SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution, Affiliated to Anna University
Coimbatore - 641 008

DEPARTMENT OF CIVIL ENGINEERING

CURRICULUM AND SYLLABI

BE CIVIL ENGINEERING

REGULATION 2022

(B: 2023-2027)

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

An Autonomous Institution affiliated to Anna University, Chennai

Kuniamuthur, Coimbatore - 641 008

DEPARTMENT OF CIVIL ENGINEERING

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CURRICULUM AND SYLLABI

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CHOICE BASED CREDIT SYSTEM

SRI KRISHNA COLLEGE OF ENGNEERING AND TECHNOLOGY

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VISION AND MISSION OF THE DEPARTMENT

Our Vision

To be a center of excellence in Civil Engineering Education through full-fledged learningexperience along with research.

Our Mission

To accomplish our vision, we are committed to

M1: Faculty experts from all specialization of Civil Engineering to facilitate teaching learningprocess

M2: Excellent infrastructure facilities to apply Civil Engineering knowledge and perform societalbased research

M3: Exposure to latest technologies in Civil Engineering through industry-institute interaction andprofessional bodies

M4: Environs to develop their innovative thoughts, ethics, communication, inter- and intra-personal skills

M5: Enthusiasm towards self-learning, social responsibility and entrepreneurship

Program Outcomes (POs):-

At the time of their graduation students of Civil Engineering Program should be in possession of the following Program Outcomes

PO 1. **Engineering knowledge:** Apply the knowledge of mathematics, science and engineering fundamentals for the solution of complex Civil Engineering problems.

PO 2. **Problem analysis:** Identify, formulate and analyse complex Civil Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.

PO 3. **Design/development of solutions:** Design solutions for complex Civil Engineering problems and design system components with appropriate consideration for public health & safety, cultural, societal and environmental considerations.

PO 4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis & interpretation of data and synthesis of the information to provide valid conclusions.

PO 5. **Modern tool usage:** Create, select & apply appropriate techniques, resources, modern engineering and IT tools, including prediction and modeling to complex Civil 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 & 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 as well as norms of the engineering practice.

PO 9. **Individual and team work:** Function effectively as an individual, 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 the 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:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives (PEOs):-

The following Program Educational Objectives are designed based on the department mission

1. To apply knowledge of mathematics, science and engineering to solve existing problems in the area of Structural, Geotechnical, Water Resources, Environmental, Transportation, Urban Planning, Construction Materials and Management in Civil Engineering
2. To analyze, design, construct Civil Engineering traditional and modern structures

3. To perform investigation on any complicated Civil Engineering problems by conducting research using modern equipment's and software tools
4. To communicate and develop strong inter- and intra- personal skills to prepare them for placement and higher studies
5. To be self-motivated towards lifelong learning and entrepreneurship

Mapping of POs to PEOs

Program Educational Objectives	Program Outcomes											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
PEO 1	**3**	**2**	**3**	2	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**2**
PEO 2	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**3**
PEO 3	**3**	**3**	**3**	**2**	3	**3**	**2**	**2**	**2**	**3**	**2**	**3**
PEO 4	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**3**
PEO 5	**3**	**3**	**3**	**2**	3	**3**	**2**	**2**	**2**	**3**	**2**	**3**

1	Reasonably agreed	**2**	Moderately agreed	**3**	Strongly agreed

Program Specific Outcomes (PSOs):-

At the end of the Program, Graduate shall have

PSO 1	**Analytical Knowledge and Practical Skills**	The ability to analyse, design and interpret by applying the concepts of mathematics and physical sciences in the core areas of Civil Engineering.
PSO 2	**Civil Engineer and Sustainability**	The propensity to excel in portfolio of waste management, sanitation, housing and construction management for the sustainable environment.
PSO 3	**Environment and Social Commitment**	The ability to acquire and update knowledge continuously and offer engineering solutions to meet the environmental and societal needs.

B.E. CIVIL ENGINEERING

REGULATION 2022 (B: 2023-2027)

I – VIII SEMESTER CURRICULUM AND SYLLABI

SEMESTER I									
SL. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Contact hrs./wk.**	**C**	**Ext / Int**	**Cat.**
1	23CE101	Introduction to Civil Engineering	3	0	0	3	3	60/40	HSMC
2	23MA101	Mathematics I	3	1	0	4	4	60/40	BSC
3	23EE113	Fundamentals of Electrical and Electronics Engineering	2	1	0	3	3	60/40	ESC
4	23PS101	Physical Sciences	4	0	0	4	4	60/40	BSC
5	23TA101	Heritage of Tamils	1	0	0	1	1	60/40	IKS
6	23CS101	Problem solving using C++	1	0	4	5	3	50/50	ESC
7	23PS102	Physical Science Laboratory	0	0	4	4	2	40/60	BSC
8	23EE115	Fundamentals of Electrical and Electronics Engineering Laboratory	0	0	2	2	1	40/60	ESC
9	23CE102	Engineering Graphics Laboratory	0	0	3	3	1.5	40/60	ESC
10	23MC101	Induction Programme 3 - weeks (Mandatory Course -I)					0	0/100	MC
		Total	**14**	**2**	**13**	**29**	**22.5**	1000	

SEMESTER II									
SL. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Contact hrs./wk.**	**C**	**Ext / Int**	**Cat.**
1	23MA204	Calculus and Fourier Series	3	1	0	4	4	60/40	BSC
2	23CE201	Applied Mechanics	3	1	0	4	4	60/40	BSC
3	23CE202	Construction Materials and Techniques	3	0	0	3	3	60/40	ESC
4	23TA201	Tamils and Technology	1	0	0	1	1	60/40	IKS
5	23CE203	Architectural Planning and Building Drawing	3	0	3	6	4.5	50/50	ESC
6	23EN101	Oral and Written Communication Skills	2	0	2	4	3	50/50	HSMC
7	23IT211	Introduction to Python Programming	1	0	4	5	3	50/50	ESC
8	23CE204	Engineering Practices Laboratory	0	0	4	4	2	40/60	ESC
		Total	**16**	**2**	**13**	**31**	**24.5**	800	

SEMESTER III									
SL. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Contact hrs./wk.**	**C**	**Ext / Int**	**Cat.**
1	23MA303	Numerical Methods	3	1	0	4	4	60/40	BSC
2	23CE301	Fluid Mechanics and Hydraulic Engineering	3	0	0	3	3	60/40	PCC
3	23CE302	Solid Mechanics	3	1	0	4	4	60/40	PCC
4	23CE303	Surveying and Geomatics	3	0	0	3	3	60/40	PCC
5	23GE301	Universal Human Values	3	0	0	3	3	60/40	HSMC
6	23CE304	Fluid Mechanics Laboratory	0	0	3	3	1.5	40/60	PCC
7	23CE305	Solid Mechanics Laboratory	0	0	3	3	1.5	40/60	PCC
8	23CE306	Surveying and Geomatics Laboratory	0	0	3	3	1.5	40/60	PCC
9	23MCxxx	Mandatory Course II	2	0	0	2	0	0/100	MC
		Total	**17**	**2**	**9**	**28**	**21.5**	900	

SEMESTER IV									
SL. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Contact hrs./wk.**	**C**	**Ext / Int**	**Cat.**
1	23CE401	Concrete Technology	3	0	0	3	3	60/40	PCC
2	23CE402	Environmental Engineering	3	0	0	3	3	60/40	PCC
3	23CE403	Structural Analysis	3	1	0	4	4	60/40	PCC
4	23CE404	Transportation Engineering	3	0	0	3	3	60/40	PCC
5	23xxyyy	Open Elective I	3 or 1 or 0	0 or 0 or 0	0 or 4 or 6	3 or 5 or 6	3	60/40 or 40/60	OEC
6	23CE405	Concrete and Highway Engineering Laboratory	0	0	4	4	2	40/60	PCC
7	23CE406	Environmental Engineering Laboratory	0	0	3	3	1.5	40/60	PCC
8	23CE407	Structural Analysis Laboratory	0	0	3	3	1.5	40/60	PCC
9	23EES101	Employability Enhancement Skills (Internship / Training – 2 weeks)	0	0	0	0	1	40/60	EES
10	23MCxxx	Mandatory Course III	2	0	0	2	0	0/100	MC
		Total	**17**	**1**	**10**	**28**	**22**	1000	

SEMESTER V									
SL. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Contact hrs./wk.**	**C**	**Ext / Int**	**Cat.**
1	23CE501	Design of Reinforced Concrete Elements	3	1	0	4	4	60/40	PCC
2	23CE502	Geotechnical Engineering	3	1	0	4	4	60/40	PCC
3	23CE503	Intelligent transportation system	3	0	0	3	3	60/40	PCC
4	23CExxx	Professional Elective I	3	0	0	3	3	60/40	PEC
5	23xxyyy	Open Elective II	3 or 1 or 0	0 or 0 or 0	0 or 4 or 6	3 or 5 or 6	3	60/40 or 40/60	OEC
6	23CE504	Design of RC Structures Laboratory	0	0	3	3	1.5	40/60	PCC
7	23CE505	Geotechnical Laboratory	0	0	3	3	1.5	40/60	PCC
8	23EES102	Employability Enhancement Skills (Internship / Training – 2 weeks)	0	0	0	0	1	40/60	EES
9	23MCxxx	Mandatory Course – IV	2	0	0	2	0	0/100	MC
		Total	**17**	**2**	**6**	**25**	**21**	900	

SEMESTER VI									
SL. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Contact hrs./wk.**	**C**	**Ext / Int**	**Cat.**
1	23CE601	Construction Planning and Management	3	0	0	3	3	60/40	PCC
2	23CE602	Design of Steel Structural Elements	3	1	0	4	4	60/40	PCC
3	23CE603	Foundation Engineering	3	0	0	3	3	60/40	PCC
4	23CExxx	Open Elective III	3	0	0	3	3	60/40	OEC
5	23Cexxx	Professional Elective II	3	0	0	3	3	60/40	PEC
6	23Cexxx	Professional Elective III	3	0	0	3	3	60/40	EEC
7	23CE604	Design of Steel Structures Laboratory	0	0	3	3	1.5	40/60	PCC
8	23CE605	Project Planning Laboratory	0	0	3	3	1.5	40/60	PCC
		Total	**18**	**1**	**6**	**25**	**22**	800	

SEMESTER VII									
SL. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Contact hrs./wk.**	**C**	**Ext / Int**	**Cat.**
1	23CE701	Construction Cost Estimation and Valuation	3	1	0	4	4	60/40	PCC
2	23CE702	Sustainable and Green Construction	3	0	0	3	3	60/40	PCC
3	23Cexxx	Open Elective IV	3	0	0	3	3	60/40	OEC
4	23Cexxx	Professional Elective IV	3	0	0	3	3	60/40	PEC
5	23Cexxx	Professional Elective V	3	0	0	3	3	60/40	PEC
6	23Cexxx	Professional Elective VI	3	0	0	3	3	60/40	PEC
7	23CE703	Construction Cost Estimation and Valuation Laboratory	0	0	3	3	1.5	40/60	PCC
8	23CE704	Design Comprehensive Project	0	0	4	4	2	40/60	PROJ
		Total	**18**	**1**	**7**	**26**	**22.5**	800	

SEMESTER VIII									
SL. No.	**Course Code**	**Course**	**L**	**T**	**P**	**Contact hrs./wk.**	**C**	**Ext / Int**	**Cat.**
1.	23CE801	Project Work	0	0	24	24	12	40/60	PROJ
		Total	**0**	**0**	**24**	**24**	**12**	**100**	

L: Lecture **T:** Tutorial **P:** Practical **C:** Credit **Cat.:** Category

HSMC : Humanities and Social Sciences including Management
BSC : Basic Science Courses
ESC : Engineering Science Courses
PCC : Professional Core Courses
PEC : Professional Elective Courses
OEC : Open Elective Courses
EEC : Emerging Elective Courses
IKS : Indian Knowledge System
PROJ : Project Work
MC : Mandatory Course

Definition of Credit:

L – Lecture	1 Hr. Lecture (L) per week	1 credit
T – Tutorial	1 Hr. Tutorial (T) per week	1 credit
P – Practical/Practice (Project and Industry based Courses)	1 Hr. Practical (P) per week	0.5 credit

SEMESTER WISE CREDIT DISTRIBUTION: -

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**Total**
Credits	**22.5**	**24.5**	**21.5**	**22**	**21**	**22**	**22.5**	**12**	**168**

Total Credits: 168

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

SL. No.	Stream	Credits/Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1.	Humanities & SocialSciences Including Management (HSMC)	3	3	3						9
2.	Basic Sciences (BSC)	10	8	4						22
3.	Engg. Sciences (ESC)	8.5	12.5							21
4.	Professional Core (PCC)			14.5	18	14	13	8.5		68
5.	Professional Electives (PEC)					3	6	9		18
6.	Multidisciplinary Open Electives Courses (OEC)				3	3	3	3		12
7.	Project Work (PROJ) / Employability Enhancement Skills (EES)				1	1		2	12	16
8.	Indian Knowledge System (IKS)	1	1							2
9.	Mandatory Course (MC)	0		0	0	0				0
	Total	**22.5**	**24.5**	**21.5**	**22**	**21**	**22**	**22.5**	**12**	**168**

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAMME

SL. No.	Course Work – Subject Area	AICTE Suggested Breakdown of Credits	Civil-SKCET Credits
1.	Humanities and Social Sciencesincluding Management courses	06	9
2.	Basic Science courses	24	22
3.	Engineering Science courses including Workshop, Drawing, Basics of Electrical / Mechanical / Computer etc.	20	21
4.	Professional core courses	62	68
5.	Professional Electives coursesrelevant to the chosen specialization / branch	26	18
6.	Multidisciplinary Open Electives Courses (OEC)	12	12
7.	Project Work, Seminar and / orInternship in Industry or elsewhere.	16	14
8.	Industrial Practice / Employability EnhancementSkills		2
9.	Indian Knowledge System	2	2
10.	Mandatory Courses	Non-credit	Non-credit
Total		168	168

HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT (9 Credits)

SL. NO	Course Code	Course	L	T	P	Contact hrs./Wk.	C	Cat.
1	23CE101	Introduction to Civil Engineering	3	0	0	3	3	HSMC
2	23EN101	Oral and Written Communication Skills	2	0	2	4	3	HSMC
3	23GE301	Universal Human Values	3	0	0	3	3	HSMC

BASIC SCIENCE COURSES (22 Credits)

SL. NO	Course Code	Course	L	T	P	Contact hrs./Wk.	C	Cat.
1	23MA101	Mathematics I	3	1	0	4	4	BSC
2	23PS101	Physical Sciences	4	0	0	4	4	BSC
3	23PS102	Physical Science Laboratory	0	0	4	4	2	BSC
4	23MA204	Calculus and Fourier Series	3	1	0	4	4	BSC
5	23CE201	Applied Mechanics	3	1	0	4	4	BSC
6	23MA303	Numerical Methods	3	1	0	4	4	BSC

ENGINEERING SCIENCE COURSES (21 Credits)

SL. NO	Course Code	Course	L	T	P	Contact hrs./Wk.	C	Cat.
1	23EE113	Fundamentals of Electrical and Electronics Engineering	2	1	0	3	3	ESC
2	23CS101	Problem solving using C++	1	0	4	5	3	ESC
3	23EE115	Fundamentals of Electrical and Electronics Engineering Laboratory	0	0	2	2	1	ESC
4	23CE102	Engineering Graphics Laboratory	0	0	3	3	1.5	ESC
8	23CE204	Engineering Practices Laboratory	0	0	4	4	2	ESC
5	23CE202	Construction Materials and Techniques	3	0	0	3	3	ESC
6	23CE205	Architectural Planning and Building Drawing	3	0	3	6	4.5	ESC
7	23IT211	Introduction to Python Programming	1	0	4	5	3	ESC

INDIAN KNOWLEDGE SYSTEM (2 Credits)

SL. NO	Course Code	Course	L	T	P	Contact hrs./Wk.	C	Cat.
1.	23TA101	Heritage of Tamils	1	0	0	1	1	IKS
2.	23TA201	Tamils and Technology	1	0	0	1	1	IKS

PROFESSIONAL CORE COURSES (68 Credits)

SL. NO	Course Code	Course	L	T	P	Contact hrs./Wk.	C	Cat.
1	23CE301	Fluid Mechanics and Hydraulic Engineering	3	0	0	3	3	PCC
2	23CE302	Solid Mechanics	3	1	0	4	4	PCC
3	23CE303	Surveying and Geomatics	3	0	0	3	3	PCC
4	23CE304	Fluid Mechanics Laboratory	0	0	3	3	1.5	PCC
5	23CE305	Solid Mechanics Laboratory	0	0	3	3	1.5	PCC
6	23CE306	Surveying and Geomatics Laboratory	0	0	3	3	1.5	PCC
7	23CE401	Concrete Technology	3	0	0	3	3	PCC
8	23CE402	Environmental Engineering	3	0	0	3	3	PCC
9	23CE403	Structural Analysis	3	1	0	4	4	PCC
10	23CE404	Transportation Engineering	3	0	0	3	3	PCC
11	23CE405	Concrete and Highway Engineering Laboratory	0	0	4	4	2	PCC
12	23CE406	Environmental Engineering Laboratory	0	0	3	3	1.5	PCC
13	23CE407	Structural Analysis Laboratory	0	0	3	3	1.5	PCC
14	23CE501	Design of Reinforced Concrete Elements	3	1	0	4	4	PCC
15	23CE502	Geotechnical Engineering	3	1	0	4	4	PCC
16	23CE503	Intelligent transportation system	3	0	0	3	3	PCC
17	23CE504	Design of RC Structures Laboratory	0	0	3	3	1.5	PCC
18	23CE505	Geotechnical Laboratory	0	0	3	3	1.5	PCC
19	23CE601	Construction Planning and Management	3	0	0	3	3	PCC
20	23CE602	Design of Steel Structural Elements	3	1	0	4	4	PCC
21	23CE603	Foundation Engineering	3	0	0	3	3	PCC
22	23CE604	Design of Steel Structures Laboratory	0	0	3	3	1.5	PCC
23	23CE605	Project Planning Laboratory	0	0	3	3	1.5	PCC
24	23CE701	Construction Cost Estimation and Valuation	3	1	0	4	4	PCC
25	23CE702	Sustainable and Green Construction	3	0	0	3	3	PCC
26	23CE703	Construction Cost Estimation and Valuation Laboratory	0	0	3	3	1.5	PCC

PROFESSIONAL ELECTIVE COURSES - VERTICALS

Vertical I **Structural Engineering**	**Vertical II** **Geotechnical Engineering**	**Vertical III** **Construction Management**	**Vertical IV** **Environmental Engineering**	**Vertical V** **Infrastructures Engineering**	**Vertical VI** **Diversified Courses**
Conditional Assessment and Rehabilitation of Structures	Soil Dynamics and Earthquake Engineering	Project Formulation and Implementation	Air and Noise Pollution	Computer Simulation Applications in Transportation Engineering	Plumbing (Water and Sanitation)
Design of RC Structures	Ground Improvement and Geosynthetics	Construction Personnel Management	Industrial Wastewater Treatment System	Smart City Planning and Development	Applications of Sensors and IoT in Civil Engineering
Finite Element Analysis	Environmental Geotechnics	Lean and Sustainable Construction	Rural Water Supply and Onsite Sanitation Systems	Metro Rail Engineering and Infrastructure	Building Services and Management
Pre-stressed Concrete Structures	Surface Water Hydrology	Construction Method and Equipment Management	Irrigation and water resources engineering	Remote Sensing and GIS for Civil Engineering	Valuation of Real Properties
Design of Steel Structures	Assessment of Contaminated Site and Remediation	Supply Chain Management and Logistics in Construction	Ground water and surface water pollution	Smart Construction Materials and Techniques	Nanotechnology in Civil Engineering
Prefabricated Structures	Design of Substructures	Risk and Reliability Analysis of Civil Infrastructure Systems	Solid and Hazardous Waste Management	Highway Pavement Design and Evaluation	Airport and Harbour Engineering
Advanced Structural Analysis	Seismic Design of Structures	Formwork Engineering	Environmental impact Assessment and Life Cycle Analysis	Coastal Engineering	Robotics and Automation in Civil Engineering

PROFESSIONAL ELECTIVE COURSES (18 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
Vertical I : Structural Engineering						
1.	23CE901	Conditional Assessment and Rehabilitation of Structures	3/0/0	3	3	PEC
2.	23CE902	Design of RC Structures	3/0/0	3	3	PEC
3.	23CE903	Finite Element Analysis	3/0/0	3	3	PEC
4.	23CE904	Pre-stressed Concrete Structures	3/0/0	3	3	PEC
5.	23CE905	Design of Steel Structures	3/0/0	3	3	PEC
6.	23CE906	Prefabricated Structures	3/0/0	3	3	PEC
7.	23CE907	Advanced Structural Analysis	3/0/0	3	3	PEC
Vertical II: Geotechnical Engineering						
8.	23CE908	Soil Dynamics and Earthquake Engineering	3/0/0	3	3	PEC
9.	23CE909	Ground Improvement and Geosynthetics	3/0/0	3	3	PEC
10.	23CE910	Environmental Geotechnics	3/0/0	3	3	PEC
11.	23CE911	Surface Water Hydrology	3/0/0	3	3	PEC
12.	23CE912	Assessment of Contaminated Site and Remediation	3/0/0	3	3	PEC
13.	23CE913	Design of Substructures	3/0/0	3	3	PEC
14.	23CE914	Seismic Design of Structures	3/0/0	3	3	PEC
Vertical III: Construction Management						
15.	23CE915	Project Formulation and Implementation	3/0/0	3	3	PEC
16.	23CE916	Construction Personnel Management	3/0/0	3	3	PEC
17.	23CE917	Lean and Sustainable Construction	3/0/0	3	3	PEC
18.	23CE918	Construction Method and Equipment Management	3/0/0	3	3	PEC
19.	23CE919	Supply Chain Management and Logistics in Construction	3/0/0	3	3	PEC
20.	23CE920	Risk and Reliability Analysis of Civil Infrastructure Systems	3/0/0	3	3	PEC
21.	23CE921	Formwork Engineering	3/0/0	3	3	PEC
Vertical IV: Environmental Engineering						
22.	23CE922	Air and Noise Pollution	3/0/0	3	3	PEC
23.	23CE923	Industrial Wastewater Treatment System	3/0/0	3	3	PEC
24.	23CE924	Rural Water Supply and Onsite Sanitation Systems	3/0/0	3	3	PEC
25.	23CE925	Irrigation and water resources engineering	3/0/0	3	3	PEC

26.	23CE926	Ground water and surface water pollution	3/0/0	3	3	PEC
27.	23CE927	Solid and Hazardous Waste Management	3/0/0	3	3	PEC
28.	23CE928	Environmental impact Assessment and Life Cycle Analysis	3/0/0	3	3	PEC
Vertical V :Infrastructures Engineering						
29.	23CE929	Computer Simulation Applications in Transportation Engineering	3/0/0	3	3	PEC
30.	23CE930	Smart City Planning and Development	3/0/0	3	3	PEC
31.	23CE931	Metro Rail Engineering and Infrastructure	3/0/0	3	3	PEC
32.	23CE932	Remote Sensing and GIS for Civil Engineering	3/0/0	3	3	PEC
33.	23CE933	Smart Construction Materials and Techniques	3/0/0	3	3	PEC
34.	23CE934	Highway Pavement Design and Evaluation	3/0/0	3	3	PEC
35.	23CE935	Coastal Engineering	3/0/0	3	3	PEC
Vertical VI : Diversified Courses						
36.	23CE936	Plumbing (Water and Sanitation)	3/0/0	3	3	PEC
37.	23CE937	Applications of Sensors and IoT in Civil Engineering	3/0/0	3	3	PEC
38.	23CE938	Building Services and Management	3/0/0	3	3	PEC
39.	23CE939	Valuation of Real Properties	3/0/0	3	3	PEC
40.	23CE940	Nanotechnology in Civil Engineering	3/0/0	3	3	PEC
41.	23CE941	Airport and Harbour Engineering	3/0/0	3	3	PEC
42.	23CE942	Robotics and Automation in Civil Engineering	3/0/0	3	3	PEC

PROJECT WORK (14 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	23CE704	Design Comprehensive Project	0/0/4	4	2	PROJ
2.	23CE801	Project Work	0/0/24	24	12	PROJ

EMPLOYABILITY ENHANCEMENT SKILLS (2 Credits)

SL. No.	Course Code	Course Title	Duration	C	Cat.
1.	23EES101	Employability Enhancement Skills (Internship / Training)	2 Weeks	1	EES
2.	23EES102	Employability Enhancement Skills (Internship / Training)	2 Weeks	1	EES

MANDATORY COURSES (Non-credit)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	23MC101	Induction Programme	3 WEEKS		0	MC
2.	23MC102	Environmental Sciences	2/0/0	2	0	MC
3.	23MC103	Management Organizational Behavior	2/0/0	2	0	MC
4.	23MC112	Civil Engineering – Societal & Global Impact	2/0/0	2	0	MC
5.	23MC113	Professional Practice, Law & Ethics	2/0/0	2	0	MC
6.	23MC114	Disaster Mitigation and Management	2/0/0	2	0	MC
7.	23MC115	Disability, Accessibility and Universal Design	2/0/0	2	0	MC

OPEN ELECTIVE COURSES (6 Credits) [Offered to Other Branches]

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	C	Cat.
1.	23CE001	Disaster Management	3/0/0	3	3	OEC
2.	23CE002	Engineering Risk and Uncertainty	3/0/0	3	3	OEC
3.	23CE003	Environmental Pollution and Global issues	3/0/0	3	3	OEC
4.	23CE004	Project Management	3/0/0	3	3	OEC
5.	23CE005	Industrial Safety	3/0/0	3	3	OEC
6.	23CE006	Research Methodology and IPR	3/0/0	3	3	OEC

VALUE ADDED COURSES (Additional credit courses)

SL. No.	Course Code	Course Title	Course Credits
1.	23VA130	Effective Communication Skills	1
2.	23VA101	Building Functional Design using AutoCAD	1
3.	23VA102	Total Station and GPS Surveying	1
4.	23VA103	Arc GIS for Civil Engineers	1
5.	23VA104	Structural Analysis and Design Using STAAD.Pro	1
6.	23VA105	Project Management Using Primavera	1
7.	23VA106	3DBuilding Modeling Using Revit Architecture	1
8.	23VA107	Building Valuation	1

SEMESTER I

23CE101	INTRODUCTION TO CIVIL ENGINEERING	3/0/0/3
Nature of Course	Theory	
Prerequisites	Nil	

Course Objectives:

1	To understand about civil engineering structures and civil engineering materials
2	To illustrate the components of a building and impart knowledge on various aspects ofbuilding construction
3	To acquaint earth's structure and comprehend the significance of geology in civil engineering
4	To impart knowledge about the impacts of human activities in environment

Course Outcomes:
Upon completion of the course, students shall have the ability to

C101.1	Understand the scope of civil engineering and importance of civil engineering structures	[U]
C101.2	Identify building materials required for appropriate construction	[U]
C101.3	Recognizebuilding components and various aspects of building constructions	[AP]
C101.4	Classify the rock types and identify their uses	[U]
C101.5	Illustrate the geological structure and their relevance in civil engineering	[U]

Course Contents:

Module 1: Civil Engineering Structures and Materials **15 Hrs**

Scope of civil engineering - functions of a civil engineer - relevance of civil engineering in overall infrastructure development of a country – civil engineering structures: buildings, bridges, dams, roads, railways, runways, tunnels, towers, chimneys, retaining walls, water tanks, cooling towers and silos - building materials: bricks, stones, aggregates, m-sand, cement, concrete, steel, plywood, aluminum, GI sheet, PVC – emerging construction materials

Module 2: Building Components and Construction **15 Hrs**

Selection of site – building components – foundation, basement, wall: stone masonry, brick masonry, column, floor, beam, roof, reinforced concrete members, staircase, lintel, slab, truss and damp-proof course - design and construction sequences of a building - maintenance, repairs and rehabilitation – fundamentals of town planning and smart cities – building bye laws - green building –applications of software and IoT in civil engineering

Module 3: Geology and Environment **15 Hrs**

Geology in civil engineering – branches of geology – structure of earth and its composition – tectonic plates – continental drift - earth's atmosphere - weathering of rocks - classification of rocks: igneous (granite, basalt), sedimentary (sandstone, limestone) and metamorphic (schist, gneiss, marble) – strike, dip - folds, faults and joints:relevance to civil engineering – human and environment – pollution: water, air, soil, noise

Total Hours	**45 Hrs.**

Text Books:	
1	Bhavikatti S.S., “Basic Civil Engineering”, New Age International Publishers, 2018.
2	Parbinsingh Engineering and General Geology, S.K. Kataria& Sons Publications, New Delhi, 2019.
Reference Books:	
1	Punmia B.C., Ashok Kumar Jain and Arun Kumar Jain, “Building constructions”, Laxmi Publications (P) Ltd, 2016
2	Varghese P.C., “Engineering Geology for Civil Engineering”, Prentice Hall of India Learning Private Limited, New Delhi, 2012.
3	Purushothama Raj P “Building Construction Materials and Techniques”, Pearson Education India, 2017
Web References:	
1	https://civiconcepts.com/blog/components-of-building
2	https://theconstructor.org/building/types-of-building-materials-construction/699/
3	https://www.engineeringcivil.com/
4	https://www.constructionplacements.com/civil-engineering-software/
5	https://www.geologypage.com/2019/04/engineering-geology.html
6	https://seismo.gov.in/

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms’ Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom’s Level**	**Assessment Component (Choose and mapcomponentsfromthelist-Quiz,Assignment, Casestudy, Seminar,GroupAssignment)**	**FA(16%) [80Marks]**
C101.1	Understand	Quiz	20
C101.2	Apply	Assignment	20
C101.3	Analyze	Assignment	20
C101.4	Apply	Seminar	20
C101.5	Apply		

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment(24%) [120Marks]**		**End Semester Examination (60%) [100Marks]**
	CIA1:[60Marks]	**CIA2:[60Marks]**	
Remember	-	-	-
Understand	60	60	60
Apply	40	40	40
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200Marks]						**End Semester Examination (60%) [100Marks]**
CA1:100Marks			**CA2:100Marks**			
SA1 (60Marks)	**FA1 (40Marks)**		**SA2 (60Marks)**	**FA2 (40Marks)**		
	Component- I (20Marks)	**Component - II (20 Marks)**		**Component-I (20 Marks)**	**Component - II (20 Marks)**	

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	-	1	-	1	1	-	1	-	2	-	-	1	2	2
2	3	-	1	-	1	1	-	1	-	2	-	-	1	2	2
3	3	-	1	-	1	1	-	1	-	2	-	-	1	2	2
4	3	-	1	-	1	1	-	1	-	2	-	-	1	2	2
5	3	-	1	-	1	1	-	1	-	2	-	-	1	2	2
Avg.	3	-	1	-	1	1	-	1	-	2	-	-	1	2	2
1	Reasonably agreed				2	Moderately agreed				3		Strongly agreed			

23MA101	MATHEMATICS I (COMMON TO ALL BRANCHES)	3/1/0/4

Nature of Course	Problem Analytical
Pre requisites	-

Course Objectives:

1	To use logical notation to define the fundamental data types and structures used in computer algorithms and systems.
2	To use the concepts of graph theory in practical situations.
3	To acquire thorough knowledge of fundamental notions of proof's and its application in Cryptography.
4	To analyse data pertaining to discrete and continuous random variables to interpret the results.
5	To impart the knowledge of counting principles, to think critically and apply it in real world problems.

Course Outcomes(Theory)
Upon completion of the course, students shall have ability to

C101.1	Recall the basic concepts of logical laws, structures and probability.	[R]
C101.2	Understand the concepts of proof techniques, structures and random variables.	[U]
C101.3	Apply the logical and foundational structures of mathematics with an emphasis on writing proofs.	[AP]
C101.4	Apply the concepts of graph and number theory in cryptography.	[AP]
C101.5	Apply the probability concepts in transition from real problem to a probabilistic model.	[AP]

Course Contents:

MODULE I : LOGICAL PROOF'S& FUNCTIONS (20 Hrs)

Proofs: Definitions - Proof by cases - Proof by contradiction - Logical formulas - Propositions - Truth table - Logical operators - Tautologies and Contradictions – Contrapositive - Equivalences and implications - Predicates - Free and bound variables – Quantifiers - Universe of discourse - **Sets:** Basic sets - Operations on Sets – Law on Sets(without proof) - Cartesian product of sets. **Relations:**Binary relation-Types of relations and their properties - Relational matrix and graph of a relation - Equivalence relations - Partial ordering relation**Functions:** Classifications of functions – Induction - Ordinary induction and Strong induction - Recursive data types - Definition of recursive and structural induction.

MODULE II : NUMBER THEORY & GRAPH THEORY (20 Hrs)

Number Theory: Divisibility - Greatest common divisor - Euclid's algorithm - Prime numbers- Fundamental theorem of arithmetic - Modular arithmetic - Remainder arithmetic - Multiplicative inverses and cancelling - Relatively prime - Euler's theorem.- Chinese Reminder Theorem**Graph Theory:**Vertices and Degrees - Types of graphs - Handshaking theorem - Adjacency matrices - Walks and paths -Connectivity -Isomorphism - Directed acyclic graphs and scheduling –Matchings - The Stable marriage problem –Forests and trees - Spanning trees - Minimum weight spanning trees –Prim's algorithm - Kruskal's algorithm.

MODULE III : COUNTING &PROBABILITY(20 Hrs)

Sums and Asymptotics-Sums of Powers-Harmonic Numbers-Asymptotic Notation-The Division Rule-Counting Subsets-Sequences with Repetitions-The Pigeonhole Principle-Events and Probability Spaces-The Four Step Method-Conditional Probability-The Four-Step Method for Conditional Probability-The Law of Total Probability-Baye'stheorem-Random Variables–Discrete and continuous random variables - Distribution Functions-Bernoulli Distribution-Uniform Distribution-Binomial Distribution-Great Expectations-Conditional Expectation-Linearity of Expectation-Infinite Sums-Expectations of Products

Total Hours:	**60**

Text Books:	
1	Tremblay J.P and Manohar R, "Discrete Mathematical Structures with applications to Computer Science", Tata McGraw–Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
2	Koshy. T, "Elementary Number Theory with Applications", Elsevier Publications, New Delhi, Second Edition, 2007.
3	Eric Lehman, F.Thomson Leightonand Albert R.Meyer, "Mathematics for Computer Science", 14thEdition, MIT Open courseware, 2018.
Reference Books:	
1	Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, "Discrete Mathematical Structures", sixth edition, Pearson Education Pvt Ltd., New Delhi, 2017
2	Kenneth H. Rosen, "Discrete Mathematics and its Applications", Eighth Edition, Tata McGraw – Hill Pub. Co. Ltd., New Delhi, Eighth Edition, 2021.
3	Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2004.
4	P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Fifth Edition, Pearson Education Asia, New Delhi, Fifth Edition, 2019.
Web References:	
1	https://onlinecourses.nptel.ac.in/noc23_cs109/preview
2	https://onlinecourses.nptel.ac.in/noc23_cs120/preview
3	https://onlinecourses.nptel.ac.in/noc23_ma77/preview
4	https://onlinecourses.nptel.ac.in/noc23_ma72/preview
Online Resources:	
1	https://www.coursera.org/specializations/discrete-mathematics
2	https://www.cs.ucdavis.edu/~rogaway/classes/20/fall21/mit-book.pdf
3	https://mathworld.wolfram.com/topics/DiscreteMathematics.html
4	https://mathworld.wolfram.com/topics/NumberTheory.html

Assessment Methods & Levels (based on Blooms' Taxonomy)

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C101.1	Remember	Quiz	20
C101.2	Understand	Presentation	20
C101.3 – C101.5	Apply	Tutorial	20
C101.3 – C101.5	Apply	Assignment	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1: 100 Marks			**CA 2: 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 2 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)(Theory)															
COs	**POs**												**PSOs**		
	a	**b**	**c**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**	**l**	**1**	**2**	**3**
C101.1	1	1											1		
C101.2	2	2											1		
C101.3	3	3													
C101.4	3	3											1		
C101.5	3	3													

3	Strongly agreed	2	Moderately agreed	1	Reasonably agreed

23EE113	Fundamentals of Electrical and Electronics Engineering (Common to MECH and CIVIL)	2/1/0/3
Nature of Course	G (Theory analytical)	
Course Pre-requisites	Nil	

Course Objectives:

1	To import the students with a basic understanding of Electrical circuits.
2	To learn the working principle of static machine.
3	To understand the rotating Machines working principles and to have a knowledge on selection of machine for specific types of applications.
4	To give a comprehensive exposure to Electrical installations.

Course Outcomes:

Upon completion of the course, students shall have ability to

C113.1	Analyze the concepts in AC circuit and DC circuits.	[A]
C113.2	Examine the working principle of Static machines.	[A]
C113.3	Understand the working principle of Rotating machines.	[U]
C113.4	Utilize the basic components for Electrical installations.	[AP]
C113.5	Interpret the basic devices in Electronics and Instrumentation.	[A]

Course Contents:

Course Contents:

Module I: DC Circuits and AC Circuits **15 Hrs**

DC Circuits - Electrical circuit elements (R, L and C) - Voltage and Current Sources - Kirchoff's current and voltage law - analysis of simple circuits with DC excitation - Mesh and Nodal Analysis. **AC Circuits** - Representation of sinusoidal waveforms, Peak and RMS values, Phasor representation, Real power, Reactive power, Apparent power, Power factor. Analysis of single phase ac circuits consisting of R, L, C, RL and RC. Three phase balanced circuits - Voltage and Current relations in star and delta connections.

Module II: Electrical Machines and Installations **15 Hrs**

Static machines: BH characteristics, construction & working principle of single-phase and three phase transformers. Rotating machines: Generation of rotating magnetic fields, construction and working principle of DC machines, three-phase induction motor and synchronous motor. Components of LT Switchgear - Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Domestic wiring, Types of Wires and Cables, Earthing.

Module III: Fundamentals of Semiconductor Devices and Instrumentation **15 Hrs**

Semiconductor - PN junction diode - Zener diode - Bipolar Junction Transistor Introduction - Field Effect Transistor Introduction - Construction and characteristics of JFETs - MOSFET - Depletion type MOSFET, Enhancement type MOSFET, Transfer characteristics. Sensors, Solenoids, Pneumatic controls with electrical actuator, Mechatronics, types of valves and its applications, Electro-Pneumatic systems, Proximity sensors, Limit switches.

Total Hours	**45**

Text Books:

1	Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Tata McGraw Hill, 7th edition, 2020.

2	Vincent. Del. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 2nd edition, 2015.
3	E. Hughes, “Electrical and Electronics Technology”, Pearson, 10th edition, 2011.
4	Donald .A. Neamen, Electronic Circuit Analysis and Design, 2nd Edition reprint, Tata Mc Graw Hill, 2013.
Reference Books:	
1	Charles A.Gross, Thaddeus A.Roppel, “Fundamentals of Electrical Engineering”, CRC press, 2012.
2	D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, Revised 1st edition 2017,
3	Theodore F. Bogart, Jeffery S. Beasley and Guilermo Rico, ‘Electronic Devices and Circuits’, Pearson Education, 6th edition, 2013.
Web References:	
1	http://nptel.ac.in/course.php?disciplineId=108
2	https://ocw.mit.edu/courses/find-by topic/#cat=engineering&subcat=electricalengineering&spec=electricpower
3	https://nptel.ac.in/video.php?subjectId=117103063
4	https://onionesquereality.wordpress.com/.../more-video- lectures-iit-open
5	https://nptel.iitg.ernet.in/Elec_Comm_Engg/.../Video-ECE.pdf
Online Resources:	
1	http://www.electrical-knowhow.com/
2	https://www.edx.org/course/electricity-magnetism-part-1-ricex-phys102-1x-1
3	https://www.mooc-list.com/course/fundamentals-electrical-engineering-coursera
4	https://nptel.ac.in/course.php

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms’ Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom’s Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C113.1	Analyze	Assignment	20
C113.2	Analyze		
C113.3	Understand	Simulation	20
C113.4	Apply	Class Presentation	20
C113.5	Understand	Quiz	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	20	20	20
Understand	30	30	30
Apply	20	20	20
Analyse	30	30	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 2 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

No. of the 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	PSO 1	PSO 2	PSO 3
C113.1	3												1		
C113.2	3												1		
C113.3	3		1										1		
C113.4	3		1										1		
C113.5	3		1										1		
1	**Reasonably Agreed**				**2**	**Moderately Agreed**					**3**	**Strongly Agreed**			

23PS101	PHYSICAL SCIENCE (Common to I Year B.E. – CIVIL &MECH)	L/T/P/C 4/0/0/4

Nature of Course	: E (Theory based)
Pre requisites	: Fundamental knowledge in applied sciences

Course Objectives:

1	To learn the fundamental concepts of physics and apply this knowledge to both scientific and engineering problems.
2	To make the students enrich basic knowledge in various fields such as Oscillation, Laser, electromagnetism and crystallography.
3	To understand the principles and applications of electrochemistry and learning electroanalytical methods.
4	To learn the effect of corrosion in materials and the methods for prevention of corrosion, and explore the knowledge of various energy sources and storage devices.
5	To understand the concepts of photophysical and photochemical processes in spectroscopy.

Course Outcomes:
Upon completion of the course, students shall have ability to

C101.1	Understand the basic concepts of oscillation, laser and Electromagnetic waves.	[U]
C101.2	Interrelate electric and magnetic fields, and predict the behaviour of electromagnetic waves	[AP]
C101.3	Estimate the Atomic packing, acquire the basic knowledge about Crystal Lattice and Unit cell.	[U]
C101.4	Understand the principle and working of reference electrodes, andacquire the knowledge of corrosion control technique and energy sources.	[U]
C101.5	Interpret the principle and working of analytical techniques.	[AP]

Course Contents:

Harmonic oscillations, Laser and Electromagnetic waves:periodic motion – Simple harmonic motion: characteristics of simple harmonic motion – Simple spring-mass system – Resonance

Laser: Characteristics of laser – Principle of spontaneous emission and stimulated emission – Population inversion – Pumping – Different types of lasers: CO_2– Qualitative industrial applications of lasers: welding, drilling and cutting.

Electromagnetic waves: Concept of Del operator, gradient, divergence and curl operators - Gauss divergence theorem, Stokes theorem.Gauss law of electricity, Gauss law of magnetism, Biot-Savart law and its application: Magnetic field due to Line charge – Ampere's law and its application: magnetic field due to a solenoid, Faraday' law of electromagnetic induction. **15*Hours***

Crystallography and Electrochemistry: crystal system – lattice –Bravais lattice, calculation of atomic packing factor for simple cubic, body centered cubic, face centered cubic and hexagonal close packed lattice – Miller indices – Crystal imperfections – Point and line imperfections.

Electrochemistry: Electrochemical cells-electrolytic cell-reversible and irreversible cells - Free energy and emf series, cell potentials, Nernst equation and applications. Oxidation and reduction potentials-standard hydrogen electrode, saturated calomel electrode, glass electrode-pH-measurement. ***15 Hours***

Corrosion and *Energy sources, Spectroscopic techniques:* Introduction-types–mechanism of dry and wet corrosion-protective coatings-electroplating of gold-electroless plating of nickel. Energy Sources-Fuel cells (H_2-O_2). Storage Devices-Batteries-Alkaline, Lead acid, Nickel cadmium and Lithium-ion batteries.

Spectroscopic techniques: Spectroscopy-Beer Lambert's law, principle, instrumentation, and applications of electronic spectroscopy (UV-visible), Vibrational and rotational spectroscopy (IR) and Flame emission spectroscopy (FES). ***15 Hours***

	Total Hours:	**45**

Text Books:

1	Rajendran, V "Engineering Physics" Mc Graw Hill Publications ltd, New Delhi, 2017.
2	David Halliday, Robert Resnick, Jearl Walker "Fundamentals of Physics", 11th edition, Wiley, 2018.
3	Gaur, R.K. and Gupta, S.L., "Engineering Physics", DhanpatRai Publishers, 2017.
4	Bhattacharya, D.K. and Poonam, T., "Engineering Physics", Oxford University Press, 2017.
5	Dara S.S, Umare S.S, "Engineering Chemistry", First revised Edition by S. Chand & Company Ltd., New Delhi 2015.
6	Jain P. C. & Monica Jain., "Engineering Chemistry", 17th Edition, DhanpatRai Publishing Company (P) Ltd, New Delhi, 2020.
7	Fundamentals of Molecular Spectroscopy, 4th Edition by C. N. Banwell Publishing McGraw-Hill Book Company (P) Ltd, England, 2001.
8	Physical Chemistry, 11th Edition by P. W. Atkins Publishing Oxford University Press (P) Ltd, United Kingdom, 2018.

Reference Books:

1	William T. Silfvast "Laser Fundamentals" Cambridge University Press, 2013
2	R. Wolfson, "Essential University Physics", Volume 1 & 2. Pearson, 2020.
3	William D CallisterJr, "Materials Science and Engineering-An Introduction", John Wiley and Sons Inc., NewYork, tenth edition, 2018.
4	S.O. Kasap, "Principles of Electronic Materials and Devices", McGraw Hill Education, 2017.
5	David Griffiths 'Introduction to Electrodynamics' 4th Edition, Cambridge University Press 2017.
6	Avadhanulu M.N., Kshirshagar P.G., Arun Murthy TVS "A Text Book of Engineering Physics"S.Chand& Co Ltd, 2018.
7	Richard P. Feynman. Robert B. Leighton, Matthew Sands "The Feynman Lectures on Physics Vol. II": The New Millennium Edition.2015.
8	Donald Neamen, "Semiconductor Physics And Devices: Basic Principles" McGraw-Hill Education, 2011
9	Perez, Nestor, "Electrochemistry and Corrosion Science", Springer, 2016.
10	Shikha Agarwal., "Engineering Chemistry and Applications", Cambridge University press, 2016.
11	Ghazi A.Karim. "Fuels, Energy and the Environment", CRC Press, Taylor and

	Francis group, 2012.
Web References:	
1	https://www.eatm.in/upload/srit__unit_i_laser.pdf
2	http://hyperphysics.phy-astr.gsu.edu/hbase/index.html
3	https://physics.info/
4	https://nptel.ac.in/courses/115101005
5	https://archive.nptel.ac.in/courses/115/106/115106122/
6	https://archive.nptel.ac.in/courses/112/106/112106293/
7	https://www.kth.se/.../electrochem/welcome-to-the-division-of-applied-electrochemistry
8	www.corrosionsource.com/
9	https://www.sciencedirect.com/book/9780750646253/battery
10	http://www.rnlkwc.ac.in/pdf/study-material/chemistry/Spectroscopy
11	https://ocw.mit.edu/courses/chemistry
12	nptel.ac.in/courses/105106112/1_introduction/5_corrosion.pdf
13.	https://ocw.mit.edu/courses/chemistry

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms'Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C101.1	Understand	Assignment - I	20
C101.2	Apply	Quiz – I	20
C101.3	Understand	Assignment - II	20
C101.4	Understand	Quiz - II	20
C101.5	Apply		

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	30	30	30
Understand	50	50	50
Apply	20	20	20
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1 : 100 Marks			CA 2 : 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20Marks)	Component - II (20 Marks)		Component - I (20Marks)	Component - II (20Marks)	

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1	3	2	2		1							1			
C101.2	3	2	2		1							1			
C101.3	3	2	2	1	1							1			
C101.4	3	2	2		1							1			
C101.5	3	2	2	1	1							1			

23TA101	HERITAGE OF TAMILS / தமிழர்மரபு	1/0/0/1
Nature of Course:	C (Theory Concept)	
Pre requisites:	NIL	

Course Objectives:

1	To know various concepts of Tamil Language families.
2	To know about the essentialities of Heritage.
3	To understand the Aram concepts of Tamils and the cultural influence.

Course Outcomes:
Upon completion of the course, students shall have ability to

C101.1	Know about the language families in India, impact of religions and the contribution of Bharathiyar and Bharathidhasan.	[U]
C101.2	Observe the growth of sculpture, making of musical instruments and the role of temples in socio and economic lives.	[U]
C101.3	Understand the significance of folklore and martial arts.	[U]
C101.4	Learn the sangam literature, sangam age and overseas conquest of Cholas.	[U]
C101.5	Understand the contribution of Tamils to Indian Freedom Struggle, role of Siddha medicine and print history of Tamil Books.	[U]

Course Contents:

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

Heritage - Rock Art Paintings to Modern Art – Sculpture: Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils. **FolkAndMartialArts:** Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

Thinai ConceptOfTamils - Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas. ContributionofTamilstoIndiannationalmovementandindianculture:Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

Total Hours:	**15**

Text-cum-Reference Books:

1	தமிழகவரலாறு – மக்களும்பண்பாடும் – கே. கே. பிள்ளை(வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ் – முனைவர்இல. சுந்தரம் . (விகடன்பிரசுரம்).
3	கீழடி – வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4	பொருநை – ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)

	(Published by: International Institute of Tamil Studies).
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C101.1	Understand	Quiz	20
C101.2	Understand	Seminar	20
C101.3	Understand	Seminar	20
C101.4	Understand	Quiz	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1: [60 Marks]	**CIA2: [60 Marks]**	
Remember	40	40	40
Understand	60	60	60
Apply	-	-	-
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 2 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1									1			1			
C101.2								1	1			1			
C101.3								1	1			1			
C101.4									1						
C101.5								1	1						

23CS101	PROBLEM SOLVING USING C++	1/0/4/3
Nature of Course	K (Problem Programming)	
Pre requisites	NIL	

Course Objectives:

1	To learn the fundamental programming concepts and methodologies which are essential to build good C++ programs.
2	To gain knowledge on control structures and functions in C++.
3	To provide the basic object-oriented programming concepts and apply them in problem solving.
4	To introduce file streams and operations for storing data permanently.
5	To know generic programming paradigm.

Course Outcomes:
Upon completion of the course, students shall have ability to

C101.1	Illustrate the fundamental concepts and methodologies required to develop a program for given problems.	[U]
C101.2	Develop a program for real-time problems with pointers and objects.	[AP]
C101.3	Apply the Constructors, destructors, and Overloading concepts to solve the solve.	[AP]
C101.4	Develop C++ programs with Interfaces, Exception and File processing	[AP]
C101.5	Implement the concepts on file streams, I/O and Lambda Expression.	[AP]

Course Contents:

Module I C++ Programming Fundamentals **15 Hours**

C vs C++, Basic of OOPS, the main () function, Header files, Basic Input and Output (I/O) using cin and cout, Variable, Constant. **Operators:** Arithmetic Operators, Assignment Operators, Relational Operators, Logical Operators, Bitwise Operators, Other Operators, Operator Precedence. Control Statements: if, if...else and Nested if...else, switch case, break and continue, Loops - for loop, while loop, do while loop, goto. **Arrays and Strings:** 1D array, 2D array, Strings, String functions. **Function:** Basics, call by value, call by reference & return by reference, Inline function, overloading Functions, inline Functions, Recursive Functions. **Pointers:** Pointer, Dynamic Memory Allocation.

Module II Object Oriented Concepts **15 Hours**

Classes and Objects, public, private, protected. **Constructors and destructors**: Overloaded Constructor, Copy Constructor, Shallow Copying Deep Copying. **Overloading:** this' Pointer, structs vs Classes, Friends of a class, Operator Overloading, Inheritance, Overloading vs Overriding, Polymorphism, Virtual Functions, Pure Virtual Functions and Abstract Classes.

Module III Files and Generic Programming **15 Hours**

Abstract Classes as Interfaces, Exception, Files, Streams and I/O, STL, Generic Programming, Lambda Expression.

Total Hours (Theory)	**45 Hours**

Lab Component

S.No.	Lab Exercise
1.	Practice of C Programming using Branching and Iterative constructs.
2.	Programs using arrays and strings.
3.	Programs using Functions.
4.	Programs using Structures and Pointers.
5.	Programs using classes and objects.
6.	Programs using constructor and destructor.
7.	Programs using method overloading, operator overloading and polymorphism concepts.
8.	Programs using friend class.

9.	Programs using virtual functions and abstract class.
10.	Programs using inheritance concepts.
11.	Programs using exception handling concept.
12.	Programs using Files.
13.	Mini project
Total Hours (Lab)	**30 Hours**
Total Hours(45+30)	**75 Hours**
Text Books:	
1.	E Balagurusamy,"Object Oriented Programming With C++", 4th Edition, Tata McGraw-Hill Education, 2008.
2.	YashavantP. Kanetkar, "Let us C++", BPB Publications, 2020.
3.	M. Sprankle, "Problem Solving and Programming Concepts", 9th Edition, Pearson Education, New Delhi, 2011.
Reference Books:	
1.	Herbert Schildt, "The Complete Reference C++", 4th edition,MH, 2015.
2.	John Hubbard, "Schaum's Outline of Programming with C++", MH, 2016.
Web References:	
1.	https://www.geeksforgeeks.org/c-plus-plus/
2.	http://web.stanford.edu/class/cs106l/
Online Resources:	
1.	https://nptel.ac.in/courses/106101208
2.	https://www.hackerrank.com/domains/cpp
3.	https://codeforces.com/blog/entry/74684
4.	https://www.hackerearth.com/practice/notes/tricky-and-fun-programming-in-c/

Continuous Assessment									**End Semester Practical Examination**	**Total**
Theory				**Practical**			**Total (A+B)**	**Total Continuous Assessment**		
Formative Assessment	**Summative Assessment**	**Total**	**Total (A)**	**Formative Assessment**	**Summative Assessment**	**Total (B)**				
80	**120**	**200**	**100**	**75**	**25**	**100**	**200**	**50**	**50**	**100**

Formative Assessment based on Capstone Model - Theory			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment,Case Study, Seminar, Group Assignment)**	**FA (10%) [80 Marks]**
C101.1	Understand	Quiz	20
C101.2 & C101.3	Apply	Assignment	20
C101.4	Apply	Group Assignment	20
C101.5	Apply	Case Study	20

Assessment based on Summative Assessment - Theory		
Bloom's Level	**Summative Assessment (15%) [120 Marks]**	
	CIA1: (60 Marks)	**CIA2: (60 Marks)**
Remember	20	20
Understand	40	30
Apply	40	50
Analyse	-	-
Evaluate	-	-
Create	-	-

Assessment based on Continuous and End Semester Examination - Practical			
Bloom's Level	**Continuous Assessment (25%) [100 Marks]**		**End Semester Practical Examination (50%) [100 Marks]**
	FA: (75 Marks)	**SA: (25 Marks)**	
Remember	10	20	20
Understand	30	20	20
Apply	50	50	50
Analyse	10	10	10
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Practical Examination								
Continuous Assessment (50%)								**End Semester Practical Examination (50%)**
CA 1 (100 Marks)			**CA 2 (100 Marks)**			**Practical Exam (100 Marks)**		
SA 1 (60M)	**FA 1**		**SA 2 (60M)**	**FA 2**		**FA (75M)**	**SA (25M)**	
	Component-I (20 Marks)	**Component-II (20 Marks)**		**Component-I (20 Marks)**	**Component-II (20 Marks)**			

Course Outcome (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C101.1	3	3											3		
C101.2	3	3	3	2	2				2	1		3	3	2	1
C101.3	3	3	3	2	3				2	1		3	3	2	1
C101.4	3	3	3	3	3				3	2		3	3	2	2
C101.5	3	3	3	3	3				2	2		2	3	2	1
C101	**3**	**3**	**3**	**3**	**3**				**3**	**2**		**2**	**3**	**2**	**2**

3	Strongly agreed	2	Moderately agreed	1	Reasonably agreed

23PS102	PHYSICAL SCIENCE LABORATORY (Common to I Year B.E. – CIVIL&MECH)	L/T/P/C 0/0/4/2

Nature of Course	: E (Skill based)
Pre requisites	: Basic Applied Science laboratory skills

Course Objectives:	
1	Providing a hands-on learning experience in measuring the basic parameters of laser and determine the frequency of oscillation.
2	To carry out experiments to understand the basic laws of magnetism.
3	To provide hands on training to measure the time constant of RC circuit and lattice constant of cubic crystal structure
4	To understand the principles and applications of electrochemistry and learning electro-analytical methods, and explore the knowledge of various energy sources and storage devices.
5	To understand the concepts of photo-physical and photochemical processes in spectroscopy.

Course Outcomes: **Upon completion of the course, students shall have ability to**		
C102.1	To determine the frequency of oscillation and laser parameters using melde's apparatus and diode laser	[E]
C102.2	To determine the magnetic field around a current carrying conductor	[E]
C102.3	To determine the time constant of RC circuit and lattice constant of cubic crystal structure	[E]
C102.4	To determine the pH,single electrode potential using reference electrodes and Electroplating process based on electrolytic cell.	[E]
C102.5	Interpret the principle and working of Spectroscopic technique.	[E]

Lab Components:		
1	Determination of frequency of transverse and longitudinal wave modes – Melde's experiment and characteristics of Simple harmonic motion – Simulation lab.	[E]
2	Determination of wavelength, particle size and angle of divergence using diode laser source.	[E]
3	Determination of Magnetic field along the axis of current carrying coil-Stewart and Gee method.	[E]
4	Determination of characteristics of RC circuit to find the time constant	[E]
5	Determination of lattice constant of cubic crystal structure.	[E]
6	Determination of strength of strong acid by pH metry.	[E]
7	Estimation of dissolved oxygen in waste water using Winkler's method.	[E]
8	Determination of single electrode potential of Zinc and Copper by Potentiometric method.	[E]
9	Determination of cathode efficiency of Nickel using electroplating process.	[E]
10	Spectrophotometry-Estimation of iron in sample water.	[E]
	Total Hours:	**30**

Text Book:	
1	Anoop Sing Yadav “Applied Physics Lab Manual” Vayu Education of India Publisher, 2018.
2	P. Kulkarni,Manual for Experiments in Engineering Physics,2015
3	C. S. Robinson, Dr. Ruby Das, “A text book of Engineering practical physics”, Laxmi Publications Pvt. Ltd., 2016.
4	S.L.Gupta and V Kumar “Practical Physics Volume -II”, Pragati Prakashan ., 2023.
5	Method of Sampling and Test (Physical and Chemical) for Water and Wastewater- Iron, 2003, Part-53; First Revision.
6	Method of Sampling and Test (Physical and Chemical) for Water and Wastewater: pH Value (2001; Part-50; Coagulation Test).
7	Method of Sampling and Test (Physical and Chemical) for Water and Wastewater, Chemical Oxygen Demand, 2012, Part-58.
8	Science and Technology Laboratory Manual. E-Book. NIOS, 2012.
References:	
1	Dr. Ruby Das and Prashant Kumar Sahu,A Textbook of Engineering Physics Practical , 2016,2nd Edition
2	S.L.Gupta and Dr.V.Kumar, “Practical physics with viva voice”, Pragati Prakashan Publishers, Revised Edition, 2009.
3	M.N.Avadhanulu, A.A.Dani and Pokely P.M, “Experiments in Engineering Physics”, S.Chand&Co,2008.
4	Sawyer, C. N., McCarty, P. L., and Parkin, G. F. 2017. Chemistry for Environmental Engineering. Fifth Edition, McGraw-Hill, Inc., New York.
5	American Public Health Association et al, Standard Methods for the Examinations of Water and Waste Water, APHA. 2017.
6	AWWA, WEF, APHA, 2017, Standard Methods for the Examination of Water and Wastewater (Method: 5210B, BOD).
Web References:	
1	https://vlab.amrita.edu/
2	https://bop-iitk.vlabs.ac.in/basics-of-physics/
3	http://vlabs.iitb.ac.in/
4	https://www.iitg.ac.in/
5	https://ee1-nitk.vlabs.ac.in/exp/determination-of-ph/simulation.html
6	https://ee1-nitk.vlabs.ac.in/exp/determination-of-biological-oxygen/simulation.html
7	https://www.youtube.com/watch?v=pORJQyP-2j8
8	https://ee1-nitk.vlabs.ac.in/exp/determination-of-ph/simulation.html
9	https://ee1-nitk.vlabs.ac.in/exp/determination-of-ph/simulation.html

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom'sLevel	Continuous Assessment (60%) [100Marks]		End Semester Practical Examination(40 %) [100Marks]
	FA (75Marks)	SA (25Marks)	
Remember	0	0	0
Understand	10	10	10
Apply	30	30	30
Analyse	30	30	30
Evaluate	30	30	30
Create	0	0	0

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes(PSO)															
COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C102.1	3	2	1	2					2			1	1		
C102.2	3	2	1	2					2			1	1		
C102.3	3	2	1	2					2			1	1		
C102.4	3	2	1	2					2			1	1		
C102.5	3	2	1	2					2			1	1		
	3	Stronglyagreed		2	Moderatelyagreed					1	Reasonablyagreed				

23EE115	Fundamentals of Electrical and Electronics Engineering Laboratory (Common to MECH and CIVIL)			0/0/2/1
Nature of Course	: M (Practical application)			
Pre-requisites	: Nil			
Course Objectives:				
1	To learn the safety precautions and troubleshooting in using Electricity.			
2	To estimate the current flow and voltage across the circuit elements under different loading conditions.			
3	To understand the basic components for electrical installations.			
Course Outcomes: **Upon completion of the course, students shall have ability to**				
C115.1	Illustrate Electrical and Electronic components and its specifications.			[U]
C115.2	Verify the current flow and voltage across the circuit elements using different analysis method.			[A]
C115.3	Measure power and power factor of single and three phase AC circuits.			[AP]
C115.4	Comprehend the cut-out sections of DC Motor and Induction Motor.			[U]
C115.5	Utilize the basic components for electrical installations.			[AP]
Course Contents:				
S.No	**List of Experiments**		**CO Mapping**	**RBT**
1	Demonstration of meters, electrical and electronic components with specification.		C115.1	[U]
2	Safety precautions with electrical components.		C115.1	[U]
3	Troubleshooting of electrical equipment.		C115.1	[A]
4	Testing of CRO and Electronic components using Multimeter.		C115.2	[A]
5	Determination of mesh current by Mesh Analysis.		C115.2	[A]
6	Estimation of Voltage and Current in star and delta connections.		C115.2	[A]
7	Measurement of power and energy.		C115.3	[A]
8	Soldering practice - Components devices and Circuits using general purpose PCB.		C115.5	[A]
9	Residential house wiring.		C115.4	[A]
10	Demonstration of cut-out sections of DC Motor and Induction Motor.		C115.3	[U]
11	Demonstration of components of LT Switch Gears.		C115.5	[U]
12	Familiarization of digital basic gate ICs.		C115.5	[U]
		Total Hours	**30**	
Text Books:				
1	Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Tata McGraw Hill, 7th edition, 2020.			
2	Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2nd edition, 2015.			
3	E. Hughes, "Electrical and Electronics Technology", Pearson, 10th edition, 2011.			

4	Donald .A. Neamen, Electronic Circuit Analysis and Design, 2nd Edition reprint, Tata Mc Graw Hill, 2013.
Reference Books:	
1	Charles A.Gross, Thaddeus A.Roppel, "Fundamentals of Electrical Engineering", CRC press, 2012.
2	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, Revised 1st edition 2017,
3	Theodore F. Bogart, Jeffery S. Beasley and Guilermo Rico, 'Electronic Devices and Circuits', Pearson Education, 6th edition, 2013.
Web References:	
1	http://nptel.ac.in/course.php?disciplineId=108
2	https://ocw.mit.edu/courses/find-by topic/#cat=engineering&subcat=electricalengineering&spec=electricpower
3	https://nptel.ac.in/video.php?subjectId=117103063

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
75	**25**	**100**	**60**	**40**	**100**

Assessment based on Continuous and End Semester Examination			
Bloom's Level	**Continuous Assessment (60%) [100 Marks]**		**End Semester Practical Examination (40%) [100 Marks]**
	FA (75 Marks)	**SA (25 Marks)**	
Remember	0	0	0
Understand	30	30	30
Apply	30	30	30
Analyse	40	40	40
Evaluate	0	0	0
Create	0	0	0

No. of the 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**	**PSO 1**	**PSO 2**	**PSO 3**
C115.1	3	1											3		
C115.2	3	1													
C115.3	3	1													
C115.4	3	2													
C115.5	3	1													
1	**Reasonably Agreed**				**2**	**Moderately Agreed**					**3**	**Strongly Agreed**			

23CE102	ENGINEERING GRAPHICS LABORATORY	0/0/3/1.5
Nature of Course	Practical application	
Pre requisites	Nil	

Course Objectives:

1	To learn the construction of conic curves used in engineering applications.
2	To develop an understanding of Isometric to orthographic projections.
3	To learn the projection of lines, planes and solids objects.
4	To know development of lateral surfaces and building drawings.

Course Outcomes:
Upon completion of the course, students shall have ability to

C102.1	Understand the construction of conic curves and its applications.	[U]
C102.2	Apply the knowledge of drafting skills in the orthographic projections.	[AP]
C102.3	Construct the projection of lines, plane surfaces and solids using the drafting package.	[AP]
C102.4	Develop the lateral surface of the solids and perspective projections.	[AP]
C102.5	Develop the plan, section and elevation of the simple building using drafting package.	[AP]

Course Contents:

Laboratory Component:

S. No	List of Experiments	CO Mapping	BT
1	Construction of conic curves (Ellipse, Parabola and Hyperbola)	C102.1	[AP]
2	Hands on experience of the drafting package.	C102.2	[AP]
3	Drawing the orthographic projections from isometric projections manually and using drafting package.	C102.2	[AP]
4	Projection of lines inclined to anyone of the principal planes using drafting package.	C102.3	[AP]
5	Projection of plane surfaces inclined to anyone of the principal planes.	C102.3	[AP]
6	Projection of solids (Prism and Pyramid) inclined to HP using drafting package.	C102.3	[AP]
7	Projection of solids (Cone and Cylinder) inclined to VP using drafting package.	C102.3	[AP]
8	Development of lateral surfaces (Prism and Pyramid) using drafting package.	C102.4	[AP]
9	Development of lateral surfaces (Cone and Cylinder) using drafting package.	C102.4	[AP]

10	Hands on overview to Perspective Projections.	C102.4	[AP]
11	Drafting the plan, section and elevation of a single room building using drafting package.	C102.5	[AP]
12	Drafting the plan and section of a simple residential building using drafting package.	C102.5	[AP]
		TOTAL HOURS	**60 Hrs.**

Reference Books:	
1	Bhatt, N.D., and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2014.
2	Natarajan K. V., "A text Book of Engineering Graphics", Dhanalakshmi Publishers, 2018.
3	Gopalakrishna K. R., "Engineering Drawing" Vol. I & II, Subhas Stores, Bangalore, 2011.
4	VenugopalK., and Prabhu Raja V., "Engineering Graphics", New Age International Pvt. Ltd., 2013.
Web References:	
1	https://onlinecourses.nptel.ac.in/noc21_me128/preview
2	https://www.autodesk.com/training

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
75	**25**	**100**	**60**	**40**	**100**

Assessment based on Continuous and End Semester Examination			
Bloom's Level	**Continuous Assessment (60%) [100 Marks]**		**End Semester Practical Examination (40%) [100 Marks]**
	FA (75 Marks)	**SA (25 Marks)**	
Remember	10	10	10
Understand	10	10	10
Apply	40	40	40
Analyse	20	20	20
Evaluate	10	10	10
Create	10	10	10

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)															
Cos	**Pos**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	2	3	-	-	1	1	1	-	2	2	-	2
2	3	2	2	2	3	-	-	1	1	1	-	2	2	-	2
3	3	2	2	2	3	-	-	1	1	1	-	2	2	-	2
4	3	2	2	2	3	-	-	1	1	1	-	2	2	-	2
5	3	2	2	2	3	-	-	1	1	1	-	2	2	-	2
Avg.	3.0	2.0	2.0	2.0	3.0	-	-	1.0	1.0	1.0	-	2.0	2.0	-	2.0

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

SEMESTER II

23MA204	CALCULUS AND FOURIER SERIES (COMMON TO MECH, CIVIL)	3/1/0/4

Nature of Course	J (Problem analytical)
Pre requisites	-

Course Objectives:

1	To gain knowledge in integrals, which are needed in engineering applications.
2	To develop logical thinking and analytical skills in evaluating multiple integrals.
3	To familiarize the concepts of differential and Integral calculus which are applicable in many branches of engineering.
4	To familiarize with the concepts of vector calculus needed for problems in all engineering disciplines.
5	To understand the different possible forms of Fourier series.

Course Outcomes: (Theory)
Upon completion of the course, students shall have ability to

C204.1	Determine the area and volume by applying the techniques of double and triple integrals.	[R]
C204.2	Develop the understanding of integration techniques needed for problems in engineering disciplines.	[U]
C204.3	Apply multiple integral ideas in solving areas, volumes and other practical problems.	[AP]
C204.4	Differentiate and integrate a vector-valued functions to solve real world applications.	[AP]
C204.5	Apply Fourier series solutions to the engineering problems	[AP]

Course Contents

MODULE I - DIFFERENTIAL AND INTEGRAL CALCULUS (20 Hrs)

Curvature, Centre, Radius and Circle of curvature in Cartesian co-ordinates – Evolutes – Envelopes – Evolute as envelope of normals. Definite integrals: Evaluation of definite integrals using Bernoulli's formula - Double integration in Cartesian coordinates – Area as double integral – Triple integration in Cartesian coordinates –Volume as triple integral

MODULE II - VECTOR CALCULUS (20 Hrs)

Vector differential operator – Gradient and Directional derivatives – Angle between the surfaces – Divergence and Curl – Scalar potential – Equation of the tangent plane and normal line – Irrotational and Solenoidal vector fields –Vector integration: Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

MODULE III – FORIER SERIES (20 Hrs)

Fourier series: Dirichlet's conditions - General Fourier Series : Problems under (0,2π)- Problems under (0,2l) - Odd and Even Functions : Problems under (-π,π) - Problems under (-l,l) - Half range sine series and cosine series - Parseval's Identity.

Total hours	**60**

Text Books:

1.	G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry, 14th Edition, Pearson, Reprint,2018.
2.	Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2020.
3.	Grewal. B.S, "Higher Engineering Mathematics", 44th edition, Khanna Publications, Delhi, 2021.

Reference Books:	
1.	Veerarajan. T, “Engineering Mathematics II”,Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.
2.	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 5th edition, 2018.
3.	N.P.Bali and Dr.ManishGoyal,”A Text book of Engineering Mathematics” 10th edition, Laxmi publications ltd, 2020.
Web References:	
1.	https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/
2.	https://archive.nptel.ac.in/courses/111/107/111107108/
3.	https://www.youtube.com/watch?v=jNC0jxb0OxE
Online Resources:	
1.	https://www.coursera.org/learn/integration-calculus
2.	https://www.coursera.org/learn/vector-calculus-engineers
3.	https://www.coursera.org/learn/differential-equations-engineers

Summative assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%)						**End Semester Examination (60 %)**
CA 1 (20 Marks)			**CA2 (20 Marks)**			**Theory Examination (60 Marks)**
SA 1 (12 Marks)	**FA 1**		**SA 2 (12 marks)**	**FA 2**		
	Component -I (4 marks)	**Component –II (4 marks)**		**Component -I (4 marks)**	**Component - II (4 marks)**	

Assessment Methods & Levels (based on Blooms’ Taxonomy)			
Formative Assessment based on Capstone Model (16%)			
Course Outcome	**Bloom’s Level**	**Assessment Component**	**Marks**
C204.1	Remember	Quiz	4
C204.2	Understand	Assignment	4
C204.3	Apply	Case study	4
C204.4	Apply	Tutorial	4
C204.5	Apply		

Summative assessment based on Continuous and End Semester Examination			
Bloom’s Level	**Continuous Assessment (24%)**		**End Semester Examination (60%) [60 Marks]**
	CIA1 [12 Marks]	**CIA2 [12 Marks]**	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C204.1	1	1	1										1		
C204.2	1	2	1										2		
C204.3	3	3	2										2		
C204.4	1	1	2										1		
C204.5	2	1	2										2		

23CE201	APPLIED MECHANICS	3/1/0/4
Nature of Course	Concepts and Analytical	
Pre-Requisites	Fundamentals of basic mathematics and physics	

Course Objectives:

1	To make the students understand the vector and scalar representation of forces and moments and the static equilibrium of particles and rigid bodies.
2	To make the students understand the properties of surfaces, prediction of behaviour of particles and rigid bodies.
3	To understand the effect of friction on equilibrium, laws of motion.
4	To analyze the bodies which are in motion using the basics of kinetics and kinematics.

Course Outcomes:
Upon completion of the course, students shall have ability to

C201.1	Compute the resultant force for various force systems using laws of mechanics	[U]
C201.2	Apply the equations of statics to determine the unknown reactions and draw shear force and bending moment diagram	[AP]
C201.3	Evaluate the geometrical properties of two dimensional objects	[AN]
C201.4	Compute the unknown frictional forces using free body diagram of rigid bodies for Impending Motion	[AP]
C201.5	Apply the equations of dynamics to determine the unknown quantities in kinetics and kinematics	[AP]

Course Contents:

Module 1: Equilibrium of Particles and Rigid Bodies **21 Hrs.**

Force Systems – Basic concepts, Laws of Mechanics, System of Forces, Coplanar Concurrent Forces, Resolution and resultant of several concurrent forces - Lami's theorem; Equilibrium of particles in 2D. Statics of Rigid bodies in two dimensions - Varignon's theorem; Couples and moment, Equations of equilibrium of rigid bodies in 2D. Beams - types of supports, loads and reactions – Shear force and bending moment diagram for determinate beams (cantilever, simply supported) under single load condition - Point of contra flexure.

Module 2: Centre of Gravity, Moment of Inertia and Friction **21 Hrs.**

Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia - Definition, Moment of inertia of plane sections from first principles, Parallel Axis theorem, Moment of inertia of standard sections and composite sections - Friction: Types of friction, Limiting friction, Laws of friction – Static Friction - simple contact friction in blocks under impending motion.

Module 3: Dynamics of Particles **18 Hrs.**

Kinematics of Particles: Displacements, Velocity and acceleration – Rectilinear motion with uniform and variable acceleration their relationship in linear motion - Introduction to Curvilinear motion (Principles Only) - Kinetics of Particles: D'Alembert's principle and its applications.

Total Hours: 60 Hrs.

Text Books:	
1	Beer F.P, and Johnston ER, Vector Mechanics for Engineers – Statics and Dynamics, McGraw Hill Education, New Delhi, 2017.
2	Dhiman A.K, Dhiman P, Kulshreshtha D.C, Engineering Mechanics-Statics and Dynamics, McGraw Hill Education, 2017.
3	Kottiswaran N, Engineering Mechanics - Statics and Dynamics, Sri Balaji Publications- 2018.
Reference Books:	
1	Bhavikatti S.S, Engineering Mechanics , New Age International Publishers - 2022.
2	Meriam JL and Craige, "Engineering Mechanics statics and dynamics", John Willey and Son's publication, 9th edition.2021
3	Sanju Unadkat, "Engineering Mechanics", Tech-Neo Publications-2020.
Web References:	
1	http://nptel.ac.in/courses/122104015/
2	http://nptel.ac.in/courses/112103109/
Online Resources:	
1	https://ocw.mit.edu/courses

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C201.1	Understand	Online Quiz	20
C201.2	Apply	Assignment	20
C201.3	Analyse	Assignment	20
C201.4	Apply		
C201.5	Apply	Online Quiz	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	10	10	10
Understand	10	20	20
Apply	40	40	40
Analyse	40	30	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1 : 100 Marks			CA 2 : 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3		1	1									2		
2	3	2	2	1									3	1	
3	3	3	3	1									3		
4	3	2	3	1									3	1	
5	3	2	2	1									3	1	
Avg.	3	2.2	2.2	1									2.8	1	

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

23CE202	CONSTRUCTION MATERIALS AND TECHNIQUES	3/0/0/3
Nature of Course	Theory	
Pre requisites	Introduction to Civil Engineering	

Course Objectives:

1	To have a clear knowledge of construction materials and their properties.
2	To know the market forms of special and alternate building materials.
3	To learn various testing methods for assessing the strength and quality of materials.
4	To be familiar with the several advanced construction techniques and practices.

Course Outcomes:
Upon completion of the course, students shall have ability to

C202.1	Demonstrate the manufacturing process of building materials and their appropriate suitability for a given scenario.	[AP]
C202.2	Illustrate the characteristics and application of alternate and decorative construction materials.	[AP]
C202.3	Illustrate the characteristics and applications of protective and special materials.	[AP]
C202.4	Identify and describe the significance of modern machineries and technology for construction activities.	[AP]
C202.5	Select appropriate techniques and tools for construction activities.	[AP]

Course Contents: Theory

Module 1: Construction Materials **15 Hrs.**

Bricks and Blocks: Classifications, Manufacturing and Test – Steel: Composition, Types, Manufacturing, Properties and Applications – Aggregates: Natural and Artificial Aggregates, Recycled Aggregates, Grading, Bulking of Fine Aggregates – Cement: Ingredients, Manufacturing, types, grades, properties – Cement mortar – Hydration of Cement.

Module 2: Alternative, Decorative, Protective and Special Materials **15 Hrs.**

Alternate Materials: Engineering wood, Bamboo, Sustainable particle boards, Veneer, Foam, Eco-friendly materials – Decorative Materials: Panels of laminates, paints, varnishes, distempers, glass, ceramics, plaster, fabric paper – Protective Materials: Sealants for joints, fibre glass reinforced plastic, carbon fiber, thermal insulation – Special Materials: Composite materials and types, Applications of laminar composites.

Module 3: Construction Machineries and Techniques **15 Hrs.**

Machineries for earthmoving – dewatering – concrete mixing – transporting & placing of materials,

plastering pre-stressing jacks and grouting equipment, pile driving, lifting (Cranes, Hoists) – Equipment Productivities – Use of drones for spread out sites – Use of robots for repetitive activities and for modern construction material use and manufacturing of materials – 3D printing – Innovative modern construction tools, accessories and equipment's – Special construction methods: Scaffolding, shoring, underpinning, piling – Conventional construction methods vs Mechanized methods and advantages of latter.	
Total Hours	**45 Hrs**
Text Books:	
1	Varghese P. C., Building Materials, PHI Learning Pvt. Ltd., New Delhi, 2016.
2	Sahu G. C., Jayagopal Jena, Building Materials and Construction, McGraw Hill Education Pvt. Ltd., New Delhi, 2017.
3	Rangwala S. C., Engineering Materials, Charotar Publishing House, New Delhi, 2019.
Suggested Readings:	
1	Rajput R. K., Engineering Materials, S. Chand & Company Ltd., 2014.
2	Duggal S, K., Building Materials, New Age International (P) Ltd. Publishers, 2019.
3	Carlos Balaguer, Robotics and Automation in Construction, Springer Ed., 2008.
4	Arora S, P., Bindra S, P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, 2013.
Web References:	
1	https://aquicore.com/blog/10-new-materials-changing-commercial-construction/
2	https://www.thenbs.com/knowledge /drones-in-construction
Online Resources:	
1	https://nptel.ac.in/courses/105/106/105106053/
2	https://onlinecourses.nptel.ac.in/noc20_ar04/preview
3	https://www.futurelearn.com/courses/modern-building-design

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms 'Taxonomy – Theory

Formative assessment based on Capstone Model (80 Marks)

Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list – Quiz,	Marks
C202.1	Apply	Assignment	20
C202.2	Apply	Technical Quiz - 1	20
C202.3 & C202.4	Apply	Case Study	20
C202.5	Apply	Technical Quiz – 2	20

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment (120 Marks)		End Semester Examination [60 marks]
	CIA 1 [60 Marks]	CIA 2 [60 Marks]	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component –I (20 Marks)	Component – II (20 Marks)		Component –I (20 marks)	Component – II (20 Marks)	

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1	-	-	2	2	-	-	-	-	2	3	2	1
2	3	2	1	-	-	2	2	-	-	-	-	2	3	2	1
3	3	2	1	-	-	2	2	-	-	-	-	2	3	2	1
4	3	2	1	-	-	2	2	-	-	-	-	2	3	2	1
5	3	2	1	-	-	2	2	-	-	-	-	2	3	2	1
Avg	3	2	1	-	-	2	2	-	-	-	-	2	3	2	1

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

23TA201	TAMILS AND TECHNOLOGY / தமிழரும்தொழில்நுட்பமும்	1/0/0/1
Nature of Course:	C (Theory Concept)	
Pre requisites:	NIL	

Course Objectives:

1	To know about weaving, ceramic, design and construction technologies in sangam age.
2	To know the significance of technologies such as manufacturing, agriculture and irrigation.
3	To understand the development of Scientific Tamils and Tamil Computing.

Course Outcomes:
Upon completion of the course, students shall have ability to

C201.1	Describe about the weaving industry in sangam age and ceramic technology.	[U]
C201.2	Observe the design of houses, sculptures and construction of temples.	[U]
C201.3	Relate the various manufacturing materials and stone types in Silappathikaram.	[U]
C201.4	Understand the significance of agriculture and irrigation technology in ancient period.	[U]
C201.5	Explain the growth of scientific Tamil, Tamil computing and digitization of Tamil books.	[U]

Course Contents:

Weaving and Ceramic Technology: Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries. **Design and Construction Technology:** Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple) - Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Manufacturing Technology: Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel - Copper and gold - Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads - Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram. **Agriculture and Irrigation Technology:** Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

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

Total Hours: 15

Text-cum-Reference Books:

1	தமிழகவரலாறு – மக்களும்பண்பாடும் – கே.கே.பிள்ளை(வெளியீடு: தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ் – முனைவர்இல. சுந்தரம் . (விகடன்பிரசுரம்).
3	கீழடி – வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4	பொருநை – ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.

7	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms' Taxonomy)

Formative Assessment based on Capstone Model

Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C201.1	Understand	Seminar	20
C201.2	Understand	Quiz	20
C201.3	Understand	Quiz	20
C201.4 C201.5	Understand	Seminar	20

Assessment based on Summative and End Semester Examination

Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	40	40	40
Understand	60	60	60
Apply	-	-	-
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 2 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1										1		1			
C201.2										1		1			
C201.3										1		1			
C201.4										1		1			
C201.5										1		1			

23CE203	ARCHITECTURAL PLANNING AND BUILDING DRAWING	3/0/3/4.5
Nature of Course	Theory and Practical	
Pre requisites	Engineering Graphics	

Course Objectives:

1	To summarize the various facets of architectural design for a holistic understanding of the discipline.
2	To illustrate the various elements and principles of architecture.
3	To analyse the different design approach of various building types with specific reference to site and climate.
4	To interpret and apply the building rules, Bye laws and Building Information Modelling concepts (BIM).

Course Outcomes:
Upon completion of the course, students shall have ability to

C203.1	Apply the components and elements of an architectural design.
C203.2	Relate spatial relationship and spatial organization principles.
C203.3	Incorporate principles of architecture and circulation in the design.
C203.4	Perform climate responsive designs and its various components – passive design strategy.
C203.5	Design in accordance with building Bye laws, National Building Code and discuss Building Information Modelling.

Course Contents:

Module 1: Introduction and Elements of Architecture **15 Hrs**

Definitions of Architecture – architecture as a discipline – context for architecture as satisfying human needs: functional, aesthetic and psychological- outline of components and aspects of architectural form. Spatial relationship and its types, Spatial organization and its types – built form and open space relationships.

Module 2: Principles of Architecture and Climate responsive design **15 Hrs**

Understanding fundamental principles - Movement with reference to the architectural form and space – relationship between architectural form and circulation – Types of circulation. Site analysis and climate responsive design **-** Climate and Shelter - Factors that determine climate – Characteristics of climate types –Passive and active energy controls Energy Optimization in Design- Low Carbon Building Systems

Module 3: Building Bye laws & Building Information Modelling **15 Hrs**

Building Rules and Bye-laws - Overview to National Building Code (NBC) -Overview to Development Control Regulation (DCR) - Guidelines-Building Approval Process -Plan Requirements- Real estate regulatory authority (RERA)- Building Information Modelling - BIM softwares -Case studies.

Total Hours (Theory)	**45**

Lab Component

S.No.	List of Exercises	CO	BT
1.	Planning and drafting the plan, section & elevation of a single storied residential building.	C 203.1 - C203 .5	AN
2.	Planning and drafting the plan section, elevation of a G+1 hospital building	C 203.1 - C203 .5	AN
3.	Planning, drafting the section and elevation of a school building	C 203.1 - C203 .5	AN
4.	Planning and drafting the section, elevation of a factory building with north Light Roof truss	C 203.1 - C203 .5	AN

5.	Planning and drafting the section elevation of a G+1 commercial complex building.	C 203.1 - C203 .5	AN
6.	Hands on Overview to Building Information Modelling (BIM)	C 203.5	U
7.	Hands-on 3D Modeling of a single storied residential building.(Autodesk Revit Architecture).	C 203.1 - C203 .6	AN
8.	Hands-on 3D Modeling of a factory building with north Light Roof truss (Autodesk Revit Architecture).	C 203.1 - C203 .6	AN
9.	Hands-on 3D Modeling of a school building (Autodesk Revit Architecture)	C 203.5	AN
10.	Hands-on Overview to 4D (BIM)- Simulation of a residential building.	C 203.5	U
11.	Hands-on Overview to 5D (BIM) - cost estimating of a residential building.	C 203.5	U
12.	Hands-on Overview to Clash detection (Navisworks) and Visual Programming environment for automation (Dynamo Studio)	C 203.5	U
	Total Hours (Lab)	**30**	
	Total Hours(45+30)	**75**	

Text Books:	
1.	Simon Unwin, “Analyzing Architecture”, Routledge; 4th edition, 2014
2.	Koenigsberger O.H. et.al, “Manual of Tropical Housing and Building” – Part I - Climate design, Orient Longman, Madras, India, 2020.
3.	Kale C.M, Patki S.Y. “Building Drawing with an Integrated to Built Environment” Mc-Graw Hill Education, fifth reprint edition 2013.
Reference Books:	
1.	Julius Panero, Martin Zelnik, “Human Dimension and Interior Space: A Source Book of Design Reference Standards”, 2012.
2.	Arvind Krishnan, Nick Baker, Simos Yannas and Szokolay.S.V., “Climate Responsive Architecture”., A Design Hand Book for Energy Efficient Building, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2017
3.	Ricard Hyde, “Climate Responsive Design: A Study of Buildings in Moderate and Hot Humid Climates” Taylor & Francis; 1 edition, 2015
Web References:	
1.	https://www.aia.org/
2.	https://www.arcat.com/
3.	https://awinet.org/
4.	https://www.archtoolbox.com/
Online Resources:	
1.	https://onlinecourses.nptel.ac.in/noc19_ar14/preview
2.	https://www.coursera.org/learn/making-architecture
3.	https://www.edx.org/learn/sustainable-development/massachusetts-institute-of-technology-sustainable-building-design
4.	https://www.edx.org/learn/architecture/harvard-university-the-architectural-imagination

Continuous Assessment									End Semester Practical Examination	Total
Theory				Practical			Total (A+B)	Total Continuous Assessment		
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)				
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model – Theory			
Course Outcome	**Bloom's Level**	**Assessment Component**	**FA (10%) [80 Marks]**
C203.1	Analyse	Quiz	20
C203.2 & C203.3	Analyse	Assignment	20
C203.4	Analyse	Outside Classroom Learning Experience	20
C203.5	Apply	Case Study	20

Assessment based on Continuous and End Semester Examination – Practical			
Bloom's Level	**Continuous Assessment (25%) [100 Marks]**		**End Semester Practical Examination (50%) [100 Marks]**
	FA: (75 Marks)	**SA: (25 Marks)**	
Remember	-	-	-
Understand	20	20	20
Apply	40	30	30
Analyse	40	50	50
Evaluate	-	-	-
Create	-	-	-

Assessment based on Summative Assessment - Theory		
Bloom's Level	**Continuous Assessment (25%) [100 Marks]**	
	CIA1: (60 Marks)	**CIA2: (60 Marks)**
Remember	-	-
Understand	10	10
Apply	40	40
Analyse	50	50
Evaluate	-	-
Create	-	-

Assessment based on Continuous and End Semester Examination			
Continuous Assessment (50%)			**End Semester Practical Examination**
CA 1 (100 Marks)	**CA 2 (100 Marks)**	**Practical Exam (100 Marks)**	

SA 1 (60M)	FA 1		SA 2 (60M)	FA 2		FA (75M)	SA (25M)	(50%)
	Component-I (20 Marks)	Component-II (20 Marks)		Component-I (20 Marks)	Component-II (20 Marks)			

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C203.1	3	3	-	-	-	-	-	-	-	-	-	-	3	-	-
C203.2	3	3	3	2	3	-	-	-	2	1	-	3	3	2	1
C203.3	3	3	3	2	3	-	-	-	2	1	-	3	3	2	1
C203.4	3	3	3	3	3	-	-	-	2	2	-	3	3	2	1
C203.5	3	3	3	3	3	-	-	-	2	2	-	3	3	2	1
C203	**3**	**3**	**3**	**2.5**	**3**	**-**	**-**	**-**	**2**	**1.5**	**-**	**3**	**3**	**2**	**1**

23EN101	ORAL AND WRITTEN COMMUNICATION SKILLS (CSE/CSD/CY/IT/AI&DS - SEMESTER I) (ECE/EEE/MCT/MECH/CIVIL - SEMESTER II)	2/0/2/3

Nature of Course	Theory Skill Based
Pre requisites	Basics of English Language

Course Objectives:

1	To empower students to comprehend different aspects of communication using LSRW skills.
2	To highlight the essential aspects of effective oral and written communication necessary for professional success.
3	To expand the skills of the students in preparing job search artefacts and negotiating their use in GDs and interviews.
4	To enable students to communicate contextually in specific, personal and professional situations with courtesy.
5	To enrich students to carry out day-to-day communication at the workplace and facilitate efficient interpersonal communication.

Course Outcomes:
Upon completion of the course, students shall have ability to

C101.1	Remember and expand writing skills through guided activities.	R
C101.2	Apply communication skills in a corporate environment.	AP
C101.3	Analyse and collaborate better with colleagues, building stronger professional and personal relationships.	AN
C101.4	Apply technical writing skills to write letters, emails and prepare technical documents.	AP
C101.5	Analyze and communicate effectively in personal and professional situations.	AN

Course Contents:

Module I

Reading : Reading techniques -Skimming and scanning - Cloze reading - Reading and understanding technical articles – Reading for detailed comprehension: Email and letters - Reading advertisements - Table completion: Interpreting charts and graphs - Verbal reasoning – Comprehending reviews – Reading and responding to instant messages.

Module II

Writing : Formal letters (Sales letter, calling for quotations, seeking clarification, placing an order, complaint letter, inviting, accepting and declining letters) - Emails - Minutes of meeting - Professional report writing - Proposal writing - Resume / job application letter - Case study.

Module III

Listening : Situational listening - Listening about an experience - Listening about short extracts - Listening an interview - Conversational speaking. Speaking : Conversational speaking - Decipher the picture given and answer the question posed along with it - Decipher the mind map given and speak about it - Listen to the questions posed and answer them appropriately.

Lab Components

1	Conversational listening	[U]
2	Speaking - Pictography	[AP]
3	Listening about an experience	[U]
4	Listening to short extracts	[U]
5	Writing - Resume Writing, Job application letter	[AP]
6	Mock interview	[AP]
	Total Hours:	60

Text Books:

1	Jay Sullivan, “Simply Said: Communicating Better at Work and Beyond”, Wiley Publication, 2018.
2	Alred J Gerald, Brusaw T Charles,. Oliu E Walter, “Handbook of Technical Writing”, Bedford/St. Martin’s Boston publication,New York, 2012.
3	Liz Hamp-Lyons and Ben Heasly, “Study Writing :A Course in Written English for Academic Purposes”, Updated Edition, Cambridge University Press, 2006.
4	Dr.Praveen Sam and K N Shoba - A Course in Technical English by Cambridge University press, 2020.

Reference Books:

1	Rutherfoord J Andrea, “ Basic Communication Skills for Technology”, Upper Saddle River, N.J. : Prentice Hall, 2001.
2	Singh Hardeep (Author), Kothari (Author), “Written & Oral Technical Communication Skills For Engineers/Scientists” - LAMBERT Publications, 2019.

Web References:

1	http://www.academiccourses.com/Courses/English/Business-English
2	https://www.liveworksheets.com/worksheets/en/English_as_a_Second_Language_(ESL)/Technical_English

Online Resources:

1	https://www.coursera.org/specializations/business-english
2	https://www.businessenglishresources.com/learn-english-for-business/student-section/practice-exercises-new/

Assessment									End Semester Examination Continuous n	Total
Theory				Practical			Total (A+B)	Total Continuous Assessment		
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)				
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)**	**FA (10%) [80 Marks]**
C101.1 C101.2	Understand	Listening to Short Extracts	**20**
C101.3	Apply	Speaking - Pictography	**20**
C101.4	Apply	Mock Interview	**20**
C101.5	Apply	Assignment	**20**

Assessment based on Summative and End Semester Examination - Theory			
Bloom's Level	**Summative Assessment (15%) [120 Marks]**		**End Semester Examination (25%) [100 Marks]**
	CIA1: (60 Marks)	**CIA2: (60 Marks)**	
Remember	20	20	20
Understand	40	40	40
Apply	40	40	40
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination - Practical			
Bloom's Level	**Continuous Assessment (25%) [100 Marks]**		**End Semester Examination (25%) [100 Marks]**
	FA: (75 Marks)	**SA: (25 Marks)**	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Course Outcomes (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1										3					
C101.2								2		3					
C101.3								2		3	2				
C101.4										3					
C101.5										3		3			

23IT211	INTRODUCTION TO PYTHON PROGRAMMING	1/0/4/3
Nature of Course	F (Theory Programming)	
Prerequisites	Nil	

Course Objectives:

1.	To understand and execute Python script using types and expressions.
2.	To understand the difference between expressions & statements and to understand the concept of assignment semantics.
3.	To utilize high level data types such as lists and dictionaries.
4.	To import and utilize a module and to perform read & write operations on files.

Course Outcomes

Upon completion of the course, students shall have ability to

C211.1	Demonstrate programs using simple python statements and expressions.	[U]
C211.2	Build control flow and string concept in python for solving problems.	[AP]
C211.3	Develop python programs using functions.	[AP]
C211.4	Analyze compound data using python lists, tuples and dictionaries.	[A]
C211.5	Apply python programs using files, exception, modules and packages.	[AP]

COURSE CONTENTS:

DATA, EXPRESSIONS, STATEMENTS: (15 Hours)

Data Types, Variables and Identifiers, Operators and Expression, Conditional Branching Statements, Iterative statements- Nested Loops, Break, Continue, Pass statements, Function - definition and function call, arguments, return statements, Lambda Function and Recursive Function.

STRING, LISTS, FUNCTIONS: (15 Hours)

Strings – Concatenation, Append, Comparing Strings, Iterating Strings, Strings Modules and Functions, Modules – NumPy, Math, List: Operations, Nested list, Cloning, Methods, Looping, Tuple: Operations, Nested Tuple, Tuple assignments, Checking the index, Dictionary: Operations, looping over and Nested Dictionary, Built in functions and Methods.

FILES, INHERITANCE: (15 Hours)

Classes and Objects, Inheritance, Polymorphism, File Handling and Exception Handling.

Total Hours	**45**

Laboratory Component:

S. No	List of Experiments
1.	Compute the GCD of two numbers.
2.	Find the square root of a number (Newton's method).
3.	Exponentiation (power of a number).
4.	Find the maximum of a list of numbers.
5.	Linear search and Binary search.
6.	Selection sort, Insertion sort.
7.	Merge sort.
8.	First n prime numbers.
9.	Multiply matrices.
10.	Programs that take command line arguments (word count).
11.	Plotting datasets.
12.	File handling and plotting.

Total Hours: 30 hours

Text Books:	
1.	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist’’, 2nd Edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.(http://greenteapress.com/wp/think-python/).
2.	Tony Gaddis, “Starting out with Python’’, 4th Edition, Addison Wesley, Pearson, 2017.
Reference Books:	
1.	Paul Deitel and Harvey Deitel, “Python for Programmers”, Pearson Education, 1st Edition, 2021.
2.	G Venkatesh and Madhavan Mukund, “Computational Thinking: A Primer for Programmers and Data Scientists”, 1st Edition, Notion Press, 2021.
3.	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data”, 3rd Edition, MIT Press, 2021.
Web References:	
1.	http://nptel.ac.in/courses/106106145/
2.	https://www.codecademy.com/learn/learn-python
3.	https://www.coursera.org/learn/python-data-analysis#syllabus
Online Resources:	
1.	https://www.programiz.com/python-programming
2.	https://www.fullstackpython.com/best-python-resources
3.	https://www.udemy.com/course/easy-way-to-learn-python-for-beginners-2021/
4.	https://stackify.com/learn-python-tutorials/

Continuous Assessment									**End Semester Practical Examination**	**Total**
Theory				**Practical**			**Total (A+B)**	**Total Continuous Assessment**		
Formative Assessment	**Summative Assessment**	**Total**	**Total (A)**	**Formative Assessment**	**Summative Assessment**	**Total (B)**				
80	**120**	**200**	**100**	**75**	**25**	**100**	**200**	**50**	**50**	**100**

Formative Assessment based on Capstone Model - Theory			
Course Outcome	**Bloom’s Level**	**Assessment Component**	**FA (10%) [80 Marks]**
C211.1	Understand	Assignment - 1	**20**
C211.2	Apply	Quiz	**20**
C211.3	Apply	Assignment - 2	**20**
C211.4	Analyze	Case Study	**20**
C211.5	Apply		

Assessment based on Summative Assessment – Theory		
Bloom's Level	**Summative Assessment (15%) [120 Marks]**	
	CIA1: (60 Marks)	**CIA2: (60 Marks)**
Remember	10	10
Understand	40	40
Apply	40	40
Analyse	10	10
Evaluate	-	-
Create	-	-

Assessment based on Continuous and End Semester Examination - Practical			
Bloom's Level	**Continuous Assessment (25%) [100 Marks]**		**End Semester Examination (50%) [100 Marks]**
	FA: (75 Marks)	**SA: (25 Marks)**	
Remember	10	10	10
Understand	30	30	30
Apply	40	40	40
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination								
Continuous Assessment (50%)								**End Semester Practical Examination (50%)**
CA 1 (100 Marks)			**CA 2 (100 Marks)**			**Practical Exam (100 Marks)**		
SA 1 (60 M)	**FA 1**		**SA 2 (60 M)**	**FA 2**		**FA (75M)**	**SA (25 M)**	
	Component-I (20 Marks)	**Component-II (20 Marks)**		**Component-I (20 Marks)**	**Component-II (20 Marks)**			

Course Outcomes (CO)	**Programme Outcomes (PO)**												**Programme Specific Outcomes (PSO)**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C211.1	1	2	1	1								2			
C211.2	3	3	3	3	2							2			
C211.3	3	3	3	3								2			
C211.4	3	3	3	3	3							2			
C211.5	3	2	3	3	3							1			

23CE204	ENGINEERING PRACTICES LABORATORY	0/0/4/2

Nature of Course	Practical application
Pre-Requisites	Nil

Course Objectives:

1	To examine the quality of civil engineering building materials as per standard code recommendations.
2	To accomplish knowledge on building surveying.
3	To gain hands on experience in carpentry and sheet metal
4	To develop the skills for experience in plumbing and welding.

Course Outcomes:
Upon completion of the course, students shall have ability to

C204.1	Examine the quality and properties of building materials and construction methods	[AP]
C204.2	Calculate the area of given plots and mark the boundaries of building using setting out process.	[AP]
C204.3	Assess the preliminary characteristics of soil and cement particles using laboratory examinations	[AP]
C204.4	Prepare the basic connections involved in plumbing and make simple metal joints using welding equipment and wooden joints using carpentry tools	[AP]
C204.5	Develop the surfaces and make simple components like tray and funnel	[AN]

Course Contents:

GROUP A (CIVIL)

List of Experiments:

S.No	List of Experiments	CO Mapping	RBT
1	Examine the quality of bricks based on: (i)structure – standard shape, size, colour; (ii) hardness, (iii) sound test (iv) water absorption and (v) presence of chemicals and report.	C204.1	[AP]
2	Construct the front elevation of English bond and Flemish bond in bricks. Demonstrate the plan for 1 brick thick and 1½ brick thick wall.	C204.1	[AP]
3	Setting out work of a building using linear methods.	C204.2	[AP]
4	Measure the area of given plot using chain surveying	C204.2	[U]
5	Collect different soil samples and name them. Analyse and report the origin of the soil samples.	C204.3	[AP]
6	Determine the specific gravity of cement. Also, find the initial and final setting time of cement.	C204.3	[AP]

GROUP B (MECHANICAL)

List of Experiments:

S.No	List of Experiments	CO Mapping	RBT
1	Connections of pipelines and joints involved in water tank to wash basin, water heater and washing machine	C204.4	[AP]

2	Preparation of plumbing line sketches for water supply and sewage works.	C204.4	[AP]
3	Preparation of dove-tail joint from the given wood piece to the required shape	C204.4	[AP]
4	Preparation of square butt joint from the given metal piece to the required shape	C204.4	[AP]
5	Preparation of lap joint from the given metal piece to the required shape	C204.5	[AP]
6	Making rectangular tray from the given sheet metal to the required shape	C204.5	[AP]
		Total Hours:	**45**

Reference Books:	
1	H.S Moondra, Rajiv Gupta, “Laboratory manual for civil engineering”, Vol. II, CBS publications., 2019.
2	M.K. Pant, “Laboratory manual for civil engineering students”, S.K. Kataria Publishers., 2016.
3	Hajra Choudhury, “Elements of Workshop Technology”, Vol. I & II, Media Promotors Pvt Ltd., 2014.
4	Balasubramanyam N, Prasanthi G.” A Text Manual of Engineering Workshop Technology”, Hamburg, Anchor Academic Publishing 2016.
Web References:	
1	www.nptel.ac.in
2	www.sme.org
3	http://www.allaboutcircuits.com/education/

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
75	**25**	**100**	**60**	**40**	**100**

Assessment based on Continuous and End Semester Examination			
Bloom’s Level	**Continuous Assessment (60%) [100Marks]**		**End Semester Practical Examination (40%) [100Marks]**
	FA (75Marks)	**SA (25Marks)**	
Remember	10	10	10
Understand	10	10	10
Apply	40	40	40
Analyse	20	20	20
Evaluate	10	10	10
Create	10	10	10

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)															
Cos	**Pos**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	2	2	-	-	2	-	-	-	2	3	-	2
2	3	3	2	2	2	-	-	2	-	-	-	2	3	-	2
3	3	3	2	2	2	-	-	2	-	-	-	2	3	-	2
4	3	3	2	2	2	-	-	2	-	-	-	2	3	-	2
5	3	3	2	-	-	-	-	2	-	-	-	2	3	-	2
Avg.	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**3**	**-**	**2**
1	Reasonably agreed					2	Moderately agreed				3	Strongly agreed			

SEMESTER III

23MA303	Numerical Methods (MECH & CIVIL)	3/1/0/4
Nature of Course	B (100% Analytical)	
Pre requisites	-	
Course Objectives:		
1	To study the concept of finding the roots of linear equations and nonlinear equations	
2	To learn and construct approximate polynomial for the given numerical data and to find the intermediate missing values	
3	To find the numerical solutions of large system of differential equations and interpolation of the given numerical data.	
4	To find the solution of ordinary differential equations as most of the Engineering problems are characterized in this form.	
5	To study the concept of mathematical formulation of certain practical problems in terms of partial differential equations and solving for physical interpretation.	
Course Outcomes (Theory) **Upon completion of the course, students shall have ability to**		
C303.1	Remember numerical methods to solve algebraic, transcendental and simultaneous equations	[R]
C303.2	Understanding the ordinary differential equations generated from the current scenario to solve by numerical techniques.	[U]
C303.3	Apply numerical methods to find the interpolation of numerical data	[AP]
C303.4	Apply numerical methods to fit the polynomial.	[AP]
C303.5	Apply numerical methods to solve wave and heat equation with boundary conditions	[AP]

Course Contents:

MODULE I : NUMERICAL SOLUTION TO ALGEBRAIC AND TRANSCENDENTAL EQUATIONS (20 Hrs)

Numerical Solution To Algebraic And Transcendental Equations **:** Newton-Raphson method – Iteration method- Regula - Falsi method. Numerical Solution to system of equations: Gauss Elimination method -Gauss Jordan method - Gauss Seidel method – Inverse of a matrix by Gauss Jordan method –Eigen value of a matrix by power method.

MODULE II : INTERPOLATION, NUMERIAL DIFFERENTIATION AND INTEGRATION (20 Hrs)

Interpolation - Interpolation with equal intervals –Newton's Forward and Backward difference formula - Interpolation with unequal intervals –Newton's Divided difference formula – Lagrange's interpolation formula. Numerical Differentiation and integration: Differentiation using Newton forward and Backward interpolation formulae - Trapezoidal rule – Simpson's 1/3 and 3/8 rules.

MODULE III : NUMERICAL SOLUTION TO PARTIAL DIFFERENTIAL EQUATION(20 Hrs)

Numerical solution to first order ordinary differential equations: Single step methods: Modified Euler's Method – Runge-Kutta Method of fourth order. Numerical Solution to Partial differential Equation - Elliptic equations - Laplace equation - Liebmann's Iteration Process -Poisson equation - Parabolic Equation (one dimensional heat equation) - Bender-Schmidt's Difference Scheme – Crank-Nicholson's Difference Scheme - Hyperbolic Equation (one dimensional wave equation).

	Total Hours:	**60**

Text Books:

1	Gerald C.F. and Wheatley, P.O. "Applied Numerical Analysis", 6th edition Pearson Education Asia, New Delhi.
2	Grewal B.S. – Numerical methods in Engineering and Science. 10th edition, Khanna Publishers, 2014.
3	Jain M.K. Iyengar, K & Jain R.K., Numerical Methods for Scientific and Engineering Computation, New Age International (P) Ltd, Publishers,6th edition, 2016.

Reference Books:	
1	Kreyszig. E – Advanced Engineering Mathematics, 10th edition , John Wiley and Sons (Asia) Limited, Singapore, 2014
2	P. Kandasamy, K. Thilagavathy and K. Gunavathy, “Numerical methods”, S.Chand Co. Ltd., New Delhi, 2003.
Web References:	
1	https://nm.mathforcollege.com/
2	https://www.math.wsu.edu/kcooper/M448/resources.php
3	https://global.oup.com/uk/orc/biosciences/maths/reed/01student/numerical_tutorials/
4	https://www.youtube.com/watch?v=QLIFxllwNL0
Online Resources:	
1	https://onlinecourses.nptel.ac.in/noc19_ma21/preview
2	https://www.coursera.org/courses?query=numerical%20analysis
3	https://ocw.mit.edu/courses/18-335j-introduction-to-numerical-methods-spring-2019/
4	https://www.coursera.org/learn/numerical-methods-engineers

Assessment Methods & Levels (based on Blooms’ Taxonomy)

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms’ Taxonomy)

Formative Assessment based on Capstone Model

Course Outcome	Bloom’s Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C303.1	Remember	Quiz	20
C303.2	Understand	Presentation	20
C303.3 – C303.5	Apply	Tutorial	20
C303.3 – C303.5	Apply	Assignment	20

Assessment based on Summative and End Semester Examination

Bloom’s Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)(Theory)

COs	POs												PSOs		
	a	b	c	d	e	f	g	h	i	j	k	l	1	2	3
C303.1	1	1													
C303.2	2	2													
C303.3	3	3													
C303.4	3	3													
C303.5	3	3													

3	Strongly agreed	2	Moderately agreed	1	Reasonably agreed

23CE301	FLUID MECHANICS AND HYDRAULIC ENGINEERING	3/0/0/3
Nature of Course	Problem Analytical	
Pre requisites	Physical Sciences	

Course Objectives:

1	To understand the statics, kinematics and dynamics behavior of fluid and apply Pascal's law, continuity equation, and Bernoulli's equation
2	To determine pressure in closed pipes, major and minor energy loss in flow through pipes, and design most economical section for open channel flow
3	To analyze fluid flow through pipes in series, parallel, branched pipes and understand the fluid discharge in pipe networks
4	To apply dimensional and prototype-model analysis of hydraulic structures, and understand the work done by hydraulic machines (turbines and pumps), applications of computational fluid dynamics

Course Outcomes:
Upon completion of the course, students shall have ability to

C301.1	Understand fluid properties, the broad principles of fluid statics, kinematics, dynamics and apply Pascal's law, continuity equation and Bernoulli's equation	[AP]
C301.2	Determine pressure in closed pipes, major and minor energy loss in flow through pipes and design most economical section for open channel flow	[AN]
C301.3	Analyze the fluid flow through pipes in series, parallel, branched pipes and understand the concept of fluid discharge in pipe networks	[AN]
C301.4	Apply dimensional analysis and perform prototype-model analysis for any hydraulic structures	[AP]
C301.5	Analyze the performance of hydraulic machines (turbines and pumps) and examine the concept of numerical simulation of fluid flow	[AN]

Course Contents: Theory

Module 1: Fluid Statics, Kinematics and Dynamics **12 Hrs**

Properties of fluids: density, specific weight, specific volume, specific gravity – viscosity, compressibility, bulk modulus, surface tension, capillarity, vapour pressure and cavitation - Pascal's law - pressure measurement in simple and differential manometers - hydrostatic forces – buoyancy – Types of fluid flow, rate of flow, continuity equation, stream and equipotential lines, flow net

Module 2: Flow through Pipes and Open Channel **15 Hrs**

Euler's equation - Bernoulli's equation – Practical applications (venturimeter, orificemeter) - closed conduit: laminar, turbulent flow – major and minor losses – hydraulic gradient and total energy line – Flow through pipes in series and parallel – water hammer - open channel: notches and weirs: classification and discharge – most economical section, hydraulic jump and energy dissipation – boundary layer concept

Module 3: Dimensional Analysis and Hydraulic Machines	**18 Hrs**
Rayleigh's method and Buckingham's pi theorem - Hydraulic models – Geometric, kinematic and dynamic similarities - dimensionless numbers – model and prototype relations – Turbines (Pelton, Francis and Kaplan) – Pumps (Centrifugal and Reciprocating) - working principle, work done and efficiency – Introduction to Computational Fluid Dynamics - Numerical simulation of fluid flow	
Total Hours	**45 Hrs**

Text Books:	
1	Bansal R K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi, 11th Edition 2019.
2	Frank M. White and Henry Xue, "Fluid Mechanics", McGraw Hill, 2022
3	Karim Ghaib, "Introduction to Computational Fluid Dynamics (essentials)", Springer, 2022
Reference Books:	
1	Subramanya K, "Flow in open channels", Tata McGraw Hill publishing company 4th Edition, 2015.
2	Som S K, "Introduction to Fluid Mechanics and Fluid Machines", McGraw Hill Education; 3rd edition, 2017
3	Yunus Cengel, "Fluid Mechanics in SI Units", McGraw Hill Education; 3rd edition, 2017
4	Modi P N and Seth S.M, "Hydraulics & Fluid Mechanics", Standard book house, New Delhi, 2017.
Web References:	
1	https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-01-unified-engineering-i-ii-iii-iv-fall-2005-spring-2006/fluid-mechanics/
2	https://nptel.ac.in/courses/105/105/105105203/
3	https://cfdflowengineering.com/basics-of-cfd-modeling-for-beginners/
4	https://www.simscale.com/blog/2016/03/what-everybody-ought-to-know-about-cfd/
Online Resources:	
1	https://nptel.ac.in/courses/112/104/112104118/
2	https://onlinecourses.nptel.ac.in/noc20_ae11/preview
3	https://www.learncax.com/courses/by-software/fundamentals-of-cfd-detail
4	https://onlinecourses.nptel.ac.in/noc20_ae11/preview

Continuous Assessment (40 Marks)				**End Semester Examination %**	**Total %**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment %**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C301.1	Analyze	Tutorial -1	20
C301.2	Apply	Assignment -1	20
C301.3 & C301.4	Analyze	Tutorial -2	20
C301.5	Apply	Assignment -2	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	10		
Understand	10	20	20
Apply	40	40	40
Analyse	40	40	40
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 1 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	3			2	2	2	3		2	3		
2	3	3	3	3			2	2	2	3		2	3		
3	3	3	3	3			2	2	2	3		2	3		
4	3	3	3	3			2	2	2	3		2	3		
5	3	3	3	3			2	2	2	3		2	3		
Avg.	**3**	**3**	**3**	**3**			**2**	**2**	**2**	**3**		**2**	**3**		
1	**Reasonably agreed**					**2**	**Moderately agreed**					**3**	**Strongly agreed**		

23CE302	SOLID MECHANICS	3/1/0/4
Nature of Course	Problem Analytical	
Pre requisites	Applied Mechanics	

Course Objectives:

1	To apply the basic principles to analyse the stress strain bending and torsion
2	To impart the basic principles to compute slope and deformations of beams.
3	To apply the concepts to analyse the critical load of columns.
4	To analyse the indeterminate structures and trusses.

Course Outcomes:
Upon completion of the course, students shall have ability to

C302.1	Apply the fundamental concepts of stress, strain and deformation of solids by bending and torsion	[AP]
C302.2	Compute the slope and deflection of beams by various methods	[AN]
C302.3	Analyse the column stability and compute the critical load using various theories	[AN]
C302.4	Analyze the indeterminate beams and compute the shear forces and bending moments.	[AN]
C302.5	Apply the equilibrium concepts to analyse the trusses.	[AN]

Course Contents: Theory

Module 1: Simple Stresses, Strains, Bending and Torsion **20 Hrs**

Stresses in the Members of a Structure - types of stresses and strain - Hooke's Law – Stress–Strain relationship –Strain Behavior of Ductile and Brittle Materials –Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli - Relation between Elastic Constants - Bars of varying section – composite bars – Temperature stresses - Theory of simple bending - Determination of bending stresses - Section modulus - Torsional Deformation of a Circular Shaft – power transmitted by shafts.

Module 2: Behavior of Beams and Columns **20 Hrs**

Slope and deflection for determinate beams: Integration Method - Moment Area Method - General energy theorems - Castigliano's theorem - Unit load method (Application to problems of beams) - Columns - Buckling of Column - Euler's Formula - axially loaded and eccentrically loaded columns – Rankine's-Gordon formula.

Module 3: Indeterminate beam analysis and Truss analysis **20 Hrs**

Indeterminate Beams – fixed, propped and continuous beams : Theorem of three moments (Limited to two span) - shear force and bending moment - Analysis of plane truss – stability and equilibrium of plane frames – analysis of forces in truss members- method of joints - method of sections - Tension coefficient method.

Total Hours **60 Hrs**

Text Books:	
1	Gere J.M. and Goodno, B.J., “Mechanics of Materials”, CENGAGE Learning Custom Publishing; 9th edition, 2017.
2	Bansal R.K, “Strength of Materials”, Lakshmi Publications Ltd, New Delhi, 2022.
3	Punmia B.C and Jain A.K., “Mechanics of Materials”, Laxmi Publications Ltd, New Delhi, 2018.
Reference Books:	
1	William A. Nash, Strength of Materials, Tata McGraw-Hill Publishing Co. Ltd, New Delhi, 2013
2	Gambhir M.L.“Fundamentals of Solid Mechanics”, PHI Learning Private Ltd.,New Delhi, 2009.
3	Kazimi S.M.A.,“Solid Mechanics", Tata Mc Graw-Hill Publishing Company, New Delhi, 2017
4	ShamesI.H., Introduction to Solid Mechanics, Prentice-Hall of India Pvt. Ltd, 2009
Web References:	
1	http://nptel.iitk.ac.in/courses/Webcourse-contents/IIT-Delhi/Mechanics%20Of%20Solids/index.htm
2	http://textofvideo.nptel.iitm.ac.in/1053/lec1.pdf
3	https://www.classcentral.com/course/swayam-strength-of-materials-14308
Online Resources:	
1	http://nptel.ac.in/video.php?subjectId=112107147
2	http://nptel.ac.in/video.php?subjectId=105106116
3	https://www.udemy.com/course/strength-of-material-i/?couponCode=NVDPRODIN35

Continuous Assessment (40 Marks)				End Semester Examination %	Total %
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment %		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms’ Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom’s Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C302.1	Apply	Quiz - 1	20
C302.2	Apply	Assignment - 1	20
C302.3 & C302.4	Analyze	Assignment - 2	20
C302.5	Analyze	Quiz -2	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	10	10	10
Understand	20	15	20
Apply	40	40	40
Analyse	30	35	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 1 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	2						2		2	3		
2	3	3	3	2						2		2	3		
3	3	3	3	2						2		2	3		
4	3	3	3	2						2		2	3		
5	3	3	3	2						2		2	3		
Avg.	**3**	**3**	**3**	**2**						**2**		**2**	**3**		
1	**Reasonably agreed**					**2**	**Moderately agreed**					**3**	**Strongly agreed**		

23CE303	SURVEYING AND GEOMATICS	3/0/0/3
Nature of Course	Theory and Application	
Pre requisites	-	

Course Objectives:

1	To introduce the principles of various surveying methods and applications to Civil Engineering Projects
2	To deals with geodetic measurements and control survey methodology and its Adjustments.
3	To introduce the working principles of modern surveying instruments
4	To expose the modern surveying methods and its applications in recent surveying techniques

Course Outcomes:
Upon completion of the course, students shall have ability to

C303.1	Measure the area of the plot and volume of earthwork using various techniques	[AP]
C303.2	Choose the surveying equipment to prepare LS & CS, Contour maps and carryout surveying works related to civil engineering projects	[AP]
C303.3	Apply the concepts of triangulation and tachometry concepts for the measurement of heights and distance	[AP]
C303.4	Understand the working principle of modern surveying instruments	[U]
C303.5	Classify the concepts of photogrammetry and remote sensing techniques used in modern surveying methods	[AP]

Course Contents: Theory

Module 1: Conventional surveying and Levelling **15 Hrs**

Definitions, Classifications – basic principles – field and office work - Scales - methods of ranging – Errors in linear measurements and their corrections - Compass – types – bearing systems and conversions – errors and local attraction – levelling and applications – Booking – Levels and staves - Reduction Methods – Fly, Check and Reciprocal levelling – curvature and refraction - Contouring – characteristics & Interpolating methods – Computations of cross-sectional areas and volumes – Earthwork calculations – Road & Railway embankment

Module 2: Triangulation & Modern surveying methods **15 Hrs**

Theodolite – surveying adjustments – Heights and Distances – Triangulation – instrument and accessories – satellite station – reduction to center – Signals and towers - true and most probable values - Total Station Surveying– Electro optical system: Measuring and working principles, sources of errors. Electro optical micro wave system – COGO functions – Field procedure and applications - Comparison between Electrooptical and Microwave system - Care and maintenance of Total Station instruments.

Module 3: Hydrographic and GPS surveying **15 Hrs**

Hydrographic surveying – Tides – MSL – Sounding methods – Determination of depth and position using multi-beam sounder - Fundamentals of underwater acoustic positioning - sediments and seabed topography - GPS Surveying - segments of GPS – Satellite

configuration and signal structure – Hand held and Geodetic receivers – Photogrammetry and remote sensing techniques – Flying height - Geodetic satellite – Doppler effect – Positioning concept – GNSS – IRNSS and GAGAN – Anti spoofing and selective availability	
Total Hours	**45 Hrs**
Text Books:	
1	Punmia B.C., “Surveying” – “Vols. – I, II & III”, Laxmi publications, New Delhi 2023.
2	Kanetkar T.P, Kulkarni S.V., “Surveying and Levelling”, Vols. I and II, Standard publishers Distributors, New Delhi 2020.
3	Anji Reddy M., Remote Sensing and Geographical Information System, B.S. Publications, 2017
Reference Books:	
1	Purushothamaraj. P, “Surveying –I & II” Laxmi Publications, 2015
2	James M. Anderson and Edward M. Mikhali, “Surveying, Theory and Practice”, 7th Edition, McGraw Hill, 2017
3	Satheesh Gopi, R. Sathish kumar, N. Madhu, “Advanced Surveying, Total Station GPS and Remote sensing” Pearson education, 2017.
4	Arora K.R., “Surveying Vol I & II”, Standard book house, 2015
Web References:	
1	http://nptel.ac.in/course.php?disciplineId=108
2	https://onlinecourses.nptel.ac.in/noc20_ce18/preview
3	https://nptel.ac.in/video.php?subjectId=117103063
Online Resources:	
1	https://www.udemy.com/course/surveying/
2	https://freevideolectures.com/course/98/surveying
3	https://www.surveyofindia.gov.in/pages/courses-offered

Continuous Assessment (40 Marks)				**End Semester Examination %**	**Total %**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment %**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms’ Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom’s Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C303.1 & C303.2	Apply	Assignment -1	20
C303.3	Apply	Quiz	20

C303.4	Analyze	Assignment -2	20
C303.5	Analyze	Seminar	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	10	-	-
Understand	10	20	20
Apply	40	40	40
Analyse	40	40	40
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 1 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2						2				2	2		
2	3	2	3	3				2				2	2		
3	3	2	2					2				2	2		
4	3	2	2	3				2				2	2		
5	3	2	3	3				2				2	2		
Avg.	**3**	**2**	**2.5**	**3**				**2**				**2**	**2**		
1	**Reasonably agreed**					**2**	**Moderately agreed**					**3**	**Strongly agreed**		

23GE201	UNIVERSAL HUMAN VALUES (Common to all branches)	3/0/0/3

Nature of Course	Descriptive
Pre-Requisites	-

Course Objectives:

1	Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
2	Understanding (or developing clarity) of the harmony in the human being ,family, society and nature/existence.
3	Strengthening of self-reflection.
4	Development of commitment and courage to act.
5	Helping the students to appreciate the essential complementarily between 'VALUES' and' SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
6	Highlighting plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

Course Outcomes:
Upon completion of the course, students shall have ability to

C201.1	Understand and take responsibilities in life and handle problems to attain sustainable solutions while keeping human relationships and human nature in mind.	[U]
C201.2	Apply responsibilities towards their commitments (human values, human relationship and human society).	[AP]
C201.3	Apply what they have learnt to their own self indifferent day-to-day settings in real life, atleast a beginning would be made in this direction.	[AP]
C201.4	Analyze ethical and unethical practices, and formulate strategies to actualize a harmonious environment wherever they work.	[AN]
C201.5	Understand the harmony in nature and existence, and work out mutually on fulfilling participation in nature.	[U]

Course Contents:

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education, Understanding Harmony in the Human Being-Harmony in Myself! 15 Hrs.
Self-evaluation of the students- Pre-test of UHV**-** Purpose and motivation for the course. Self-Exploration–Its content and process- A look at basic Human Aspirations. Understanding Happiness and Prosperity correctly-Understanding the needs of Self ('I') and 'Body'- Understanding the Body as an instrument of 'I' (being the doer, seer and enjoyer)- Understanding the characteristics and activities of 'I' and harmony in 'I' - Understanding the harmony of 'I' with the Body- Social activities – Waste Management - Water Conservation-Soil Pollution - Physical Health and related activities - Lectures by eminent persons- Literary activities.

Module 2: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding Harmony in the Nature and Existence- Whole

existence as Coexistence **15 Hrs.**

Understanding values in human relationship - Understanding the harmony in the society (society being an extension of family): - Visualizing a universal harmonious order in society- Understanding the harmony in Nature.-Understanding Existence as Coexistence of mutually Interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence- Buddy program- Relationships-Homesickness- Managing peer pressure-Projects-Socially responsible engineers-Visit to local areas (orphanages, special children)- Physical activities(games).

Module 3: Implications of the above Holistic Understanding of Harmony on Professional Ethics **15 Hrs.**

Natural acceptance of human values- Definitiveness of Ethical Human Conduct- Basis for Humanistic Education-Humanistic Constitution and Humanistic Universal Order-Competence in professional ethics-Case studies of typical holistic technologies, management models and eco-friendly production systems - Strategy for transition from the present state to Universal Human Order-Sum up: Self-evaluation of the students-Post test of UHV.

	Total Hours:	**45**
Text Books:		
1	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010	
2	Rajni Setia, Priyanka Sharma, “Human Values”, Genius Publication”, Jaipur, 2019.	
Reference Books:		
1	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.	
2	The Story of My Experiments with Truth –by Mohandas Karamchand Gandhi	
3	India Wins Freedom-Maulana Abdul Kalam Azad.	
Web References:		
1	https://examupdates.in/professional-ethics-and-human-values/	
2	http://hvpe1.blogspot.com/2016/06/notes-human-values-and-professional.html	
3	https://www.yourmorals.org/schwartz.2006.basic%20human%20values.pdf	
Online Resources:		
1	https://nptel.ac.in/courses/109/104/109104068/	
2	https://medium.com/the-mission/the-12-important-life-skills-i-wish-id-learned-in-school-f4593b49445b	
3	https://www.thebalancecareers.com/life-skills-list-and-examples-4147222	

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms’ Taxonomy)
Formative Assessment based on Capstone Model

Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C201.1	Understand & Apply	Online Quiz	20
C201.2	Understand & Apply	Group Assignment	20
C201.3	Understand	Presentation	20
C201.4	Apply		
C201.5	Apply	Seminar	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	10	10	10
Understand	10	20	20
Apply	40	40	40
Analyse	40	30	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1 : 100 Marks			CA 2 : 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcomes(CO)	Programme Outcomes(PO)												Programme Specific Outcomes(PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1						3									
C201.2						3			3						
C201.3						3		3							
C201.4						3	3	3			2				
C201.5						3	3								

23CE304	FLUID MECHANICS LABORATORY		0/0/3/1.5
Nature of Course	Practical application		
Pre requisites	Nil		
Course Objectives:			
1	To measure pipe flow and discharge in open channels		
2	To determine major and minor losses in pipes		
3	To demonstrate the performance of turbines and pumps		
4	To simulate theory and model fluid flow using computational fluid dynamics		
Course Outcomes: Laboratory **Upon completion of the course, students shall have ability to**			
C304.1	Measure the flow in closed conduit using orificemeter and venturimeter		[AP]
C304.2	Measure the discharge in channels using notches and impact of jet		[AP]
C304.3	Determine the major and minor losses in pipes		[AP]
C304.4	Study the performance of different types of pumps and turbines		[AP]
C304.5	Simulate theory concept and model fluid flow numerically using software		[AP]
Laboratory Course Content:			
S. No	**List of Experiments**	**CO Mapping**	**BT**
1	Flow measurement in closed conduit	C304.1	[AP]
2	Flow measurement in open channel using notch	C304.2	[AP]
3	Study of impact of jet on vanes	C304.2	[AP]
4	Determination of major and minor losses in pipes	C304.3	[AP]
5	Performance test on reciprocating pump	C304.4	[AP]
6	Performance test on centrifugal pump	C304.4	[AP]
7	Performance test on Pelton Turbine (impulse turbine)	C304.4	[AP]
8	Performance test on Francis Turbine (reaction turbine)	C304.4	[AP]
9	Performance test on Kaplan Turbine (reaction turbine)	C304.4	[AP]
10	Determine metacentric height of a body using virtual simulation	C304.5	[AP]
11	Numerical modelling of fluid flow and hydraulic structure	C304.5	[AP]
12	Numerical simulation of fluid flow and hydrostatic pressure	C304.5	[AP]
			Total Hours: 45 Hrs
Text Books:			
1	Bansal R K, “Fluid Mechanics and Hydraulic Machines”, Laxmi Publications, New Delhi, 2019.		

2	Frank M. White and Henry Xue, “Fluid Mechanics”, McGraw Hill, 2022
3	Karim Ghaib, “Introduction to Computational Fluid Dynamics (essentials)”, Springer, 2022
Suggested Readings:	
1	Subramanya K, “Flow in open channels”, Tata McGraw Hill publishing company 4th Edition, 2015.
2	Som S K, “Introduction to Fluid Mechanics and Fluid Machines", McGraw Hill Education; 3rd edition, 2017
3	Yunus Cengel, “Fluid Mechanics in SI Units”, McGraw Hill Education; 3rd edition, 2017
4	Modi P N and Seth S.M, “Hydraulics & Fluid Mechanics”, Standard book house, New Delhi, 2017.
Web References:	
1	https://ocw.mit.edu/courses/aeronautics-and-astronautics/16-01-unified-engineering-i-ii-iii-iv-fall-2005-spring-2006/fluid-mechanics/
2	https://nptel.ac.in/courses/105/105/105105203/
3	https://cfdflowengineering.com/basics-of-cfd-modeling-for-beginners/
4	https://www.simscale.com/blog/2016/03/what-everybody-ought-to-know-about-cfd/
Online Resources:	
1	https://fm-nitk.vlabs.ac.in/
2	https://me.iitp.ac.in/Virtual-Fluid-Laboratory/
3	https://eerc03-iiith.vlabs.ac.in/
4	http://vlabs.iitkgp.ac.in/psac/newlabs2020/vlabiitkgpMF/#

Continuous Assessment				**End Semester Examination %**	**Total %**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment %**		
75	**25**	**100**	**60**	**40**	**100**

Summative assessment based on Continuous and End Semester Examination			
Bloom’s Level	**Continuous Assessment (60%)**		**End Semester Practical Examination (40%) [100 Marks]**
	FA (75 Marks)	**SA (25 Marks)**	
Remember	10		
Understand	10	20	20
Apply	40	40	40
Analyze	40	40	40
Evaluate	-	-	-
Create	-	-	-

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	1	3		1	1	1	1		2	3		
2	3	3	3	1	3		1	1	1	1		2	3		
3	3	3	3	1	3		1	1	1	1		2	3		
4	3	3	3	1	3		1	1	1	1		2	3		
5	3	3	3	1	3		1	1	1	1		2	3		
Avg.	**3**	**3**	**3**	**1**	**3**		**1**	**1**	**1**	**1**		**2**	**3**		
1	**Reasonably agreed**					**2**	**Moderately agreed**					**3**	**Strongly agreed**		

23CE305	SOLID MECHANICS LABORATORY	0/0/3/1.5
Nature of Course	Practical application	
Pre requisites	Nil	

Course Objectives:

1	To learn the usage of software for analysis of beam, portal frame and roof truss.
2	To make measurements of strains, stress and elastic properties of materials
3	To introduce experimental procedures and common measurement instruments, equipment, devices.
4	To exposure to a variety of established material testing procedures and techniques

Course Outcomes:
Upon completion of the course, students shall have ability to

C305.1	Analyze and compute the shear force, bending moment and deflection of beams using analysis package.	[AP]
C305.2	Analyze and compute the member forces and deflection of portal frames and roof truss using analysis package.	[AP]
C305.3	Demonstrate the tension, shear, torsion strength and modulus of elasticity of metal specimens.	[AP]
C305.4	Compute the hardness and impact strength of a metal specimen.	[AP]
C305.5	Analyze and compute the spring stiffness, modulus of rigidity of the spring wire.	[AP]

Course Contents:

Laboratory Component:

S. No	List of Experiments	CO Mapping	BT
1	Computation of shear force, bending moment and deflection of determinate beams using analysis package.	C305.1	[AP]
2	Computation of shear force, bending moment and deflection of indeterminate beams using analysis package.	C305.1	[AP]
3	Computation of shear force, bending moment and deflection of portal frames using analysis package.	C305.2	[AP]
4	Computation of member forces and deflection for a roof truss using analysis package.	C305.2	[AP]
5	Determination of tensile strength of steel rod	C305.3	[AP]
6	Determine the modulus of elasticity of material by beam deflection method.	C305.3	[AP]
7	Determination of double shear strength of steel rod	C305.3	[AP]
8	Estimate the torsion strength of steel rod	C305.3	[AP]
9	Determine the impact strength of steel bar (Charpy / Izod)	C305.4	[AP]
10	Determine the hardness of metal specimens (Brinell / Rockwell)	C305.4	[AP]
11	Determination of Elastic properties of open coiled helical springs.	C305.5	[AP]
12	Determination of Elastic properties of closed coiled helical springs.	C305.5	[AP]

Total Hours: 45 Hrs.

Text Books:	
1	Gere J.M. and Goodno, B.J., “Mechanics of Materials”, CENGAGE Learning Custom Publishing; 9th edition edition, 2017.
2	Bansal R.K, “Strength of Materials”, Lakshmi Publications Ltd, New Delhi, 2022.
3	Punmia B.C and Jain A.K., “Mechanics of Materials”, Laxmi Publications Ltd, New Delhi, 2018.
Reference Books:	
1	William A. Nash, Strength of Materials, Tata McGraw-Hill Publishing Co. Ltd, New Delhi, 2013
2	Gambhir M.L. “Fundamentals of Solid Mechanics”, PHI Learning Private Ltd., New Delhi, 2009.
3	Kazimi S.M.A., “Solid Mechanics ", Tata McGraw-Hill Publishing Company, New Delhi, 2017
4	Shames I.H.., Introduction to Solid Mechanics, Prentice-Hall of India Pvt. Ltd, 2009
Web References:	
1	http://nptel.iitk.ac.in/courses/Webcourse-contents/IIT-Delhi/Mechanics%20Of%20Solids/index.htm
2	http://textofvideo.nptel.iitm.ac.in/1053/lec1.pdf
3	http://www.nesoacademy.org/civil-engineering/mechanics of solids

Continuous Assessment				End Semester Examination %	Total %
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment %		
75	25	100	60	40	100

Summative assessment based on Continuous and End Semester Examination			
Bloom’s Level	Continuous Assessment (60%)		End Semester Practical Examination (40%) [100 Marks]
	FA (75 Marks)	SA (25 Marks)	
Remember	10		
Understand	10	20	20
Apply	40	40	40
Analyze	40	40	40
Evaluate	-	-	-
Create	-	-	-

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	1	3		1	1	1	1		2	3		
2	3	3	3	1	3		1	1	1	1		2	3		
3	3	3	3	1	3		1	1	1	1		2	3		
4	3	3	3	1	3		1	1	1	1		2	3		
5	3	3	3	1	3		1	1	1	1		2	3		
Avg.	**3**	**3**	**3**	**1**	**3**		**1**	**1**	**1**	**1**		**2**	**3**		
1	**Reasonably agreed**					**2**	**Moderately agreed**					**3**	**Strongly agreed**		

23CE306	SURVEYING AND GEOMATICS LABORATORY	0/0/3/1.5
Nature of Course	Practical application	
Pre requisites	Nil	

Course Objectives:

1	To introduce the principles of various surveying methods and applications to Civil Engineering Projects
2	To deals with geodetic measurements and control survey methodology and its Adjustments.
3	To introduce the working principles of modern surveying instruments
4	To know the basic process of total station and GPS instruments and its working procedure

Course Outcomes:
Upon completion of the course, students shall have ability to

C306.1	Measure the Horizontal & Vertical angles and calculate the area of the given plot	[AP]
C306.2	Measure the difference in elevation between two inaccessible points and plot the LS & CS view of the road surface using software tools	[AP]
C306.3	Setting out of simple circular and transition curves using various methods	[AP]
C306.4	Prepare the contour map of the area using modern tools and measure the elevation differences	[AP]
C306.5	Measure the area and distance of two points Find out the Latitude & Longitude of the point using GPS	[AP]

Laboratory Course Content:

S. No	List of Experiments	CO Mapping	BT
1	Computation of bearings and area by Compass Traversing	C306.1	[AP]
2	Measurement of Horizontal angles by Repetition, Reiteration and Vertical angles.	C306.1	[AP]
3	Determination of Elevation of an object single plane method. (Base accessible and in-accessible)	C306.2	[AP]
4	Determination of difference in elevation using Dumpy/Auto Level	C306.2	[AP]
5	Profile leveling – Longitudinal & Cross-sectional plotting using TERRA MODEL/EXCEL	C306.2	[AP]
6	Measurement of height and distance by tangential tachometry.	C306.2	[AP]
7	Setting out of simple circular curve using Rankine's method	C306.3	[AP]

8	Setting out work of transition curve using theodolite/total station	C306.3	[AP]
9	Preparation of Contour map by grid contouring method using software tools	C306.4	[AP]
10	Determination of distances and elevation between two inaccessible points using total station.	C306.5	[AP]
11	Traversing and area measurement using total station and its latitude and longitude observation using GPS.	C306.5	[AP]
12	Determination of Remote height and staking out process of the given points using total station	C306.5	[AP]
			Total Hours: 45 Hrs.

Text Books:	
1	Punmia B.C., “Surveying” – “Vols. – I, II & III”, Laxmi publications, New Delhi 2023..
2	Kanetkar T.P, Kulkarni S.V., “Surveying and Levelling”, Vols. I and II, Standard publishers Distributors, New Delhi 2015.
3	Anji Reddy M., Remote Sensing and Geographical Information System, B.S. Publications, 2012
Suggested Readings:	
1	Purushothamaraj. P, “Surveying –I & II” Laxmi Publications, 2012.
2	James M. Anderson and Edward M. Mikhali, “Surveying, Theory and Practice”, 7th Edition, McGraw Hill, 2017
3	Satheesh Gopi, R. Sathish kumar, N. Madhu, “Advanced Surveying, Total Station GPS and Remote sensing” Pearson education, 2017.
4	Arora K.R., “Surveying Vol I & II”, Standard book house, 2015
Web References:	
1	http://nptel.ac.in/course.php?disciplineId=108
2	https://onlinecourses.nptel.ac.in/noc20_ce18/preview
3	https://nptel.ac.in/video.php?subjectId=117103063

Continuous Assessment				**End Semester Examination %**	**Total %**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment %**		
75	**25**	**100**	**60**	**40**	**100**

Summative assessment based on Continuous and End Semester Examination			
Bloom's Level	**Continuous Assessment (60%)**		**End Semester Practical Examination (40%) [100 Marks]**
	FA (75 Marks)	**SA (25 Marks)**	
Remember	10		
Understand	10	20	20
Apply	40	40	40
Analyze	40	40	40
Evaluate	-	-	-
Create	-	-	-

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	1	3		1	1	1	1		2	3		
2	3	3	3	1	3		1	1	1	1		2	3		
3	3	3	3	1	3		1	1	1	1		2	3		
4	3	3	3	1	3		1	1	1	1		2	3		
5	3	3	3	1	3		1	1	1	1		2	3		
Avg.	**3**	**3**	**3**	**1**	**3**		**1**	**1**	**1**	**1**		**2**	**3**		
1	**Reasonably agreed**					**2**	**Moderately agreed**					**3**	**Strongly agreed**		

SEMESTER IV

23CE401	CONCRETE TECHNOLOGY	3/0/0/3
Nature of Course	Theory Application	
Pre requisites	Construction Materials and Techniques	

Course Objectives:

1	To enable the students to understand the concept of mix design.
2	To impart knowledge on properties and durability of concrete.
3	To impart knowledge on the special concrete.
4	To facilitate the students to know concreting under special circumstances.

Course Outcomes:
Upon completion of the course, students shall have ability to

C401.1	Apply the principles of concrete mix design by using IS code	[AP]
C401.2	Determine the role of admixtures in the concrete mixture .	[AP]
C401.3	Recognise the properties of fresh and hardened concrete and apply non-destructive testing techniques.	[AP]
C401.4	Understand the durability properties of concrete.	[AP]
C401.5	Explore the significance and practical uses of special concrete.	[AP]

Course Contents: Theory

Module 1: Admixtures and Mix Design **15 Hrs.**

Admixtures: Properties, Advantages, dosage and application. Chemical Admixtures: Accelerators -Retarders - Plasticizers - Super plasticizers- Water proofers - Mineral Admixtures: Fly Ash, Silica Fume, Ground Granulated Blast Furnace Slag and Metakaolin -Mix proportioning of concrete using Admixtures-Steps involved in manufacturing of concrete-Mix design: concept of mix design – mix design methods – mix design and proportioning.

Module 2: Fresh and Hardened Concrete **15 Hrs.**

Workability: factors affecting workability, measurement of workability: Slump Cone test, Compaction Factor test, Vee-Bee Consistometer test, Flow table, segregation, bleeding – factors affecting strength of concrete: water/cement ratio, maturity of concrete, shrinkage of concrete – Testing on Hardened Concrete: Compressive strength test, flexural strength of concrete, splitting tensile strength test – Non-destructive strength test: ultrasonic pulse velocity test, rebound hammer test.

Module 3: Durability of Concrete and Special Concrete **15 Hrs.**

Durability: significance, permeability – Chemical Attack and its controlling methods: sulphate attack, alkali aggregate reaction, chloride attack, acid attack, carbonation, concrete in sea water - thermal properties of concrete – resistance to abrasion and cavitation – acoustic properties – corrosion of reinforcement – Special Concretes: Lightweight concrete – High strength concrete – High performance concrete – Fiber reinforced concrete – Ferro cement – Polymer concrete – Ready mix concrete – Self compacting concrete -Vacuum dewatering concrete – Mass concrete – SIFCON .

Total Hours	**45 Hrs**

Text Books:	
1	Shetty M.S., and Jain A.K., Concrete Technology (Theory and Practice), S. Chand Publishing., New Delhi, 2019.
2	Santhakumar A. R., Concrete Technology, Oxford University Press, New Delhi, 2018.
3	Neville A.M., Properties of Concrete, Pearson England Limited, England, 2012
Reference Books:	
1	Gambhir M.L., Concrete Technology, Tata McGraw Hill, Publishing Co. Ltd, New Delhi, 2017
2	Gupta B.L., and Amit Gupta, Concrete Technology, Standard Publishers Distributors, 4th Edition, 2014
3	Rethaliya R P," Concrete Technology", Charotar Publishing House Pvt Ltd Gujarat 2018
IS Codes	
1	IS:10262 Recommended Guidelines for Concrete Mix Design, 2019, BIS, New Delhi.
2	IS:456 Plain and Reinforced Concrete -Code of Practice, 2000, BIS, New Delhi.
3	SP 23 : Handbook on Concrete Mixes, 1982, BIS, New Delhi.
Web References:	
1	https://www.sciencedirect.com/book/9780750656863/advanced-concrete-technology
2	https://swayam.gov.in/courses/4709-july-2018-concrete-technology
Online Resources:	
1	https://onlinecourses.nptel.ac.in/noc16_ce10
2	http://nptel.ac.in/courses/105102012

Continuous Assessment (40 Marks)				**End Semester Examination %**	**Total %**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment %**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C401.1	Analyze	Online Quiz -1	20
C401.2	Apply	Assignment -1	20
C401.3 & C401.4	Analyze	Online Quiz -2	20

C401.5	Apply	Assignment -2	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	10	10	5
Understand	20	20	25
Apply	40	40	40
Analyse	30	30	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 1 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	2								2	2		2
2	3	2	1	2								2	2		2
3	3	2	2	2								2	2		2
4	3	2	2	2								2	2		2
5	3	2	2	2								2	2		2
Avg.	**3**	**2.2**	**1.8**	**2**								**2**	**2**		**2**
1	**Reasonably agreed**					**2**	**Moderately agreed**					**3**	**Strongly agreed**		

23CE402	ENVIRONMENTAL ENGINEERING	3/0/0/3
Nature of Course	Theory analytical	
Pre requisites	Environmental Science	

Course Objectives:

1	To study the principles and concepts of unit operations and processes involved in water and wastewater treatment.
2	To enable the students in designing water and waste water treatment plants for a community.
3	To study the various techniques for sludge disposal and disposal into land or water bodies.
4	To understand about air pollution sources and control methods.

Course Outcomes:
Upon completion of the course, students shall have ability to

C402.1	Cognize and assimilate the physical, chemical and biological characteristics of different sources of water	[AP]
C402.2	Estimate the water demand and design a good water distribution system for a town/city	[AP]
C402.3	Design an appropriate treatment system for the water and wastewater available at the source	[AP]
C402.4	Identify the suitable mode of disposal for the treated wastewater without endangering the environment	[AN]
C402.5	Analyze the amount of Particulate Matter present in the Air and its control measures	[AN]

Course Contents: Theory

Module 1: Water quality characteristics and water supply system 15 Hrs.

Physical, Chemical and Biological quality parameters. – Water quality requirements and standards – Planning – objectives – design period – population forecasting – water demand – Water distribution system- Methods of distribution – Analysis of network (Hardy cross method-Theory only). Water Treatment – objectives – unit operations and process – Clarifiers – Flocculators – Sedimentation tanks and sand filters – Disinfection – Aeration – Iron and manganese removal – defluoridation and demineralization – Membrane systems – Desalination – Recent advances.

Module 2: Primary and Secondary treatment of wastewater 15 Hrs.

Sources of waste – Characteristics and composition of sewage – Primary treatment – Principles, Functions – Screens – Grit chambers – Skimming tank - Primary sedimentation tanks – Secondary treatment – Activated Sludge Process - UASB – Septic tanks -Trickling filters – oxidation ditches and aerated lagoons – waste stabilization ponds – Reclamation and reuse of sewage – Recent advances in sewage.

Module 3: Sludge Disposal and Environmental Pollution 15 Hrs.

Sludge Characteristics – Sludge Thickening – Sludge Digestion and Biogas Generation – Sludge Drying beds – Conditioning and dewatering – Incineration – Deep well Injection – Sludge Disposal – Self-purification of natural water bodies – Land disposal and sewage farming – Disposal to lakes and sea – Sanitary practices in rural areas – Eutrophication -Impact on sea - Oxygen sag curve (Theory only) – Bio toilets – Air Pollution – Standards and legislations - Sources Effects – Control measures – Monitoring methods.	
Total Hours	**45 Hrs.**
Text Books:	
1	Garg S.K, “Water Supply Engineering”, Khanna publishers, 2018
2	Metcalf and Eddy, “Wastewater Engineering Treatment and Reuse”, Tata McGraw Hill Publishers, New Delhi, 2010.
3	Punmia B.C, Ashok Jain, “Wastewater Engineering”, Laxmi publications Pvt. Ltd., 2016
Reference Books:	
1	Birdie G.S., Water supply Engineering, Dhanpat rai publishing company, 2014
2	Venugopal Rao P., “Textbook of Environmental Engineering”, Prentice Hall of India Pvt.Ltd, 2013
3	Peavy, Rowe, Tchobanoglous, “Environmental Engineering”, McGraw Hill Publishers, NewDelhi, 2013.
4	Basak N.N, “Environmental Engineering”, McGraw Hill Education., 2017
Web References:	
1	http://mohua.gov.in/cms/Latest-Manual-part-a-Engineering.php
2	http://164.100.161.188/cms/Latest-Manual-Part-B-Operation-and-Maintenance-2013.p
3	http://mohua.gov.in/cms/Latest-Manual-Part-C-Management-2013.php
4	http://cpheeo.gov.in/cms/manual-on-municipal-solid-waste-management-2016.php
Online Resources:	
1	https://www.mooc-list.com/course/water-and-wastewater-treatment-engineering-physicochemical-technology-edx
2	http://nptel.ac.in/courses/105106119/
IS Codes	
1	IS 10500:2012 Water Quality Standards, New Delhi, 2012
2	SP 35 – Handbook on Water supply and Drainage.

Continuous Assessment (40 Marks)				**End Semester Examination %**	**Total %**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment %**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C402.1	Analyze	Online Quiz -1	20
C402	Apply	Assignment -1	20
C402.3 & C402.4	Analyze	Seminar presentation	20
C402.5	Apply	Presentation – OCLE Report	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	10	10	5
Understand	20	20	25
Apply	40	40	40
Analyse	30	30	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination							
Continuous Assessment (40%) [200 Marks]							**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**				
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 1 (60 Marks)**	**FA 2 (40 Marks)**			
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**		

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	2	2		2	3	2	2			3		3	2
2	3	2	2	2		1	3	2	2			2		3	2
3	2	2	2	2		1	3	2	1			2		3	2
4	3	3	2	1		1	3		1			3		3	2
5	3	3	3			2	3	1	1			3		3	2
Avg.	**2.8**	**2.6**	**2.2**	**1.8**		**1.8**	**3**	**1.8**	**1.6**			**2.6**		**3**	**2**
1	**Reasonably agreed**					**2**	**Moderately agreed**					**3**	**Strongly agreed**		

23CE403	STRUCTURAL ANALYSIS	3/1/0/4
Nature of Course	Theory Analytical	
Prerequisites	Strength of Materials	

Course Objectives:

1	To apply the influence line concepts on beam analysis.
2	To understand the arch behaviour and compute the reaction on arches.
3	To analyse the indeterminate beams and frames using various methods.
4	To analyse the beams, trusses and frames using matrix methods.

Course Outcomes:
Upon completion of the course, students shall have the ability to

C403.1	Apply and analyse the ILD concepts to beams and compute the forces and moments.	[AN]
C403.2	Analyse the three hinged arches and cables.	[AN]
C403.3	Analyse the determinate and indeterminate beams and compute the reactions, slope deflection and moments.	[AN]
C403.4	Analyse the frames with and without sway.	[AN]
C403.5	Analyse the beams and frames using the flexibility and stiffness matrix method.	[AN]

Course Contents: Theory

Module 1: Influence lines, moving loads, Arches and Cables **20 Hrs.**

Influence lines for statically determinate beams – Reaction, shear force and bending moment and elastic curve – Calculation of shear force and bending moment for moving UDL and series of concentrated loads – Absolute maximum bending moment and Equivalent UDL – Arches – Three hinged arches, parabolic and circular arches – Analysis of cables, stiffened girders.

Module 2: Slope deflection method and Moment distribution method **20 Hrs.**

Slope deflection method – Continuous beams and rigid frames (with and without sway) – symmetry and antisymmetry – Simplification for hinged end – support displacements – Moment distribution method – Continuous beams and frames – Limited to 3 degrees of freedom – Plane rigid frames with and without sway.

Module 3: Matrix Methods **20 Hrs.**

Static and Kinematic indeterminacy – Degrees of freedom 2D and 3D – Matrix methods – Flexibility and stiffness approach – Formation of flexibility and stiffness matrix for bar, truss and beams – Analysis of determinate and indeterminate structures using flexibility matrix method – Problems in simple, continuous beams and frames – Limited to 2 degree static and kinematic indeterminacy.

Total Hours	**60 Hrs**

Text Books:	
1	Bhavikatti S S, Structural Analysis Vol. 1 and 2, Vikas Publishing House Pvt. Ltd., 2021.
2	Vaidyanathan R and Perumal P, Structural Analysis Vol. 1 and 2, Laxmi Publications, New Delhi, 2022.
3	Devdas Menon, Structural Analysis, Narosa Publishing House, 2018.
Suggested Readings:	
1	Norris C H, Wilbur J B and Utku S, Elementary Structural Analysis, TMH, 2003.
2	Hibbeler R C., Structural Analysis, 8th Edition, Prentice Hall, 2012.
3	Ghali A, Neville A and Brown T, Structural Analysis – A unified classical and matrix approach, 6th Edition, SponPress, London and New York, 2013.
4	Reddy C S, Basic Structural Analysis, Tata McGraw Hill Publishing Company, 2011.
Web References:	
1	https://freevideolectures.com/course/3015/advanced-structural-analysis
2	https://www.studocu.com/en/document/university-of-sheffield/advanced-structural-analysis/lecture-notes/lecture-notes-lectures-11-20/674048/view
Online Resources:	
1	https://nptel.ac.in/downloads/105101085
2	https://nptel.ac.in/courses/105105109
3	https://nptel.ac.in/courses/105106050

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms 'Taxonomy – Theory			
Formative assessment based on Capstone Model (80 Marks)			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list – Quiz,**	**Marks**
C403.1	Analyze	Tutorial – 1	20
C403.2	Analyze	Assignment	20

C403.3 & C403.4	Analyze	Tutorial – 2	20
C403.5	Apply	Technical Quiz	20

Summative assessment based on Continuous and End Semester Examination

Bloom's Level	Continuous Assessment (120 Marks)		End Semester Examination [60 marks]
	CIA 1 [60 Marks]	CIA 2 [60 Marks]	
Remember	10	-	10
Understand	20	20	10
Apply	20	30	30
Analyse	50	50	50
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1: 100 Marks			CA 2: 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component –I (20 Marks)	Component –II (20 Marks)		Component –I (20 marks)	Component –II (20 Marks)	

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)

COs	POs												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	2	1	-	-	1	1	1	2	-	2	2	-	-
2	3	2	2	1	-	-	1	1	1	2	-	2	2	-	-
3	3	2	2	1	-	-	1	1	1	2	-	2	2	-	-
4	3	2	2	1	-	-	1	1	1	2	-	2	2	-	-
5	3	2	2	1	-	-	1	1	1	2	-	2	2	-	-
Avg	3	2	2	1	-	-	1	1	1	2	-	2	2	-	-

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

23CE404	TRANSPORTATION ENGINEERING	3/0/0/3
Nature of Course	Theory Application	
Pre requisites	Nil	

Course Objectives:

1	To obtain knowledge related to highway planning and the geometric design of roads.
2	To acquire knowledge on the fundamentals and practices of pavement design and maintenance.
3	To gain knowledge regarding the principles of construction and maintenance of railway tracks.
4	To comprehend the procedures encompassed in railway engineering.

Course Outcomes:
Upon completion of the course, students shall have ability to

C404.1	Apply the basic concepts of highway planning.	[AP]
C404.2	Plan the various geometric elements for highway construction.	[AN]
C404.3	Illustrate the construction processes and alignment of railways.	[AN]
C404.4	Examine the working procedures in railways.	[AP]
C404.5	Outline the airport components and services	[AP]

Course Contents

Module 1: Highway planning, design and construction **15 Hrs.**

Significance of highway planning – Road construction practice – factors influencing highway alignment - Engineering surveys for alignment, Classification of highways. Highway components - Sight distances – Horizontal curves, Super elevation, transition curves, widening at curves – Vertical curves – Use of software for alignment process - Gradients, Testing of highway materials - Sustainability in roads.

Module 2: Railway planning, design, construction and maintenance **15 Hrs.**

Role of Indian Railways in National Development – Railway cross sectional elements - Functions - Geometric Design of railway tracks, superelevation, cant deficiency and excess, negative superelevation. Points and Crossings – Working Principle - Signaling, Interlocking and Track Circuiting, Track Drainage, Railway Stations and Yards, Level Crossings – Metro Systems and its working principles – Track construction for metro - Lighting for metro lines

Module 3: Airport planning and design **15 Hrs.**

Airports – Components of airports - Airport obstructions - Airport drainage - Airport lighting - Air traffic control -Runway and taxiway markings - Visual aids - Air traffic control network - Passenger facilities and services - Runway orientation - Cross wind component - Wind rose diagram (Problem) - Layout of taxiway and terminal area - Systems of aircraft parking - Circular Runways – Sustainability of terminal buildings.

Total Hours 45 Hrs.

Text Books:	
1	Rangwala, “Airport Engineering”, Charotar Publishing House, 2016.
2	Veeraragavan. A, Khanna S.K and Justo C E G, “Highway Engineering “, Nem Chand & Bros, 10th edition, 2015.
3	Arora .S.P and Saxena .S.C, “A Textbook of Railway Engineering”, CBS Publishers, 2017.
Suggested Readings:	
1	Sharma S.K, “Principles Practices & Design of Highway Engineering” S.Chand & Co, 2014.
2	Satish Chandra and Agarwal.M.M, “Railway engineering” Prabha & Co, Delhi, 2012.
3	Partha Chraborthy and Animesh Das, “Principles of Transportation Engineering”, Tata McGraw Hill Co Ltd, New Delhi, 2012.
4	Norman J. Ashford, Saleh Mumayiz, Paul H. Wright, “Airport Engineering: Planning, Design, and Development of 21st Century Airports” Wiley; 4th edition, 2011
IS Codes	
1	IS: 2386 – Part I to IV – 1963, “Methods of test for aggregates for concrete” .
2	IS 1203 to 1208 – 1978, “Methods for testing for tar and bituminous materials”
Web References:	
1	https://www.designingbuildings.co.uk/wiki/Railway_engineering
2	https://www.brighthubengineering.com/building-construction-design/125227-highway-construction-and-engineering/
Online Resources:	
1	https://www.edx.org/course/railway-engineering-an-integral-approach-2
2	https://www.mooc-list.com/tags/highway-engineering

Continuous Assessment (40 Marks)				**End Semester Examination %**	**Total %**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment %**		
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case study, Seminar, Group Assignment)**	**FA (16%) [80 Marks]**
C404.1	Analyze	Online Quiz -1	20
C404.2	Apply	Assignment -1	20
C404.3 & C404.4	Analyze	Seminar presentation	20
C404.5	Apply	Assignment -2	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	10	10	5
Understand	20	20	25
Apply	40	40	40
Analyse	30	30	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 1 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	3	3	3			2	2	2	3		2	3		
2	3	3	3	3			2	2	2	3		2	3		
3	3	3	3	3			2	2	2	3		2	3		
4	3	3	3	3			2	2	2	3		2	3		
5	3	3	3	3			2	2	2	3		2	3		
Avg.	**3**	**3**	**3**	**3**			**2**	**2**	**2**	**3**		**2**	**3**		
1	**Reasonably agreed**					**2**	**Moderately agreed**					**3**	**Strongly agreed**		

23CE405	CONCRETE AND HIGHWAY ENGINEERING LABORATORY	0/0/4/2
Nature of Course	Practical Application	
Pre requisites	Nil	

Laboratory Objectives:	
1	To acquire knowledge of physical properties of concrete ingredients.
2	To learn about the properties of fresh and hardened properties.
3	To acquire knowledge of properties, strength and shape assessments for aggregates.
4	To comprehend the process of testing bitumen for practical application in the field.

Laboratory Outcomes: **Upon completion of the course, students shall have ability to**	
C405.1	Determine the properties of cement and fine aggregate.
C405.2	Determine the properties of fresh, hardened concrete.
C405.3	Determine the NDT and durability properties of hardened concrete.
C405.4	Determine the suitability of coarse aggregate for usage in pavements
C405.5	Examine the suitability of bitumen for usage in the field.

Course Contents: Laboratory

S. No.	List of Exercises	CO Mapping	RBT
1	Determine the physical properties of cement, (i) Specific gravity test, (ii) Consistency, initial and final setting time	C405.1	[AN]
2	Determine the physical properties of fine aggregates, (i) Specific gravity test, (ii) Sieve analysis	C405.1	[AN]
3	Determine the fresh concrete property by field methods.	C405.2	[AN]
4	Determine the hardened concrete property by (i) Compressive Strength Test (ii) Flexural Strength Test	C405.2	[AN]
5	Determine the surface hardness and quality by (i) NDT Rebound hammer test (ii) Ultrasonic Pulse Velocity test	C405.3	[AN]
6	Determine the durability property of concrete by Rapid Chloride Permeability Test.	C405.3	[AN]
7	Determination of resistance offered by aggregate against gradual and impact loading	C405.4	[AN]
8	Determination of by aggregate against abrasion and shape tests	C405.4	[AN]
9	Determine the design mix of Bituminous Concrete using IRC standards	C405.4	[AN]
10	Determination of corrected length and orientation of the airport runways	C405.5	[AN]
11	Design of horizontal and vertical alignment of pavements using software package	C405.5	[AN]
12	Determination of bitumen properties for road construction	C405.5	[AN]
	Total Hours		**45 Hrs**

Suggested Readings:	
1	Shetty, M.S., Jain, A.K., Concrete Technology, Theory and Practice, S. Chand and Company Ltd, New Delhi, 2018
2	Neville A.M. Concrete Technology, Pearson Education, New Delhi, 2019
3	Sharma S.K, “Principles Practices & Design of Highway Engineering” S.Chand& Co, 2014.
4	ParthaChraborthy and Animesh Das, “Principles of Transportation Engineering”, Tata McGraw Hill Co Ltd, New Delhi, 2012.
Web References:	
1	https://www.indianconcreteinstitute.org/
2	https://www.brighthubengineering.com/building-construction-design/125227-highway-construction-and-engineering/
Online Resources:	
1	https://onlinecourses.swayam2.ac.in/nou20_cs14/
2	https://www.mooc-list.com/tags/highway-engineering

Continuous Assessment				End Semester Examination %	Total %
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment %		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom’s Level	Continuous Assessment (60%)		End Semester Practical Examination (40%) [100 marks]
	FA [75 Marks]	SA [25 Marks]	
Remember	10	-	10
Understand	20	20	10
Apply	20	30	30
Analyse	50	50	50
Evaluate	-	-	-
Create	-	-	-

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	3	1	-	-	-	1	1	1	-	2	2	-	-
2	3	2	3	1	-	-	-	1	1	1	-	2	2	-	-
3	3	2	3	1	-	-	-	1	1	1	-	2	2	-	-
4	3	2	3	1	-	-	-	1	1	1	-	2	2	-	-
5	3	2	3	1	-	-	-	1	1	1	-	2	2	-	-
Avg	3	2	3	1	-	-		1	1	1	-	2	2	-	-

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

23CE406	ENVIRONMENTAL ENGINEERING LABORATORY		0/0/3/1.5
Nature of Course	Practical application		
Pre requisites	Physical Science Laboratory		
Course Objectives:			
1	To understand the Physico chemical analysis of water and wastewater.		
2	To interpret the results and draw conclusions about the quality of water for intended usage.		
3	To learn the principles of analysis of common air pollutant.		
4	To enable the students in modeling of wastewater treatment plants for a community.		
Course Outcomes: **Upon completion of the course, students shall have ability to**			
C406.1	Determine the quality of water based on its physical and chemical characteristic using the suitable experimental procedures		[AP]
C406.2	Calculate the type and quantum of chemical required for the removal of dissolved solid substances in water		[AP]
C406.3	Investigate the oxygen content in various forms in water		[AN]
C406.4	Determine the ionic and elemental concentration in water using sophisticated analytical methods		[AP]
C406.5	Investigate the ambient air quality characteristics and calculate the air quality index		[AN]
Course Contents: Laboratory Component			
S. No	**List of Experiments**	**CO Mapping**	**BT**
1.	Determination of Optimum Coagulant dosage for a given sample	C406.1	[AP]
2.	Determination of Hardness present in the given water sample	C406.1	[AP]
3.	Determination of Dissolved Oxygen presents in the water sample	C406.2	[AN]
4.	Determination of Chlorides present in the given sample	C406.2	[AN]
5.	Determination of Bio-chemical Oxygen Demand in the given wastewater sample	C406.3	[AN]
6.	Determination of Chemical Oxygen Demand in the given wastewater sample	C406.3	[AP]
7.	Determination of Fluorides presents in the given waste water sample	C406.4	[AP]
8.	Determination of Sulphates presents in the given waste water sample	C406.4	[AP]
9.	Determination of Potassium presents in given wastewater sample	C406.4	[AP]

10.	Determination of Sodium presents in the given wastewater sample	C406.4	[AP]
11.	Determination of Air pollutant – Particulate Matter and Gaseous pollutant analysis	C406.5	[AN]
12.	Modeling of Wastewater treatment plant using Steady-State Modeling Program	C406.5	[AP]
		Total Hours:	**45 Hrs.**

Text Books:	
1	Punmia B.C, Ashok Jain, “Wastewater Engineering”, Laxmi publications Pvt. Ltd., 2016
2	Birdie G.S., Water supply Engineering, Dhanpat rai publishing company, 2014
3	Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 2017
Reference Books:	
1	Venugopal Rao P., “Textbook of Environmental Engineering”, Prentice Hall of India Pvt.Ltd, 2013
2	Peavy, Rowe, Tchobanoglous, “Environmental Engineering”, McGraw Hill Publishers, NewDelhi, 2013.
3	Basak N.N, “Environmental Engineering”, McGraw Hill Education., 2017
Web References:	
1	http://mohua.gov.in/cms/Latest-Manual-part-a-Engineering.php
2	http://164.100.161.188/cms/Latest-Manual-Part-B-Operation-and-Maintenance-2013.php
3	http://mohua.gov.in/cms/Latest-Manual-Part-C-Management-2013.php
4	http://cpheeo.gov.in/cms/manual-on-municipal-solid-waste-management-2016.php
IS Code References:	
1	IS 10500:2012 Water Quality Standards, New Delhi, 2012
2	IS SP 26 – Handbook on Water supply and Drainage.
Online Resources:	
1	https://www.mooc-list.com/course/water-and-wastewater-treatment-engineering-physicochemical-technology-edx
2	http://nptel.ac.in/courses/105106119/

Continuous Assessment				**End Semester Examination**	**Total**
Formative Assessment	**Summative Assessment**	**Total**	**Total Continuous Assessment**		
75	**25**	**100**	**60**	**40**	**100**

Assessment based on Continuous and End Semester Examination			
Bloom's Level	**Continuous Assessment (60%) [100 Marks]**		**End Semester Practical Examination (40%) [100 Marks]**
	FA (75 Marks)	**SA (25 Marks)**	
Remember	-	-	-
Understand	30	20	20
Apply	40	40	40
Analyse	30	40	40
Evaluate	-	-	-
Create	-	-	-

Mapping of Course Outcomes (CO) with Programme Outcomes (PO)Programme Specific Outcomes (PSO)

Cos	**Pos**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	2	2	1	2	1	1	-	1	1	2	3	2
2	2	2	2	2	2	2	2	1	1	-	2	2	1	2	2
3	2	2	2	2	2	2	2	1	1	-	1	2	1	2	2
4	3	2	2	2	2	2	2	1	1	-	2	1	2	3	2
5	3	3	2	2	2	1	2	1	1	-	2	2	2	3	2
Avg.	**2.6**	**2.2**	**2**	**2**	**2**	**1.6**	**2**	**1**	**1**	**-**	**1.6**	**1.6**	**1.6**	**2.6**	**2**

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

23CE407	STRUCTURAL ANALYSIS LABORATORY	0/0/3/1.5
Nature of Course	Practical Application	
Prerequisites	Nil	

Laboratory Objectives:

1	to learn the analysis of indeterminate beams.
2	To analyse the multi-storey structure using an analysis package.
3	To analyse the grid floor using an analysis package.
4	To learn the analysis of arches using an analysis package.

Laboratory Outcomes:
Upon completion of the course, students shall have the ability to

C407.1	Analyse an indeterminate beam using an analysis package.	[AN]
C407.2	Analyse a multi-story RCC structure using an analysis package.	[AN]
C407.3	Analyse an arch structure using an analysis package.	[AP]
C407.4	Analyse the grid floor using an analysis package.	[AN]
C407.5	Analyse the proposed reinforced concrete using an analysis package.	[AN]

Course Contents: Laboratory

S. No.	List of Exercises	CO Mapping	RBT
1	Analysis of a fixed and propped beam under gravity and lateral loads using an analysis package.	C407.1	[AN]
2	Analysis of a continuous beam under gravity and lateral loads using an analysis package.	C407.1	[AN]
3	Analysis of a curved beam in plan under gravity and lateral loads using an analysis package.	C407.1	[AN]
4	Analysis of a multi-storey RCC framed structure under gravity loads using an analysis package.	C407.2	[AN]
5	Analysis of a multi-storey RCC framed structure under gravity and lateral loads using an analysis package.	C407.2	[AN]
6	Analysis of 2-hinged arches using analysis package	C407.3	[AN]
7	Analysis of 3-hinged arches using analysis package	C407.3	[AN]
8	Analysis of a grid floor (4x4) using the analysis package	C407.4	[AN]
9	Prepare a report on the analysis of the proposed reinforced concrete structure under gravity and lateral loads using an analysis package.	C407.5	[AN]
	Total Hours		**45 Hrs**

Suggested Readings:	
1	Bhavikatti S S, Structural Analysis Vol. 1 and 2, Vikas Publishing House Pvt. Ltd., 2021.
2	Vaidyanathan R and Perumal P, Structural Analysis Vol. 1 and 2, Laxmi Publications, New Delhi, 2022.
3	Devdas Menon, Structural Analysis, Narosa Publishing House, 2018.
4	Reddy C S, Basic Structural Analysis, Tata McGraw Hill Publishing Company, 2011.
Web References:	
1	https://freevideolectures.com/course/3015/advanced-structural-analysis
2	https://www.studocu.com/en/document/university-of-sheffield/advanced-structural-analysis/lecture-notes/lecture-notes-lectures-11-20/674048/view
Online Resources:	
1	https://nptel.ac.in/downloads/105101085
2	https://nptel.ac.in/courses/105105109
3	https://nptel.ac.in/courses/105106050

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
75	25	100	60	40	100

Assessment based on Continuous and End Semester Examination			
Bloom's Level	Continuous Assessment (60%)		End Semester Practical Examination (40%) [100 marks]
	FA [75 Marks]	SA [25 Marks]	
Remember	10	-	10
Understand	20	20	10
Apply	20	30	30
Analyse	50	50	50
Evaluate	-	-	-
Create	-	-	-

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	3	2	2	1	3	-	1	1	1	2	-	2	2	-	-
2	3	2	2	1	3	-	1	1	1	2	-	2	2	-	-
3	3	2	2	1	3	-	1	1	1	2	-	2	2	-	-
4	3	2	2	1	3	-	1	1	1	2	-	2	2	-	-
5	3	2	2	1	3	-	1	1	1	2	-	2	2	-	-
Avg	3	2	2	1	3	-	1	1	1	2	-	2	2	-	-

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

23EES101	Employability Enhancement Skills (2 Weeks Internship / Training)	0/0/0/1

Nature of Course	Training
Pre requisites	Nil

Course Objectives:

1.	To give a first-hand knowledge of practical problems related to Civil Engineering
2.	To offer firsthand knowledge of applications of Construction Management in carrying out engineering tasks.
3.	To train the students on real-time learning experiences in site.
4.	To offer an additional edge to their profession

Course Outcomes:
Upon completion of the course, students shall have ability to

CS01.1	Identify critical activities in the Construction Industry	[AN]
CS01.2	Develop the methodology to solve the identified problem	[AN]
CS01.3	Develop skills in facing the problems experienced in the field.	[AP]
CS01.4	Develop skills in solving the problems experienced in the field.	[AP]
CS01.5	Present the report clearly to a specific audience in both the written and oral forms	[AP]

Course Contents:

The students individually undertake training in reputed engineering companies doing construction during the vacation for a specified duration of four weeks. At the end of the training, a detailed report on the work done should be submitted. The students will be evaluated through a viva-voce examination by a team of internal faculty.

Tentative Assessment Method & Levels (based on Revised Bloom's Taxonomy)

Summative assessment based on Report and Viva Voce Examination

Revised Bloom's Level	Training Report [40 marks]	Viva Voce Examination [60 marks]
Remember	10	10
Understand	20	20
Apply	40	40
Analyse	30	30
Evaluate	-	-
Create	-	-

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	PSO 1	PSO 2	PSO 3
1	3	3	2	2	2	2	2	3	3	3	2	3	2	2	3
2	3	3	2	2	1	2	2	3	3	3	2	3	2	2	3
3	3	2	1	1	1	2	2	3	3	3	2	3	2	2	3
4	3	2	1	1	1	2	2	3	3	3	2	3	2	2	3
5	3	2	1	1	1	2	2	3	3	3	2	3	2	2	3
Avg	**3.0**	**2.3**	**1.3**	**1.3**	**1.2**	**2.0**	**2.0**	**3.0**	**3.0**	**3.0**	**2.0**	**3.0**	**2.0**	**2.0**	**3.0**

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

Mandatory Courses

.

23MC101	INDUCTION PROGRAMME (Common to all B.E / B.TECH/M.TECH)	1/0/0/0

Nature of Course	Induction Programme
Pre requisites	Nil

Course Objectives:

1	To have broad understanding of society and relationships
2	To nurture the character and 135abelin one's responsibility as an engineer, a citizen and a human being
3	To incorporate meta skills and values

Course Outcomes:

Upon completion of the course, students shall have ability to

C101.1	Explore academic interest and activities	[AP]
C101.2	Work for excellence	[AP]
C101.3	Promote bonding and give a broader view of life and character	[AP]

Course Contents: Theory

PHYSICAL ACTIVITY: Research over the past years has shown Yoga to have stress-relieving powers on students, paving the way for improved academic performance with the practice of asanas, meditation and breathing exercises. To prove these words Yoga classes has been planned in this module.(CO mapping: C101.1, C101.2, C101.3)

CREATIVE ARTS (students can select any one of their choice): Cultural development supports students to understand, feel comfortable with, value and appreciate the potential enrichment of cultural diversity. They should challenge discrimination, whether based on cultural or racial difference. Students should experience cultural traditions embedded in arts, crafts, language, literature, theatre, song, music, dance, sport, Science, technology and travel. Students should develop an appreciation of beauty both in experiencing artistic expression and by exploring their own creative powers. To inculcate those skills they are given a chance to exhibit their talents through painting, sculpture, pottery, music, dance, craft making and so on. .(CO mapping: C101.1, C101.2, C101.3)

UNIVERSAL HUMAN VALUES: Moral development involves supporting students to make considered choices around their behaviour and the values that provide a framework for how they choose to live. Moral development is also learning about society's values, understanding the reasons for them, how they are derived and change; and how disagreements are resolved. Students must consider the consequences of personal and societal decisions on the wider community – local and global- and on the environment and future generations. To acquire this the students are exposed to training to enhance their soft skills. .(CO mapping: C101.1, C101.2, C101.3)

LITERARY AND PROFICIENCY MODULES: Social development helps students to work effectively together, developing the inter-personal skills required to relate positively with their peers and people of all ages. Students must also understand how to participate productively in a diverse and plural society and learn about, and how to effectively engage

with societal institutions and processes. They should understand that a person may have different roles and responsibilities within society. To reach this the following aspects are given in the form of Reading, writing, speaking – debate, role play etc. Communication and computer skills. (CO mapping: C101.1, C101.2, C101.3)

LECTURES BY EMINENT PEOPLE: Teaching with Lectures. ... It is essential to see lectures as a means of helping students learn to think about the key concepts of a particular subject, rather than primarily as a means of transferring knowledge from instructor to student. During the induction period students will attend to Guest lectures by subject experts.(CO mapping: C101.1, C101.2, C101.3)

VISIT TO LOCAL AREAS: Traveling is in fact a way of learning to learn. You are out of your comfort zone and so you must learn to be able to adapt to a new learning environment in a very short time. It also helps in your overall learning as well. In the induction period students will be taken to different places near college to learn new things. Eg.Meditation centre/orphanage/Hospital.(CO mapping: C101.1, C101.2, C101.3)

FAMILIARIZATION TO DEPARTMENT/BRANCH INNOVATION: Hod's of different branches will present about their department followed by department visit to view various facilities available at their department, new innovations from students and faculties etc. .(CO mapping: C101.1, C101.2, C101.3)

Total Hours	**30 Hrs.**

Mapping of Course Outcomes (CO) with Programme Outcomes (PO)Programme Specific Outcomes (PSO)

Cos	Pos												PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1						3	3	3	3	3	3	3			1
2						3	3	3	3	3	3	3			1
3						3	3	3	3	3	3	3			1
Avg						3.0	3.0	3.0	3.0	3.0	3.0	3.0			1.0

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

23MC102	ENVIRONMENTAL SCIENCES	2 /0 /0 /0
Nature of Course	Theory Concept	
Pre requisites	Basics in Environmental Studies	

Course Objectives:

1	To learn the integrated themes on various natural resources.
2	To gain knowledge on the type of pollution and its control methods.
3	To have an awareness about the current environmental issues and thesocial problems.

Course Outcomes:

Upon completion of the course, students shall have ability to

C102.1	Recall and play an important role in transferring a healthy environment for future generation.	[R]
C102.2	Illustrate the importance of natural resources and conservation of biodiversity.	[U]
C102.3	Interpret and analyze the impact of engineering solutions ina global and societal context.	[U]
C102.4	Apply the gained knowledge to overcome pollution problems.	[AP]
C102.5	Apply the gained knowledge in various environmentalissues and sustainable development.	[AP]

Course Contents: Theory

Natural Resources:

Introduction-Forest resources: Use and abuse, case study-Major activities in forest-Water resources-over utilization of water, dams-benefits and problems. Mineral resources-Use and exploitation, environmental effects of mining- case study–Food resources- World food problems, case study. Energy resources -Renewable and non-renewable energy sources Land resources- Soil erosion and desertification – Role of an individual in conservation of natural resources.

Environmental Pollutions:

Definition – causes, effects and control measures of: a. Air pollution - Acid rain - Greenhouse effect-Global warming- Ozone layer depletion – case study- Bhopal gas tragedy. Water pollution c. Soil pollution - Solid waste management-Recycling of plastics-Pyrolysis method- causes, effects and control measures of municipal solid wastes d. Noise pollution. e. Nuclear hazards-case study-Chernobyl nuclear disaster-Role of an individual in prevention of pollution.

Social issues and the Environment:

Sustainable development-water conservation, rain water harvesting, E-Waste Management – Environmental ethics: 12 Principles of green chemistry-Scheme of labelling of environmental friendly products (Eco mark) – Emission standards – ISO14001 standard.

Total Hours	**30 Hrs.**

Text Books:

1	Anubha Kaushik and C P Kaushik “Perspectives in Environmental Studies”4th Edition, New age International (P) Limited, Publisher Reprint 2014. New Delhi
2	Rajagopalan, R, “Environmental Studies-From Crisis to Cure”, OxfordUniversity Press 2015.
Reference Books:	
1	Tyler Miller, Jr., “Environmental Science”, Brooks/Cole a part of Cengage Learning, 2014.
2	William Cunningham and Mary Cunningham, “Environmental Science”, 13th Edition, McGraw Hill,2015.
3	Gilbert M. Masters, “Introduction to Environmental Engineering and Science”,Third Edition, Pearson Education, 2014.
Web References:	
1	http://nptel.ac.in/courses/104103020/20
2	http://nptel.ac.in/courses/120108002
3	http://nptel.ac.in/courses/122106030
4	http://nptel.ac.in/courses/120108004/
5	http://nptel.ac.in/courses/122102006/20
Online Resources:	
1	https://www.edx.org/course/subject/environmental-studies
2	www.environmentalscience.org

Assessment Methods & Levels (based on Bloom’s Taxonomy)			
Formative assessment based on Capstone Model (Max. Marks:50)			
Course Outcome	**Bloom’s Level**	**Assessment Component**	**Marks**
C102.1	Remember	Quiz	10
C102.2	Understand	Case study based on environmental aspect	20
C102.3	Understand	Class presentation	10
C102.4 & C102.5	Apply	Assignment	10

Summative assessment based on Continuous Assessment			
Bloom’s Level	**Continuous Assessment**		
	CIA-I [0 marks]	**CIA-II [0 marks]**	**Term End Assessment [50 marks]**
Remember	-	-	30
Understand	-	-	40
Apply	-	-	30
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Mapping of Course Outcomes (CO) with Programme Outcomes (PO)Programme Specific Outcomes (PSO)															
COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1	2	1	1	1	1		1							2	2
2	2	1	1	1	1		1							2	2
3	3	2	1	1	1		1							2	2
4	3	2	1	1	1		1							2	2
5	2	1	1	1	1		1							2	2
Avg	**2.5**	**1.5**	**1**	**1**	**1**		**1**							**2**	**2**

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

23MC103	Soft Skills (Department of CIVIL Engineering)	2/0/0/0
Nature of Course	Theory Concept	
Pre requisites	Technical Communication Skills	

Course Objectives:

1.	To develop the students competency level and their capabilities in language.
2.	To teach the students to be effective communicators in workplace and social environments.
3.	To create self confidence among the students and to resolve stress and conflict within themselves.
4.	To help the students to enhance their career skills by increasing their productivity and performances.
5.	To concentrate more on conversation skills, presentation skills, verbal ability, critical and creative thinking.

Course Outcomes:
Upon completion of the course, students shall have ability to

C103.1	Remember the principles of soft skills required for theirprofession.	[R]
C103.2	Understand the importance of Interpersonal communication skills among individuals, groups and cultures.	[U]
C103.3	Apply verbal and non verbal communication skills and also to apply good teamwork skills and leadership skills in corporate environment.	[AP]
C103.4	Analyse and apply creativity skills, critical thinking skills and problem solving skills in workplace.	[AP]
C103.5	Articulate oral and written messages in an appropriate and persuasive manner to suit specific purposes, audiences and contexts at work place.	[AP]

Course Contents:

Module 1: Professional Communication Skills **10 Hrs.**

Introduction to the Soft Skills, **Performance Evaluation 1** –Listening on TedX Shows- **Exercises on Listening Skills** -Speaking Skills - How to Start and Sustain a Conversation - **Speaking in Groups**- Understanding Self and Personal Branding, Attitude, Types of Attitude, Positive Attitude, Self Confidence and Self-Motivation – **Exercises on Personal Branding**. E mails –**Exercises on Email Writing**.

Module 2: Interview Skills **10 Hrs.**

Verbal Ability – Analogy – Classification - Odd One Out - Idioms and Phrases - Sentence Correction – **Exercises on Verbal Ability** - Writing Reports - Types of Reports - Strategies for Report Writing – **Exercises on Report Writing**- Developing Creativity- Critical Thinking and Problem Solving Skills-**Role Play on Critical Thinking**- Effective Resume along with Covering Letter- **Exercises**- Interviews- Facing Job Interviews – **Mock Interview**.

Module 3: Teamwork and Leadership Skills **10 Hrs.**

Impromptu Speaking- **Group Presentation** - Importance of Team Work - Developing Key Traits in Motivation, Persuasion, Negotiation and Leadership Skills- Being an Effective Team Player – **Group Activity**- Group Discussion –**Activity**- Making Effective Presentations- **Presentation Skills**.- **Performance Evaluation 2**

Total Hours: 30 Hrs.

Text Books:

1.	Business Communication for managers: An advanced approach, by Penrose, C engage learning.

2.	Professional Communication in Engineering. by H.E. Sales. Palgrave Macmillan 2009.
3.	Communication for professional engineers by W. P. Scott, Bertil Billing. Thomas Telford, 1998.
Reference Books:	
1.	Reason and professional ethics by Peter Davson-Galle. Ashgate Publishing, Ltd., 2009.
2.	Cross Cultural and Inter Cultural Communication. by William B. Gudykunst. Sage Publications India Pvt Ltd, New Delhi.2003.
3.	Corporate Communications: Theory and Practice. byJoepCornelissen. Sage Publications India Pvt Ltd, New Delhi.2004.
Web References:	
1	https://onlinecourses.nptel.ac.in/noc16_hs15/preview
2	https://www.getinternship.switchidea.com/NTAT/syllabus/Interpersonal-Communication.
3	https://smude.edu.in/smude/programs/bca/soft-skills.html
Online Resources:	
1	https://swayam.gov.in/course/4047-developing-soft-skills-and-personality
2	https://www.clearias.com/interpersonal-skills-including-communication-skills-for-csat/
3	https://www.bizlibrary.com/soft-skills-training/

Assessment Methods & Levels (based on Bloom's Taxonomy)

Formative assessment based on Capstone Model (Max. Marks:50)

Course Outcome	Bloom's Level	Assessment Component	Marks
C103.1	Remember	Group Discussion	10
C103.2	Understand	Listening Skill	10
C103.3	Apply	Interview	10
C103.4 & C103.5	Apply	Formal Presentation	20

Summative assessment based on Continuous Assessment

Bloom's Level	Continuous Assessment		
	CIA-I [0 marks]	CIA-II [0 marks]	Term End Assessment [50 marks]
Remember	-	-	30
Understand	-	-	40
Apply	-	-	30
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Mapping of Course Outcomes (CO) with Programme Outcomes (PO)Programme Specific Outcomes (PSO)

	POs												PSOs		
COs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1						1	1	2	2	3	2	2			1
2							1	1	3	3	2	2			1
3									2	3	2	2			1
4						1	1	1	2	3	3	2			1
5						1	1		2	3	2	2			1
Avg						**1**	**1**	**1.3**	**2.2**	**3**	**2**	**2**			**1**

1 Reasonably agreed 2 Moderately agreed 3 Strongly agreed

23MC104	MANAGEMENT ORGANIZATIONAL BEHAVIOUR	2/0/0/0
Nature of Course	Theory Concept	
Pre requisites	Nil	

Course Objectives:

1	The objective of the course is to provide basic knowledge about management to familiarize the students with the management principles and organizational behavior.
2	The course is designed to enable the students to adapt & apply theoretical concepts in business
3	To know about the role of manager in the area of management.
4	To create and implement team building strategies for organization building.

Course Outcomes:
Upon completion of the course, students shall have ability to

C104.1	Identify and understand different management principles techniques in business environment.	[AP]
C104.2	Apply management fundamentals and planning to solve organization problems and make effective decisions.	[AP]
C104.3	Understand and analyze the changes within an individual will change the group as well as the organization	[AN]
C104.4	Understand and analyze the leadership style and organization theories to create a productive environment to workforce.	[AN]
C104.5	Analyze the organizational climate and change management strategies and tactics	[AP]

Course Contents: Theory

Module 1: Fundamentals of Management, Planning and Decision Making 10 Hrs.

Introduction to Management- Concept and functions- Thought Managerial roles and styles- Principles of Management - Levels of Management- Theories of Management - Classical, Scientific, Administrative, Behavioral, Management Sciences Theories. Organizational planning - Vision, Mission and goals, Types of plans, steps in planning process, Approaches to planning, Planning in Dynamic Environment. Decision making process, types of decisions, decision makingstyles, Behavioral influences on decision making

Module 2: Individual, interpersonal and group behavior 10 Hrs.

Definition, need and importance of Organizational behavior Learning-Nature -Importance of Learning- Introduction and theories Motivation: Content and process theories-Leadership: Styles and Theories - Perception-Personality Attitudes- Definition, need and importance -Nature and scope-Importance of Groups and Teams- Role relationships and conflict-Group dynamics- Work values. Organization-Theories: Maslow's needs hierarchy theory ,two factor theory of motivation ,McGregor's theory, ERG theory ,MCClelland's needs theory, Valance theory

Module 3: Organizational Development 10Hrs.

Organizational culture: Elements - Organizational climate Factors affecting organizational climate-Organizational Commitment, Organizational change- Importance- Stability Vs Change- Proactive Vs Reaction change- Change process Resistance to change- Managing changes- Managing International- Workforce Productivity-Alternative change management approaches and cultural contingencies - power to manage effectively; Empowerment and Participation strategies and tactics.

Total Hours	**30 Hrs.**

Text Books:	
1	Nelson, Quick, Khandelwal, —Organizational Behavior, 2nd edition, Cengage Learning, 2016.
2	Williams, Tripathy, —Principles of Management, Cengage Learning, 2016.
3	Aswathappa, K, —Organizational Behavior, 12th Edition, Himalaya Publication, 2016.
4	Stephen Robbins, Timothy A. Judge, —Organizational Behavior, 16th edition, Prentice Hall India Pvt. Ltd, 2014
Reference Books:	
1	Chandrani Singh, Aditi Khatri, —Principles and Practices of Management and Organizational Behavior, Sage Publications, 2016
2	Richard L. Daft, —Understanding the Theory and Design of Organizations, 11th edition, Cengage Learning, 2013.
3	John M Ivancevich and Robert Konopaske, —Organizational Behavior and Management, McGraw-Hill Education, 2013
Web References:	
1	https://iedunote.com/fundamental-concepts-of-organizational-behavior
2	https://nscpolteksby.ac.id/ebook/
3	https://ebooks.lpude.in/management/mba/term_1/DMGT402_MANAGEMENT PRACTICES_AND_ORGANIZATIONAL_BEHAVIOUR.pdf
4	https://www.studocu.com/in/document/vellore-institute-of-technology/organizational - behaviour/lecture-notes/ob-notes/3208134/view
Online Resources:	
1	https://nptel.ac.in/syllabus/110105034/
2	https://nptel.ac.in/courses/110/105/110105033/

Assessment Methods & Levels (based on Blooms 'Taxonomy - Theory

Formative assessment based on Capstone Model (50 Marks)

Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list – Quiz,	Marks
C104.1	Apply	Online Quiz	20
C104.2	Apply	Online course	20
C104.3 & C104.4	Analyze		
C104.5	Apply	Assignment	10

Summative assessment based on Continuous and End Semester Examination			
Bloom's Level	**Continuous Assessment**		
	CIA 1 [0 Marks]	**CIA 2 [0 Marks]**	**Term End Assessment [50 marks]**
Remember	-	-	-
Understand	-	-	10
Apply	-	-	20
Analyse	-	-	20
Evaluate	-	-	-
Create	-	-	-

Mapping of Course Outcomes (CO) with Program Outcomes (PO) Program Specific Outcomes (PSO)

COs	**POs**												**PSOs**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
1					1	3		3	3	3	3	1			2
2					2	2		3	3	3	3	2			3
3					3	3		3	3	2	3	1			2
4					3	2		3	3	3	3	2			3
5					3	3		3	3	2	3	2			2
Avg					**2.4**	**2.6**		**3.0**	**3.0**	**2.6**	**3.0**	**1.6**			**2.4**

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

23MC105	GENERAL APTITUDE	2/0/0/0
Nature of Course	Problem analytical	
Pre requisites	Basic Mathematical calculations	

Course Objectives:

1	To ensure that students learn to think critically about mathematical models for relationships between different quantities and use those models effectively to solve problems and reach conclusions about them.
2	To impart skills that enable students to effectively use and interpret data, formulas, and graphs in the workplace.
3	To instills confidence in facing technical aptitude questions interviewed by recruiters.

Course Outcomes:
Upon completion of the course, students shall have ability to

C105.1	To teach the basics of Quantitative Techniques in a graded manner.	[R]
C105.2	Understand the verbal and non-verbal nature of problems in reality and know the shortcut methods of solving it.	[U]
C105.3	Solve problems using their general mental ability.	[AP]
C105.4	To give intense focus on improving and increasing the ability of solving real problems.	[AP]
C105.5	Think critically about mathematical models for relating different quantities to reach conclusion.	[AP]

Course Contents: Theory

Module 1: Number Theory and Statistics **10 Hrs.**

Number Systems– HCF and LCM of Numbers – Decimal Fractions – Simplification – Square Root and Cube Root of a number – Surds and Indices – Problems on numbers – Percentage – Ratio and Proportion – Divisibility – Mixtures – Averages- Polynomials – Solving Equations and Inequalities –Discard's rule of signs – Problems on ages – Chain rule – Time and Work – Time and Distance – Problems on Trains – Problems on Boats and Streams- Measures of central tendency – Mean, Median and Mode – Variance and Standard deviation Logarithms – Profit and Loss – Simple Interest – Compound Interest.

Module 2: Logic and Decision Making **10 Hrs.**

Analogy – Classification – Series completion – Coding and Decoding – Blood Relations – Puzzle Test –Direction Sense test – Logical Venn Diagrams - Number Ranking and Time Sequence Test – Decision Making – Assertion and Reason– Inserting the missing one – Logical Sequence of words – Syllogisms.

Module 3: Reasoning **10 Hrs.**

Logic – Statement and Arguments – Statements and Assumptions – Statements and Course of Action – Statements and Conclusions – Deriving conclusions from passages – Functions – Different kinds of functions – Miscellaneous sets- Series – Analogy – Classifications – Analytical Reasoning – Problems on Cubes and Dice – Mirror Images – Water Images – Rule Detection.

Total Hours	**30 Hrs.**

Text Books:	
1.	Aggarwal R. S. Quantitative Aptitudell Revised Edition, S. Chand Publication.
2.	Abhijit Guha Quantitative Aptitudell 5th Edition, McGraw Hill Education.
Suggested Readings:	
1.	Edgar Thorpe —Mental Ability & Quantitative Aptitudell 3rd Edition, McGraw Hill Education.
Web Reference:	
1	https://www.wiziq.com/tutorial/815468-quantitative-aptitude-reasoning-data-interpretation- video-lectures
2	https://learningpundits.com/contest?referrer=harsh.cse15@nituk.ac.in
3	https://nptel.ac.in/courses/114106041/8
4	https://nptel.ac.in/courses/111103020/2
Online Resources:	
1	http://aptitudetraining.in/home/index.php
2	https://www.udemy.com/vedicmaths/
3	https://www.youtube.com/channel/UCtmn-DsF4BhPug-ff9LiDAA?disable_polymer=true

Assessment Methods & Levels (based on Blooms'Taxonomy) - Theory

Formative assessment based on Capstone Model (50 Marks)

Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list – Quiz, Assignment,Case study, Seminar, Group Assignment)	Marks
C105.1	Remember	Classroom or Online Quiz	10
C105.2 & C105.3	Understand	Formal presentation	10
C105.4, C105.5	Apply	Formal interview tests	20

Summative assessment based on Continuous and End Semester Examination

Bloom'sLevel	Continuous Assessment		
	CIA 1 [0 Marks]	CIA 2 [0 Marks]	Term End Assessment [50 marks]
Remember			-
Understand			10
Apply			20
Analyse			20
Evaluate			-
Create			

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	PSO 1	PSO 2	PSO 3
1	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
2	3	2	1	-	-	-	-	-	-	-	-	-	-	-	-
3	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
4	3	2	1	-	-	-	-	-	-	-	-	-	2	-	-
5	3	3	1	-	-	-	-	-	-	-	-	-	2	-	-
Avg	**3**	**2.5**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**-**

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

Value Added Courses

.

23VA130	EFFECTIVE COMMUNICATION SKILLS (MECH/MCT/AI&DS/CIVIL/CYBER)	0/0/0/2

Nature of Course	E (Theory skill based)
Pre-Requisites	Basics of English Language

Course Objectives:

1	To become self-confident individuals by mastering interpersonal skills, team management skills, and leadership skills.
2	To develop effective communication skills.
3	To train students to use the language with confidence and without committing errors.
4	To improve the fluency of the students when speaking English.
5	To focus on pronunciation, dialect, intonation, interaction, practice and communication.

Course Outcomes:
Upon completion of the course, students shall have ability to

C130.1	Remember correct usage of English grammar in speaking.	[U]
C130.2	Apply and improve their speaking ability in English both in terms of fluency and comprehensibility.	[AP]
C130.3	Understand and communicate effectively in personal and professional situations.	[U]
C130.4	Understand and analyzeoral presentations and receive feedback on their performance.	[U]
C130.5	Apply reading fluency skills through extensive reading.	[AP]

Course Contents:

Module I **10 Hrs.**

Pre-Test - Vocabulary Building- Connecting Phrases- Exercises and **Activities-Conversation Practices-** Greetings-exchanging ideas - Asking for information - questioning techniques / answering techniques - Getting people to do things - requesting/agreeing/refusing – **Activity Common Expressions** (Individual)- Talking about Favorites - Talk Show **Activity** - **Impromptu Speaking**- Personal Interest - Talking about Past Events and Future/Talking about Everyday Life (Family, Hobbies, Work, Travel and Current Events) – **Activity.**

Module II **10 Hrs.**

Listening- Trials of a Good Listener- Listening to Texts, Listening for Specific Purpose-**Activity**- **21st Century Skills**– Communication with Critical Thinking and Creativity-Role Play-**Activity**-**Personality Development**- Manners and Etiquettes. Building Confidence and Developing Presentation Skills-**Activity**- **Singing a Song (Group)** - **Activity**.

Module III **10 Hrs.**

Story Telling- Use of Charts and Graphs-**Activity -Persuasive Speech**- Handling Criticism-Justifying Opinions-Conflict-Resolution-Situational Role Play **Activity--News reading and Pronunciation**- **Activity** -**Satori**- Intuitive Approach-**Activity**-**Post Test.**

Total Hours: 30 Hrs.

Text Books:

1	English and Soft skills Orient Black Swan Publishers (S. P. Dhanavel) 2010
2	Remedial English Grammar. F.T. Wood. Macmillan.2007

3	On Writing Well. William Zinsser. Harper Resource Book. 2001
4	Dr Sumanth S, English for Engineers, Vijay Nicole Imprints Private Limited 2015.
Reference Books:	
1	Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
2	Busch, B., & Oakley, B. (2017). Emotional intelligence: why it matters and how to teach it. Retrieved from https://www.theguardian.com/teacher-network/2017/nov/03/emotional-intelligence-why-it-matters-and-how-to-teach-it.
3	Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
Web References:	
1	https://www.udemy.com/course/english-speaking-complete/
2	https://www.cambridgeenglish.org/exams-and-tests/linguaskill/
Online Resources:	
1	https://www.lingoda.com/en/linguaskill-from-cambridge/
2	https://www.icd.org.pk/linguaskill/

23VA101	BUILDING FUNCTION DESIGN USING AUTOCAD	0/0/0/1
Nature of Course	Theory Practical	
Pre requisites	Nil	

Course Objectives:

1	To be well versed with AutoCAD user interface.
2	To develop the hands-on experience with the AutoCAD UI needed to excel in the civil engineering industry.
3	To understand the basic and advanced techniques used in the development of 2D and 3D models.
4	To learn major CAD standards and practices used to create construction documents.

Course Outcomes:

Upon completion of the course, students shall have ability to

C101.1	Understand the AutoCAD user interface, tool bars and their functions.	[U]
C101.2	Apply the various commands, use drawing aids and get acquainted with layers.	[AP]
C101.3	Illustrate the various dimensioning tools and tool palettes in the 2D drawings.	[AP]
C101.4	Apply the concepts in preparing the 2D model of a residential building.	[AP]
C101.5	Demonstrate the 3D modeling and their features by design the 3D of a residential building.	[AP]

Course Contents: Theory

Module 1: AutoCAD User Interface and Basics **5 Hrs.**

Introduction to Engineering Drawing – Various types of engineering drawings used in AEC (Architecture, Engineering and Construction) Industry – Introduction to AutoCAD – Exploring GUI and Workspaces – User coordinate system - Basics, Viewing, Geometry, Layers, Properties, Modifying, Blocks, Layouts, Notes and Labels, Text, Dimensions, Hatch and its properties.

Module 2: Dimensioning and Detailing Drawings **5 Hrs.**

Dimensioning – True associative dimensions – Leaders and Dimension styles - Design center and tool palettes concept – Working with block and block attributes – Understanding external references and layout concept – Design and draft the layout of a residential building.

Module 3: 3D Modeling **5 Hrs.**

Introduction to 3D coordinate system – types of 3D models, 3D navigation and viewing tools – getting started with 3D Modeling – Visualization – Design the 3D model of a residential building using AutoCAD 3D.

Total Hours	**15 Hrs.**

Text Books:

1	James A Leach and Shawna Lockhart, “AutoCAD 2022 Instructor”, SDC Publications, 2022.
2	Jaiprakash Pandey and Yasser Shoukry., “Practical Autodesk, AutoCAD 2023 and AutoCAD LT 2023”, Packt Publishing, 2nd Edition, 2022.

3	AutoCAD (Civil & Architecture) Exercise Book, Cad desk publisher, 2019.
Suggested Readings:	
1	Azhar Wahab, “A Handbook on AutoCAD tools Practice”, Notion Press, 2020.
2	Sunil K Pandey, “Learn AutoCAD in a easy way”, S.K. Kataria & Sons, 2019.
3	Chitawadegi M. V., and Bhavikatti S. S., “Building Planning and Drawing”, Dream Tech Press, 2019.
4	Atish B Mane, “Learning AutoCAD”, PBD Publishers, 2016.
Web References:	
1	https://www.autodesk.com/certification/learning-pathways/autocad-design-drafting
2	https://www.autodesk.in/campaigns/autocad-tutorials
3	https://skill-lync.com/civil-engineering-courses/autocad-essentials-civil-engineer
Online Resources:	
1	https://www.coursera.org/learn/autodesk-autocad-design-drafting
2	https://www.udemy.com/course/autocad-for-civil-engineers/
3	https://www.autodesk.com/certification/all-certifications/autocad-design-drafting-professional

23VA102	TOTAL STATION AND GPS SURVEYING	0/0/0/1
Nature of Course	Theory Practical	
Prerequisites	Surveying and Geomatics	

Course Objectives:

1.	To introduce the working principles of modern surveying instruments
2.	To introduce the principles of various surveying methods and applications to Civil Engineering Projects
3.	The students can be exposed to the modern surveying methods
4.	The functioning various types total station and GPS equipment and their applications

Course Outcomes:
Upon completion of the course, students shall have the ability to

C102.1	Understand the working of Total Station equipment and solve thesurveying problems.	[U]
C102.2	Analyze the working principle of Total station & GPS, its components,signal structure of GPS and error sources	[AN]
C102.3	Distinguish the advantages of electronic surveying over conventionalsurveying methods	[AP]
C102.4	Apply the concepts of various techniques available for surveying andmapping with total station and GPS	[AP]
C102.5	Apply the concepts of GPS and data processing in various types ofcivil engineering works	[AP]
C102.6	Interpret the data with modern software tools for analyzing the resultsobtained from the instruments	[AP]

Course Contents:

Module 1: Fundamentals of Total Station & GPS **5 Hrs.**

Total Station: Advantages –working principle –Field procedure - Different segments -satellite configuration -Orbit determination and representation -Task of control segment -Hand Held and Geodetic receivers -data processing -Traversing and triangulation

Module 2: EDM Measurement principles and techniques **5 Hrs.**

Methods of Measuring Distance, Basic Principles of Total Station, Electro-optical system and Microwave system: Sources of Error, Infrared and Laser Total Station instruments, Care and maintenance of Total Station instruments

Module 3: GPS Data Processing and Techniques **5 Hrs.**

GPS observables - code and carrier phase observation - linear combination and derived observables - downloading the data RINEX Format – Differential data processing – softwaremodules -Concepts of rapid, static and kinematic methods-applications

Total Hours:	**15 Hrs.**

Text Books:

1.	Punmia B.C., –Surveying‖ — –Vols. — I, II & III‖, Laxmi publications, New Delhi2016
2.	Kanetkar T.P, Kulkarni S.V., —Surveying and Levelling‖, Vols. I and II, Standard publishers Distributors, New Delhi 2015.

3.	Anji Reddy M., Remote Sensing and Geographical Information System, B.S. Publications, 2012
Suggested Readings:	
1.	Purushothamaraj.P, —Surveying –I & II‖ Laxmi Publications, 2012.
2.	James M.Anderson and Edward M. Mikhali, —Surveying, Theory and Practice‖, 7th Edition, McGraw Hill, 2017
3.	Satheesh Gopi, Rasathishkumar, N.Madhu, —Advanced Surveying, Total Station GPS andRemote sensing‖ Pearson education, 2017.
4.	Arora K.R., —Surveying Vol I & II‖, Standard book house, 2015
Web References:	
1.	http://www.textofvideo.nptel.iitm.ac.in/105107121/lec3.pdf
2.	https://books.google.co.in/books?id=dF3oDzQ6KZgC&printsec=frontcover&dq=inauthor:%22C+Venkatramaiah%22&hl=en&sa=X&ved=0ahUKEwi3gfG_5eneAhXRdCsKHQZHBh0Q6AEILTAB#v=onepage&q&f=false
3.	http://www.textofvideo.nptel.iitm.ac.in/105107121/lec3.pdf
Online Resources:	
1.	http://www.nptel.ac.in/courses/105107122
2.	http://www.nptel.ac.in/courses/105104101

23VA103	ARC GIS FOR CIVIL ENGINEERS	0/0/0/1
Nature of Course	Theory Practical	
Prerequisites	Nil	

Course Objectives:

1.	Insights of general overview about the essential GIS concepts and about al the basic skills needed in handling ArcGIS
2.	Learn about GIS key tools in an appropriate and professional way, usage of vector and raster data information in order to develop different operations and spatial analysis.
3.	Skill to overcome all possible difficulties which you may encounter in the execution of GIS projects, and their solutions through practical exercises.
4.	Gain experience in data preparation, layout development, map creation and high quality products delivery

Course Outcomes:

Upon completion of the course, students shall have the ability to

C103.1	Understand the basic components involved in ArcGIS techniques	[U]
C103.2	Illustrate the Geo-referencing and map projection system and its application in GIS	[AP]
C103.3	Apply the concepts of data analysis and data models involved in GIS	[AP]
C103.4	Interpret the spatial data with Arcgis for creating and organizing layers.	[AP]
C103.5	Identify field applications of GIS in various resource management	[AP]
C101.6	Analyze the concepts involved in GIS by using 3D visualization techniques.	[AP]

Course Contents:

Module 1: Fundamentals of ArcGIS **5 Hrs.**

Introduction to GIS and GPS - Resolution and its types - Digital Image Processing - Spatial data model - Database management Systems (DBMS) - Geo Database (GDB) - Geo-referencing and its types - ArcMap.

Module 2: Data integration and layering **5 Hrs.**

Geographic coordinate systems - Projected coordinate systems, accessing and evaluation of GIS data - Layers and data, importing data into the geodatabase – Managing and organizing map layers

Module 3: Data analysis and visualization **5 Hrs.**

Utilizing GIS database, Symbols and map visualization, Data visualization, working with tabular data - Creating and editing data - Labeling features - CAD data input to ArcGIS - Performing spatial analysis - Solving spatial problems

Total Hours:	**15 Hrs**

Text Books:

1.	Lo, C.P. and Yeung, Albert K.W., Concepts and Techniques of Geographic Information Systems, Pearson, 2016.
2.	Wilpen L. Gorr, Kristen S. Kurland, GIS Tutorial for ArcGIS Pro 2.6, Esri Press, 2020.
3.	Michael Law, Amy Collins, Getting to Know ArcGIS Desktop 10.8, Esri Press, 2021.
Suggested Readings:	
1.	Kang-tsung Chang, Introduction to Geographic Information Systems: 9th Edition, 9781259929649, McGraw-Hill Education, 2018.
2.	Paul Bolstad, GIS Fundamentals, XanEdu Publishing Inc.,2016.
3.	Anji Reddy.M, Text book of Remote sensing and GIS, B.S.Bublications., 2019.
4.	David Smith, Nathan Strout, Christian Harder, Steve Moore, Tim Ormsby and Thomas Balstrm, Understanding GIS: An ArcGIS Pro Project Workbook, Esri Press, 2018.
Web References:	
1.	https://www.arcgis.com/index.html
2.	https://www.esri.com/en-us/arcgis/about-arcgis/overview
3.	https://libguides.utk.edu/gistraining/arcgis
Online Resources:	
1.	ArcGIS Level 1: GIS & ArcMap, ArcCatalog, ArcGlobe, ArcScene by Udemy.
2.	https://mgimond.github.io/ArcGIS_tutorials/index.html
3.	https://gis.harvard.edu/arcgis-desktop-and-server-tutorials

23VA106	3D BUILDING MODELING USING REVIT ARCHITECTURE	0/0/0/1
Nature of Course	Theory Practical	
Pre-requisite	Engineering Graphics, Architectural Planning and Building Drawing	

Course Objectives:

1.	To understand the building information modelling methodology and its benefits
2.	To learn and get familiar with 3D design and drawing of a building in Autodesk Revit Architecture
3.	To create full 3D architectural project models and set them up in working drawings.
4.	To know data inputs (including CAD) and produce federated project deliverables

Course Outcomes:
Upon completion of the course, students shall have ability to

C106.1	Understand the concepts and benefits of Building Information Modelling	[U]
C106.2	Apply fundamental concepts and features of Autodesk Revit Architecture	[AP]
C106.3	Apply parametric 3D design tools to start designing projects	[AP]
C106.4	Develop higher-quality, more accurate architectural designs	[AP]
C106.5	Demonstrate various Annotation techniques and Rendering tools.	[AP]

Course Contents:

Module 1: Fundamentals of Revit Architecture **5 Hrs.**
Building Information Modelling for architectural, - Revit Architecture user interface - Common modification tools - Viewing the model, Controlling Object Visibility - Elevation and Section Views - 3D Views - Perspective view - Adding and Modifying Levels.

Module 2: Projects and Families **5 Hrs.**
Creating Project Templates - Walls and Curtain walls, Floors and Roofs, Stairs and Railings, Process for creating a staircase by sketch, Creating the generic railing - Adding Families: Creating families, loading families, placing families, Editing families in project.

Module 3: Annotation, Documentation and Output **5 Hrs.**
Temporary Dimensions - Permanent Dimensions – 3D Text - Creating Legends - Working with Schedules - Sheets and Title blocks - Print setup - Setting for exporting content - Process of exporting views to CAD formats.

Total Hours:	**15 Hrs.**

Suggested Readings

1	Elise Moss “Autodesk Revit 2021 Architecture Basics”, SDC Publications, 2020

2	Munir Hamad “Autodesk Revit 2020 Architecture”, Stylus Publishing, LLC, 2019
3	Douglas R. Seidler “Revit Architecture 2020 for Designers”, Bloomsbury Academic, 2019
4	Autodesk, Inc. “Revit Architecture 2011 user’s guide”, Autodesk, Inc. 2011
Web References:	
1.	https://images.autodesk.com/adsk/files/revit_architecture_2011_user_guide_en.pdf
2.	http://www-classes.usc.edu/engr/ce/107/revit_guide.pdf
Online Resources:	
1.	https://www.autodesk.com/products/revit/overview?term=1-YEAR&tab=subscription
2.	https://www.autodesk.in/products/revit/overview?term=1-YEAR&tab=subscription

23VA105	Project Management Using Primavera	0/0/0/1

Nature of Course	Theory Practical
Prerequisites	Nil

Course Objectives:

1.	To understand the relationships and constraints between activities
2.	To define the roles and resources for various activities
3.	To create organization and work breakdown structure of a project
4.	To maintain project documents library and manage multiple projects

Course Outcomes:
Upon completion of the course, students shall have the ability to

C105.1	Understand the fundamental principles of project management	[U]
C105.2	Construct relationship between activities and maintain the project sequence	[AP]
C105.3	Compute the roles and resources for each activity of a project	[AP]
C105.4	Analyze the resource availability and cost involved in a project	[AN]
C105.5	Analyze the risk involved in time and cost and demonstrate the report performance and documentation	[AN]

Course Contents:

Module 1: Planning and Scheduling of construction projects **5 Hrs.**

Introduction, Primavera P6, EPS, OBS, creating a project, Project dates, Calendar and types, WBS, Activity types and codes, Logical relationships, Types of relationships, Feeding activity information to execution team, Scheduling, Constraints and types.

Module 2: Resource and Cost Management **5 Hrs.**

Resource types, Maximum units of time, Resource price revision, assigning resources to activities, Roles, Resource leveling and smoothing, Activity costs, Budgeted and Actual cost of activities, Project Budgets, Cost comparison analysis, Budget revisions

Module 3: Monitoring and Controlling of Projects **5 Hrs.**

Baseline and actual schedule, Progress Update, Delay Impact analysis, Earned value analysis, S Curve Analysis, Project threshold, Project Tracking, Visualizer tool, Reports, Global and Project reports, Report Editor, Cost reports, Schedule reports, Client reports.

Total Hours:	**15 Hrs**

Text Books:

1	Paul Harris , Planning and Control using Oracle Primavera P6 version, Eastwood Harris Pty Ltd, 2015.
2	P. Vinayagam and A. Vimala, Planning and Managing Projects with PRIMAVERA (P6) Project Planner. I K International Publishing House, 2016.

3	Daniel Williams, Oracle Primavera P6 Version 8: Project and Portfolio Management Paperback, Packt Publishing Limited, 2012.
Suggested Readings:	
1	P. Sham, Exploring Oracle Primavera P6 R8.4, Cadcim Technologies, 2012.
2	Stephen Kelly, Oracle Primavera Contract Management, Business Intelligence Publisher Edition v14, Packt Publishing, 2012.
3	Dibyaranjan Maharana, Primavera P6 Professional Project Management Paperback, Create space Independent Publishing Platform, 2017.
4	Mary Jane Beaufrand, Primavera, 2009.
Web References:	
1	https://learn.oracle.com/ols/course/primavera-p6-project-management/53065/92446/154779
2	https://education.oracle.com/oracle-cloud-learning-subscriptions
3	https://www.linkedin.com/learning/primavera-p6-essential-training
Online Resources:	
1	https://www.coursera.org/lecture/construction-scheduling/primavera-p6-overview- 7cC78
2	https://www.edx.org/learn/project-management
3	https://www.schedulereader.com/blog/top-15-books-to-learn-primavera-p6/