semester Examination	ESE	1, 2, 3, 4	100	60
			Total	100

Course Code: 19CEPN6011	Course Title: INTRODUCTION TO INTERIOR DESIGN SKETCH-UP TOOL		
Course Category: Professional Core		Course Level: Practice	
L:T:P (Hours/Week) 2: 0:0	Credits:1	Total Contact Hours:30	Max Marks:100

Pr–requisites

> 19CECN3201– Computer Aided Building Drawing Laboratory

Course Objectives

The course is intended to:

1. Gain knowledge on basic tools of sketch up software.

2. Know the components/objects used in interior of a residential building.

3. Learn the Landscapes in a residential building.
4. Know the 3D exposure of a residential building.

Unit I – INTRODUCTION   **7 Hours**

Introduction to Sketch Up – The fundamental tools – Lines, Rectangles, and Circles – Move, Rotate and offset – Push, Pull and Follow Me – Understanding How Sketch UP Works

Unit II – GROUPS AND COMPONENTS   **7 Hours**

Creating and Editing Groups – Creating and Editing Components – Textures and Materials – Applying Colours and Materials – Creating Materials – Exporting Images

Unit III – LANDSCAPE   **7 Hours**

Sand box Tools – Creating Landscaping – Importing Trees – Importing CAD Files

Unit IV – Modeling and Layer Management   **9 Hours**

Real World Modelling Assignment – Good Layer Management – Cleaning Up CAD Files – Turning 2D into 3D – Real World Modelling Assignment – Presentations of Modelling Assignment

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1. Explain the basic tools of sketch up software	Understand
CO2. Develop the components/objects used in interior of a residential building.	Apply
CO3. Select the suitable elements of landscapes in a residential building	Apply
CO4. Develop three–dimensional view of a residential building	Apply

Text Book(s):

T1. Aidan Chopra and Laura Town Chris Pichereau, "Introduction to Google Sketch Up" John Wiley & Sons Publications, 2012

Reference Book(s):

R1. Alexander C. Schreyer**, "**Architectural Design with Sketch Up: 3D Modeling, Extensions, BIM, Rendering, Making, and Scripting**"** 2nd Edition**,** 2012

Web References:

3. https://help.sketchup.com/en/sketchup/getting–started–self–paced–tutorials

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	3	-	-	-	-	-	-	-	2	2	-
CO2	3	2	-	3	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	3	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	3	-	-	-	-	-	-	-	2	3	-

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Assessment 1	1,2	25	25
	Assessment 2	3,4	25	25
	Final Assessment	1,2,3,4	25	25
End Semester Examination	ESE	1,2,3,4	25	25
			Total	**100**

Course Code: 19CEPN6012	Course Title: INTRODUCTION TO ANSYS		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 2: 0: 0	Credits:1	Total Contact Hours:30	Max Marks:100

Pr–requisites

> ➢ NIL

Course Objectives

The course is intended to:

1. Acquire basic knowledge on various building materials used in construction.

2. Discuss the importance of metals, timber and other materials.

3. Study the specifications, details and sequence of sub structure construction activities.
4. List the concepts and techniques used in super structure construction.

5. Identify the equipment required in various levels of construction.

UNIT I – INTRODUCTION TO CAE AND ANSYS WORKBENCH   6 Hours

Introduction to CAE – General working of FEA– Boundary conditions– Elements and Element Shapes, Types of Engineering Analysis– General procedure to conduct FEA – Classification of materials.
Starting ANSYS Workbench 14.0– Working on a Project– Units in ANSYS Workbench– ANSYS Workbench Database and File format – Changing the unit system– Components of the system

UNIT II – SKETCHING FEATURES, TOOLS AND ASSEMBLY   6 Hours

Modeling– Design Modeler Window– Illustration of I–section, Spring Plate, Clamp. Static loadings–ductile materials, Brittle materials– Fatigue loading–ductile material, Adding a hole, Adding a round, Adding a chamfer, Patterns, Assembly, Alternate solid modeler

UNIT III – MODELING TECHNIQUES, MATERIAL PROPERTIES AND MESHING   6 Hours

Solid Modeling Fundamentals – Extrusion, Revolution, Sweep, Sketching. Parameters for modeling techniques – Surface and Line models. Introduction to Engineering Workspace – Creating and Adding Materials – Assigning Material to the Beam, Clamp, Assembly. Meshing of Plate with Holes – Generating the mesh, optimize the model and generating the local mesh (illustration through Assembly Meshing)

UNIT IV – STATIC STRUCTURAL ANALYSIS   6 Hours

Introduction to Static Structural Analysis– Pre–processing, Solution, Post–processing– Static Structural Analysis of RC elements.

UNIT V – **NATURAL FREQUENCIES, BUCKLING LOADS AND THERMAL STRESS**   **6 Hours**

Introduction to natural frequencies – Performing the Modal analysis – Specifying analysis settings – Modal analysis: Cantilever beam and Simply supported beam. Buckling analysis of Fixed free column (flag pole), Pinned–pinned column and Built–up structure. Thermal stress –uniform temperature change – Thermal stress in a cylinder

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO1. Apply the fundamentals of finite element analysis (FEA) and behind its implementation in computer-aided engineering (CAE) as well as basics of ANSYS Workbench.	Apply
CO2. Apply sketching features for brittle and ductile materials under static and fatigue loading by using appropriate tools and assembly.	Apply
CO3. Apply modelling techniques and material properties to generate a model through assembly meshing.	Apply
CO4. Analyse an RC element statically to determine the displacements, stresses, strains, and forces to solve complex problems.	Apply
CO5. Perform model analysis for different types of beams and columns with various end conditions as well as thermal analysis for cylinders.	Apply

Text Book(s):

T1. An Introduction to ANSYS Fluent 2021, By John E. Matsson Ph.D., P.E.

Reference Book(s):

R1. Finite Element Simulations with ANSYS Workbench 2021, By Huei–Huang Lee

Web References:

1. https://www.sdcpublications.com/Textbooks/Introduction–ANSYS–Fluent–2020/ISBN/ 978-1-63057-396-6/

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	3	-	-	-	-	-	-	-	2	3	-
CO2	3	2	-	3	-	-	-	-	-	-	-	2	3	-
CO3	3	2	-	3	-	-	-	-	-	-	-	2	3	-
CO4	3	2	-	3	-	-	-	-	-	-	-	2	3	-
CO5	3	2	-	3	-	-	-	-	-	-	-	2	3	-

High–3; Medium–2; Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Assessment 1	1,2	25	25
	Assessment 2	3,4	25	25
	Final Assessment	1,2,3,4	25	25
End Semester Examination	ESE	1,2,3,4	25	25
			Total	**100**

Course Code: 19CEPN6013	Course Title: WELDING TECHNOLOGY		
Course Category: Professional Core	Course Level: Practice		
L:T:P (Hours/Week) 1: 0: 1	Credits:1	Total Contact Hours:30	Max Marks:100

Pre–requisites

> ➢ Nil

Course Objectives

The course is intended to:

1. The welding principles and to learn the process of typical welding (Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, shielded metal arc welding, Submerged arc welding) as per Indian Standards
2. The process, advantages and applications of TIG and MIG welding as per Indian Standards
3. The process, advantages and applications of solid-state welding as per Indian Standards
4. The typical advanced welding processes and to know welding automation in typical fields (aerospace, nuclear and surface transport vehicles)
5. The design of weld joints, material weldability (for Aluminium, Copper & Stainless Steel) and testing of weldments

UNIT I – GAS AND ARC WELDING PROCESSES **3 Hours**

Fundamental principles – Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding.

UNIT II – TIG & MIG WELDING PROCESSES **3 Hours**

TIG & MIG welding–Process – advantages, limitations and applications.

UNIT III – SOLID STATE WELDING PROCESSES **3 Hours**

Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and Hot pressure welding processes – advantages, limitations and applications

UNIT IV – ADVANCED WELDING PROCESSES **3 Hours**

Thermit welding, Atomic hydrogen welding, Electron beam welding, Laser Beam welding, Friction stir welding, Under Water welding, Welding automation in aerospace, nuclear and surface transport vehicles.

UNIT V – DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS **3 Hours**

Various weld joint designs – Weldability of Aluminium, Copper, and Stainless steels. Destructive and non-destructive testing of weldments.

List of Exercises   **15 Hours**

1. Oxyacetylene welding on Aluminium, Copper, and Stainless steels

2. Carbon arc welding on Aluminium, Copper, and Stainless steels

3. Submerged arc welding on Aluminium, Copper, and Stainless steels

4. TIG welding on Aluminium, Copper, and Stainless steels

5. MIG welding on Aluminium, Copper, and Stainless steels

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Demonstrate typical welding (Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding) as per Indian Standards.	Apply
CO.2 Demonstrate TIG and MIG welding as per Indian Standards.	Apply
CO.3 Describe the process, advantages and applications of solid-state welding as per Indian Standards	Understand
CO.4 Explain the typical advanced welding processes and describe the welding automation in various fields such as aerospace, nuclear and surface transport vehicles.	Understand
CO.5 Explain the design of weld joints, material weld ability (for Aluminium, Copper & Stainless Steel) and testing of weldments.	Understand

Text Book(s):

T1. Parmer R.S., "Welding Engineering and Technology", 1st edition, Khanna Publishers, New Delhi, 2008.

T2. Little R.L., "Welding and welding Technology", Tata McGraw Hill Publishing Co., Ltd., New Delhi, 34th reprint, 2008.

Reference Book(s):

R1. Nadkarni S.V. "Modern Arc Welding Technology", 1st edition, Oxford IBH Publishers, 2005.
R2. Schwartz M.M. "Metals Joining Manual". McGraw Hill Books, 1979.

R3. Davis A.C., "The Science and Practice of Welding", Cambridge University Press, Cambridge, 1993

Web References:

1. https://www.jfe–steel.co.jp/en/research/report/020/pdf/020–17.pdf

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	-	-	-	-	-	-	-	-	-	2	-	3
CO2	3	1	-	-	-	-	-	-	-	-	-	2	-	3
CO3	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO5	2	1	-	-	-	-	-	-	-	-	-	2	-	2

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Assessment 1	3,4	50	25
	Assessment 2	5	50	25
	Continuous Assessment – Practical	1,2	50	25
	Final Assessment – Practical	1,2	50	
End Semester Examination	ESE	1,2,3,4,5	25	25
			Total	**100**

Course Code: 19CEPN6014	Course Title: FIRE AND SAFETY ENGINEERING		
Course Category: Professional Core	**Course Level: Practice**		
L:T:P (Hours/Week) 4: 0: 0	**Credits:4**	**Total Contact Hours: 60**	**Max Marks:100**

Pre–requisites

> ➢ NIL

Course Objectives

The course is intended to:
1. Understand the principles, policies and fundamentals of Fire and Safety Engineering as per OSHA standards
2. Learn about the tools and equipment's involved in Fire and Safety and its applications
3. Study the procedures for fire safety protection of buildings
4. Study the Fire safety risk assessment and evacuation procedures
5. Learn about Industrial Fire Safety management and laws on Industrial safety.

UNIT I – INTRODUCTION TO FIRE & SAFETY   12 Hours
History of fires – Ancient & Modern Fire safety construction techniques – fire investigation – National Fire Protection Association – Occupational Safety and Health Administration standards.
Safety goals and objectives – Monitoring safety progress – Safety and the balanced scorecard – Setting targets and ensuring commitment – Policies and procedures – Safety values and principles.

UNIT II – FIRE SAFETY TOOLS & EQUIPMENT'S   12 Hours
General Causes of fire – Detection of fire – Classification of fire – Extinguishing methods – Portable fire extinguishers – Pumps and primers – Foam and foam making equipment's – Hose and hose fittings – Water relay systems – Breathing apparatus – Small gears – Fire protective clothing – Ladders, Ropes and lines, bends & hitches.

UNIT III – FIRE SAFETY PROTECTION FOR BUILDINGS   12 Hours
Emergency Plans & Staff Training – Highly Flammables & LPG – Firefighting equipment requirements – Fire resisting construction & compartmentation – Active fire safety for building protection: Sprinklers & Automatic roof vents, Scaffolding – Types, installation methods and procedures for Fire safety protection.

UNIT IV – FIRE RISK ASSESSMENT & EVACUATION   12 Hours

Fire risk assessment structure and layout – Identifying hazards and risks –Means of escape principles – Basic requirements – Fire signage: National requirements, Fire Alarms & fire detection – Basic components, and testing, Emergency lighting –Measures to prevent and reduce fire pollution

UNIT V – INDUSTRIAL FIRE SAFETY MANAGEMENT   **12 Hours**

Job safety analysis – Safety audit – Safety survey – Risk assessment and management –Risk management and corporate policy on insurance – Accident investigation – Work permit system – Emergency planning, industrial light and ventilation – personal protective equipment – First aid & Safety Management and safety laws.

Course Outcomes	Cognitive Level
At the end of this course, students will be able to:	
CO.1 Explain the principles, policies and fundamentals of Fire and Safety Engineering as per OSHA standards	Understand
CO.2 Explain the tools and equipment's involved in Fire and Safety for various applications	Understand
CO.3 Illustrate the procedures for fire safety protection of buildings.	Understand
CO.4 Explain the procedure for Fire safety risk assessment and emergency evacuation.	Understand
CO.5 Explain about Industrial Fire Safety management and enumerate the laws on Industrial safety.	Understand

Text Book(s):

1. Akhil kumar Das, "Principles of Fire Safety Engineering: Understanding Fire and Fire Protection", Prentice Hall India Learning Private Limited, 2014.

2. Andrew Furness and Matrin Muckett, "Introduction to fire safety Management",

Reference Book(s):

1. Daniel E. Della Gustina, "Fire Safety Management Hnadbook", CRC Press, Third Edition, 2014.

2. N Prekash Sesha,"Manual of Fire Safety" ,CBS Publishers & Distributors Pvt Ltd,2017.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO2	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO3	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO4	2	1	-	-	-	-	-	-	-	-	-	2	-	2
CO5	2	1	-	-	-	-	-	-	-	-	-	2	-	2

High–3; Medium–2;Low–1

Assessment Pattern

	Assessment Component	CO.No.	Marks	Total
Continuous Assessment	Assessment 1	1,2	25	25
	Assessment 2	3,4	25	25
	Final Assessment	1,2,3,4	25	25
End Semester Examination	ESE	1,2,3,4	25	25
			Total	**100**