



**Prof. Ram Meghe Institute of Technology and
Research Badnera -444701**

**An Autonomous College Affiliated to
Sant Gadge Baba Amravati University,
Amravati, Maharashtra (India)**

**PROGRAMME SCHEME &
SYLLABI
2025-2026**

**B. Tech
(Civil Engineering)**



**Prof. Ram Meghe Institute Of Technology And Research,
Badnera - Amravati.**

**Published By
Principal**

Prof. Ram Meghe Institute Of Technology And Research, Badnera - Amravati

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: I (GROUP-A/GROUP-B)																		
Sr. No.	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours/ Week			Group	TotalHours/ Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks	Max. Marks			Int.	Ext.		
Theory																		
1	1SF01	Applied Mathematics - I	3	--	--	BSC	3	3	3	60	30	10	100	40	--	--	--	--
2	1SF02	Applied Physics	3	--	--	BSC	3	3	3	60	30	10	100	40	--	--	--	--
3	1SF03	Engineering Graphics	2	--	--	ESC	2	2	3	60	30	10	100	40	--	--	--	--
4	1SF04	Programming for Problem Solving	2	--	--	ESC	2	2	3	60	30	10	100	40	--	--	--	--
5	1SF05	Professional Communication Skills*	1	1	--	AEC	2	2	--	--	--	50	50	25	--	--	--	--
6	1SC01	Fundamentals of Civil Engineering	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
7	1SF06	Design Thinking *	1	--	--	VEC	1	1	--	--	--	50	50	25	--	--	--	--
Practical																		
8	1SF07	Applied Physics Lab	--	--	2	BSC	2	1	--	--	--	--	--	--	25	25	50	25
9	1SF08	Engineering Graphics Lab	--	--	2	ESC	2	1	--	--	--	--	--	--	25	25	50	25
10	1SF09	Programming for Problem Solving Lab	--	--	2	ESC	2	1	--	--	--	--	--	--	25	25	50	25
11	1SC02	Fundamentals of Civil Engineering Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
12	1SF10	NSS/Sports/Yoga/Cultural/ Community Service **	--	--	2	LLC	2	1	--	--	--	--	--	--	50	--	50	25
		Total	15	1	10		26	21					600				250	
																Total		850

* Assessment will be based on Unit Tests, Assignments and Case Studies
 ** Assessment will be based on participation in associated activities of not less than 30 hours

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: II (GROUP-A/GROUP-B)																		
Sr. No.	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours/ Week			Group	TotalHours/ Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks	Max. Marks			Int.	Ext.		
Theory																		
1	2SF01	Applied Mathematics - II	3	--	--	BSC	3	3	3	60	30	10	100	40	--	--	--	--
2	2SF02	Applied Chemistry	3	--	--	BSC	3	3	3	60	30	10	100	40	--	--	--	--
3	2SF03	Basics of Electrical Engineering	2	--	--	ESC	2	2	3	60	30	10	100	40	--	--	--	--
4	2SF04	Biology for Engineers	2	--	--	BSC	2	2	3	60	30	10	100	40	--	--	--	--
5	2SF05	Universal Human Values*	2	--	--	VEC	2	2	--	--	--	50	50	25	--	--	--	--
6	2SCM01	Engineering Mechanics	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
7	2SF06	Indian Knowledge Systems *	2	--	--	IKS	2	2	--	--	--	50	50	25	--	--	--	--
Practical																		
8	2SF07	Applied Chemistry Lab	--	--	2	BSC	2	1	--	--	--	--	--	--	25	25	50	25
9	2SF08	Basic of Electrical Engineering Lab	--	--	2	ESC	2	1	--	--	--	--	--	--	25	25	50	25
10	2SCM02	Engineering Mechanics Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
11	2SF09	Workshop/Digital Fabrication Lab	--	--	2	ESC	2	1	--	--	--	--	--	--	25	25	50	25
		Total	17		8		25	21					600				200	
															Total		800	

* Assessment will be based on Unit Tests and Assignments

Exit Option: To qualify for Certificate in Civil Engineering

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	4
AND	
Internship (Min 60 hrs)	4
Tota	8

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: IV																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours / Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA/IA			Int.	Ext.		
Theory																		
1	4SC01	Structural Analysis - I	3	–	–	PCC	3	3	3	60	30	10	100	40	–	–	–	–
2	4SC02	Geotechnical Engineering-I	3	–	–	PCC	3	3	3	60	30	10	100	40	–	–	–	–
3	4SC03	Environmental Engineering - I	3	–	–	PCC	3	3	3	60	30	10	100	40	–	–	–	–
4	4SCMDM1	MDM-1	3	–	–	MDM	3	3	3	60	30	10	100	40	–	–	–	–
5	4SCOE2	OE-2	3	–	–	OE	3	3	3	60	30	10	100	40	–	–	–	–
6	4SC04	Technical Report Writing*	2	–	–	AEC	2	2	–	–	–	50	50	25	–	–	–	–
7	4SC05	Entrepreneurship Development*	2	–	–	EEMC	2	2	–	–	–	50	50	25	–	–	–	–
Practicals																		
8	4SC06	Geotechnical Engineering-I Lab	–	–	2	PCC	2	1	–	–	–	–	–	–	25	25	50	25
9	4SC07	Environmental Engineering-I Lab	–	–	2	PCC	2	1	–	–	–	–	–	–	25	25	50	25
10	4SC08	Building Planning Designing & CAD	–	–	2	PCC	2	1	–	–	–	–	–	–	25	25	50	25
11	4SC09	Field Project	–	–	4	ELC	4	2	–	–	–	–	–	–	25	25	50	25
Total			19		10		29	24					600				200	
															Total		800	

OE-2 :

4SCOE2A : Fundamentals of Vastushastra ;

4SCOE2B : Basics of Geology ;

4SCOE2C : Principle of Management

* Assessment will be based on Unit Tests and Assignments

Exit Option: To qualify for Diploma in Civil Engineering

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	4
AND	
Internship (Min 60 hrs)	4
Total	8

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute)
Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: V																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours / Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA/IA			Int.	Ext.		
Theory																		
1	5SC01	Geotechnical Engineering - II	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
2	5SC02	Design of Reinforced Concrete Structure	3	--	--	PCC	3	3	4	60	30	10	100	40	--	--	--	--
3	5SC03	Environmental Engineering - II	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
4	5SC04	PEC-1	3	--	--	PEC	3	3	3	60	30	10	100	40	--	--	--	--
5	5SCMDM2	MDM-2	3	--	--	MDM	3	3	3	60	30	10	100	40	--	--	--	--
6	5SCOE3	OE-3	3	--	--	OE	3	3	3	60	30	10	100	40	--	--	--	--
Practicals																		
7	5SC05	Geotechnical Engineering - II Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
8	5SC06	Design of Reinforced Concrete Structure Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
9	5SC07	Environmental Engineering - II Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
10	5SC08	PEC-2	--	--	2	PEC	2	1	--	--	--	--	--	--	25	25	50	25
Total			18		8		26	22					600				200	
															Total		800	

PEC-1:- 5SC04PE1A: Hydrology & Water Resources Engineering;

PEC-2 :- 5SC08PE2A : CAD of Structure;

5SC08PE2E: Software Lab -T. E.

OE-3 :- 5SCOE3B : Intellectual Property Rights;

5SC04PE1B: Irrigation and Hydraulic Structures;

5SC08PE2B : Building Information Modelling;

5SCOE3C : Farming System in Agriculture;

5SC04PE1C: Ground Improvement Techniques;

5SC08PE2C : Software Lab -E.E.

5SCOE3D : Aptitude for Engineers

5SC04PE1D: Dam Engineering

5SC08PE2D : Software Lab -G. E.

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SEMESTER: VI																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours/ Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA/IA			Int.	Ext.		
Theory																		
1	6SC01	Design of Steel Structure	3	--	--	PCC	3	3	4	60	30	10	100	40	--	--	--	--
2	6SC02	Surveying - II	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
3	6SC03	Fluid Mechanics	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
4	6SC04	PEC-3	3	--	--	PEC	3	3	3	60	30	10	100	40	--	--	--	--
5	6SC05	PEC-4	3	--	--	PEC	3	3	3	60	30	10	100	40	--	--	--	--
6	6SCMDM3	MDM-3	3	--	--	MDM	3	3	3	60	30	10	100	40	--	--	--	--
7	6SDMP	Disaster Management and Preparedness*	2	--	--	VEC	2	--	--	--	--	--	--	--	--	--	--	--
Practical																		
7	6SC06	Design of Steel Structure Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
8	6SC07	Surveying - II Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
9	6SC08	Fluid Mechanics Lab	--	--	2	VSEC	2	1	--	--	--	--	--	--	25	25	50	25
10	6SC09	NMCP Lab	--	--	2	VSEC	2	1	--	--	--	--	--	--	25	25	50	25
Total			20		8		28	22					600				200	
															Total		800	

*Non Credit Compulsory Course, Assessment will be based on Unit Tests, Assignments and Case Studies

PEC-3 :- 6SC04PE3A : Docks, Harbour and Airport Engineering; 6SC04PE3B : Repairs & Rehabilitation of Structures; 6SC04PE3C : Sustainable Construction Materials; 6SC04PE3D : Watershed Engineering & Management
PEC-4 :- 6SC05PE4A : Advanced Geotechnical Engineering; 6SC05PE4B : Sustainable and Green Construction Techniques; 6SC05PE4C : Solid Waste Management

Exit Option: To qualify for Diploma in Civil Engineering

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	4
AND	
Internship (Min 60 hrs)	4
Total	8

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Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: VII																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours / Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA/IA			Int.	Ext.		
Theory																		
1	7SC01	Structural Analysis - II	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
2	7SC02	Quantity Survey and Estimate	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
3	7SC03	PEC-5	3	--	--	PEC	3	3	3	60	30	10	100	40	--	--	--	--
4	7SC04	PEC-6	3	--	--	PEC	3	3	3	60	30	10	100	40	--	--	--	--
5	7SCMDM4	MDM-4	3	--	--	MDM	3	3	3	60	30	10	100	40	--	--	--	--
Practicals																		
6	7SC05	Quantity Survey and Estimate Lab			2	PCC	2	1							25	25	50	25
7	7SC06	Research Methodology	--	--	4	ELC	4	2	--	--	--	--	--	--	50	--	50	25
8	7SC07	Project	--	--	12	ELC	12	6	--	--	--	--	--	--	100	100	200	100
Total			15		18		33	24					500				300	
															Total		800	

PEC-5 :- 7SC03PE5A : Engineering Hydraulics; 7SC03PE5B : Traffic Engineering & Management ; 7SC03PE5C : Water Power Engineering; 7SC03PE5D : Matrix Method of Structural Analysis
PEC-6 :- 7SC04PE6A : Advanced Design of RCC Structures 7SC04PE6B : Industrial Waste Water Treatment; 7SC04PE6C : Advanced Water Treatment; 7SC04PE6D : Pre-stressed Concrete Structures

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Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern)
Branch : Civil Engineering

SEMESTER: VIII																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hours / Week	Credits	THEORY						PRACTICAL			
			Lecture	Tutorial	P/D				Duration of paper (Hrs)	Max. Marks ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max. Marks		Total	Min. Passing Marks
											Max. Marks Internal Assessment	Max. Marks TA			Int.	Ext.		
Theory																		
1	8SC01	Construction Project Management *	3			PCC	3	3	3	60	30	10	100	40				
2	8SC02	Earthquake Resistant Design*	3			PCC	3	3	3	60	30	10	100	40				
Practicals																		
5	8SC03	Internship/OJT/Apprenticeship			24	ELC	24	12							150	150	300	150
Total			6		24		30	18					200				300	
															Total		500	

* Students should complete above subject in online mode.

Sem	SEM I	SEM II	SEM III	SEM IV	SEM V	SEM VI	SEM VII	SEM VIII	Total Credits
Credit	21	21	22	24	22	22	24	18	174

***MDM BASKETS OF COURSES FOR ALL Departments**

MDM Basket/ Track Name	Sr. No.	Course Code	Course Name	Semester	Students from following Departments can Register	Offered by Department of
Artificial Intelligence	1	4SAMDM1	Artificial Intelligence and Expert Systems	IV	CE, CSE, EXTC, IT, CSE(IoT), ME	Artificial Intelligence and Data Science
	2	5SAMDM2	Applied Artificial Intelligence	V		
	3	6SAMDM3	Generative Artificial Intelligence	VI		
	4	7SAMDM4	Safe and Responsible Artificial Intelligence Systems	VII		
Data Science	1	4SAMDM5	Programming for Data Science	IV	CE, CSE, EXTC, IT, CSE(IoT), ME	
	2	5SAMDM6	Business Intelligence and Analytics	V		
	3	6SAMDM7	Data Engineering	VI		
	4	7SAMDM8	Ethics in Data Science	VII		
Civil Engineering	1	4SCMDM1	Introduction to Environmental Engineering	IV	AI&DS, CSE, EXTC, IT, CSE(IoT), ME	Civil Engineering
	2	5SCMDM2	Introduction to Water Resource Engineering	V		
	3	6SCMDM3	Introduction to Transportation Engineering	VI		
	4	7SCMDM4	Basics of Structural Analysis	VII		
Construction Technology	1	4SCMDM5	Building Planning	IV	AI&DS, CSE, EXTC, IT, CSE(IoT), ME	
	2	5SCMDM6	Construction Materials	V		
	3	6SCMDM7	Basics of Surveying	VI		
	4	7SCMDM8	Basics of Geotechnical Engineering	VII		
Computer Science and Engineering	1	4SKMDM1	Fundamentals of Data Structures	IV	CE, EXTC, CSE(IoT), ME	Computer Science and Engineering
	2	5SKMDM2	Introduction to Algorithms	V		
	3	6SKMDM3	Database Management System	VI		
	4	7SKMDM4	Basics of Enterprise Resource Planning	VII		
Software Engineering	1	4SKMDM5	Software Requirements Engineering	IV	AI&DS, CE, EXTC, IT, CSE(IoT), ME	
	2	5SKMDM6	Software Architecture	V		
	3	6SKMDM7	Software Project Management	VI		
	4	7SKMDM8	Software Testing and Quality Assurance	VII		

* indicates that the Track for MDM will be decided by respective Board of Studies (BoS)

***MDM BASKETS OF COURSES FOR ALL Departments**

Electronics and Communication Engineering	1	4SEMDM1	Electronic Instrumentation	IV	AI&DS, CE, CSE, IT, CSE(IoT), ME	Electronics and Telecommunication Engineering
	2	5SEMDM2	Electronic Devices and Circuits	V		
	3	6SEMDM3	Analog and Digital Communication	VI		
	4	7SEMDM4	Electronic Circuit Design	VII		
Telecommunication Engineering	1	4SEMDM5	Basic Electronic Communication Systems	IV	AI&DS, CE, CSE, IT, ME	
	2	5SEMDM6	Introduction to Wireless Communication	V		
	3	6SEMDM7	Introduction to Mobile Computing	VI		
	4	7SEMDM8	Satellite and Optic Fiber Communication	VII		
Information Technology	1	4SNMDM1	Data Transmission and Information Technology	IV	AI&DS, CE, CSE, EXTC, CSE(IoT), ME	Information Technology
	2	5SNMDM2	Data Communication Networks	V		
	3	6SNMDM3	E-Commerce	VI		
	4	7SNMDM4	Management Information Systems	VII		
Cyber Security	1	4SNMDM5	Introduction to Cyber Security	IV	CE, EXTC, CSE(IoT), ME	
	2	5SNMDM6	Fundamentals of Cryptography	V		
	3	6SNMDM7	Basics of Ethical Hacking	VI		
	4	7SNMDM8	Blockchain Technology	VII		
Mechanical Engineering	1	4SMMDM1	Energy Engineering	IV	AI&DS, CE, CSE, EXTC, IT, CSE(IoT)	Mechanical Engineering
	2	5SMMDM2	Automobile Engineering and Electric Vehicles	V		
	3	6SMMDM3	Industrial Engineering	VI		
	4	7SMMDM4	Industrial Automation	VII		
Robotics and Automation Engineering	1	4SMMDM5	Mechatronics	IV	AI&DS, CE, CSE, EXTC, IT, CSE(IoT)	
	2	5SMMDM6	Rapid Prototyping	V		
	3	6SMMDM7	Automation Engineering	VI		
	4	7SMMDM8	Robotics and industrial Application	VII		
Internet of Things	1	4SXMDM1	Fundamentals of IoT	IV	AI&DS, CE, CSE, EXTC, IT, ME	Computer Science & Engineering(IoT)
	2	5SXMDM2	Sensors and Actuators	V		
	3	6SXMDM3	Single Board Computers	VI		
	4	7SXMDM4	Industrial Internet of Things	VII		

*** indicates that the Track for MDM will be decided by respective Board of Studies (BoS)**

DOUBLE MINOR (SPECIALIZATION) BASKETS OF COURSES FOR ALL DEPARTMENTS

Double Minor / Specialization Minor Basket Track Name	Sr. No.	Course Code	Course Name	Semester	Students from following Departments can Register	Offered by Department of
Advanced Programming	1	3SASM	Programming Language for Data Science	III	CSE, CE, EXTC, IT, CSE(IoT), ME	Artificial Intelligence and Data Science
	2	4SASM	Advanced Java Programming	IV		
	3	5SASM	Mobile Application Development	V		
	4	6SASM	Introduction to Gaming	VI		
	5	7SASM	Introduction to Software Development Platform (GitHub)	VII		
	6	8SASM	Databases and SQL for Data Science	VIII		
Construction Management and Environmental Engineering	1	3SCSM	Environmental Pollution and Control	III	AI&DS, CSE, EXTC, IT, CSE(IoT), ME	Civil Engineering
	2	4SCSM	Water Treatment Engineering	IV		
	3	5SCSM	Waste Water Treatment Engineering	V		
	4	6SCSM	Project Management and Planning	VI		
	5	7SCSM	Construction Material Management	VII		
	6	8SCSM	Construction Quality Management	VIII		
Web Technology	1	3SKSM	Introduction of HTML	III	AI&DS, CE, EXTC, IT, CSE(IoT), ME	Computer Science and Engineering
	2	4SKSM	Javascript	IV		
	3	5SKSM	Web Engineering	V		
	4	6SKSM	Cloud Technology	VI		
	5	7SKSM	Distributed Database	VII		
	6	8SKSM	User Experience Design	VIII		
Embedded System	1	3SESM	Fundamentals of Digital Electronics	III	AI&DS, CE, CSE, IT, ME	Electronics and Telecommunication Engineering
	2	4SESM	Digital System Design	IV		
	3	5SESM	Introduction to Microprocessors	V		
	4	6SESM	Microcontroller and Applications	VI		
	5	7SESM	Advanced Microcontrollers	VII		
	6	8SESM	Embedded System and RTOS	VIII		

DOUBLE MINOR (SPECIALIZATION) BASKETS OF COURSES FOR ALL DEPARTMENTS

Information Processing	1	3SNSM	Fundamentals of Information Technology	III	CE, CSE, EXTC, CSE(IoT), ME	Information Technology
	2	4SNSM	Database Processing	IV		
	3	5SNSM	Network Processing	V		
	4	6SNSM	Data Mining and Warehousing	VI		
	5	7SNSM	Data Visualaization	VII		
	6	8SNSM	Big Data Processing	VIII		
Manufacturing Techniques	1	3SMSM	Manufacturing Processes-I	III	AI&DS, CE, CSE, EXTC, IT, CSE(IoT),	Mechanical Engineering
	2	4SMSM	Manufacturing Processes -II	IV		
	3	5SMSM	Modern Manufacturing Techniques	V		
	4	6SMSM	Production Management	VI		
	5	7SMSM	Productivity Techniques	VII		
	6	8SMSM	Computer Integrated Manufacturing	VIII		
Industrial IoT	1	3SXSM	Introduction to Internet of Things	III	AI&DS, CE, CSE, EXTC, IT, ME	Computer Science & Engineering(IoT)
	2	4SXSM	Industrial Sensors and Actuators	IV		
	3	5SXSM	Edge and Fog Computing	V		
	4	6SXSM	Embedded System for Internet of Things	VI		
	5	7SXSM	Application of IoT in Healtcare and Agriculture	VII		
	6	8SXSM	Internet of Things Security	VIII		

Honors Baskets of Courses for all Departments

Name of Department	Sr. No.	Course Code	Course Name	Semester
Artificial Intelligence and Data Science	1	4SAH	Advanced Programming for Data Science	IV
	2	5SAH	Advanced Data Science and Analytics	V
	3	6SAH	Business and Web Analytics	VI
	4	7SAH	Data Engineering	VII
	5	8SAH1	Deep Learning and its Applications	VIII
	6	8SAH2	Minor Project	VIII
Civil Engineering	1	4SCH	Air Pollution and Control	IV
	2	5SCH	Structural Dynamics	V
	3	6SCH	Geographic Information Systems	VI
	4	7SCH	Advanced Foundation Engineering	VII
	5	8SCH1	Finite Element Method	VIII
	6	8SCH2	Minor Project	VIII
Computer Science and Engineering	1	4SKH	Data Science and Analytics	IV
	2	5SKH	Natural Language Processing and Text Analytics	V
	3	6SKH	Artificial Neural Network	VI
	4	7SKH	Optimization Techniques for Data Analytics	VII
	5	8SKH1	Computer Vision	VIII
	6	8SKH2	Minor Project	VIII
Electronics and Telecommunication Engineering	1	4SEH	PLC & SCADA	IV
	2	5SEH	Electronics Circuit Design	V
	3	6SEH	Cognitive Radio	VI
	4	7SEH	Biomedical Signal Processing	VII
	5	8SEH1	VLSI Design Verification and Testing	VIII
	6	8SEH2	Minor Project	VIII

Honors Baskets of Courses for all Departments

Information Technology	1	4SNH	Advanced Data Science	IV
	2	5SNH	Artificial Neural Network	V
	3	6SNH	Advanced Artificial Intelligence	VI
	4	7SNH	Advanced Machine Learning	VII
	5	8SNH1	Advanced Speech and Natural Language Processing	VIII
	6	8SNH2	Minor Project	VIII
Mechanical Engineering	1	4SMH	Energy Audit	IV
	2	5SMH	Computer Aided Design	V
	3	6SMH	Advance Heat Transfer	VI
	4	7SMH	3D Printing and Application	VII
	5	8SMH1	Design of Transmission System	VIII
	6	8SMH2	Minor Project	VIII
Computer Science & Engineering (IoT)	1	4SXH	IoT Architectures and Protocols	IV
	2	5SXH	Internet of Things Security	V
	3	6SXH	Embedded Systems and IoT	VI
	4	7SXH	Machine Learning For IoT	VII
	5	8SXH1	Data Science in IoT	VIII
	6	8SXH2	Minor Project	VIII

**Prof. Ram Meghe Institute of
Technology and Research, Badnera-
Amravati
(An Autonomous Institute)
Four Year Under Graduate Degree
Program in Bachelor of Technology
Choice Based Credit System
(Semester Pattern)
Branch: All Branches**

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Prof. Ram Meghe Institute of Technology
and Research, Badnera-Amravati
(An Autonomous Institute)
Four Year Under Graduate Degree
Program in Bachelor of Technology
Choice Based Credit System (Semester
Pattern)

Branch: All Branches

SPECIALIZATION MINOR (SM) BASKET OF COURSES (DOUBLE MINOR) for 4th Sem

Semester: IV																			
Sem	Course Code	Course Name	Teaching Scheme						Total Hrs/ Week	Credits	Examination Scheme								
			Hours / Week			SM Applicable to	Theory	Practical											
			Lecture	Tutorial	P/D						Duration of paper (Hr)	Max Marks Paper ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max Marks		Total
Max Marks MSE/ MSIE	Max. Marks TA	Int.	Ext.																
Theory																			
III	4SASM	Advanced Java Programming	3	--	--	CSE, CE, EXTC, IT, CSE(IoT), ME	3	3	3	60	30	10	100	40	--	--	--	--	
III	4SCSM	Water Treatment Engineering	3	--	--	AI&DS, CSE, EXTC, IT, CSE(IoT), ME	3	3	3	60	30	10	100	40	--	--	--	--	
III	4SKSM	Javascript	3	--	--	AI&DS, CE, EXTC, IT, CSE(IoT), ME	3	3	3	60	30	10	100	40	--	--	--	--	
III	4SESM	Digital System Design	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	--	--	--	--	
III	4SNSM	Database Processing	3	--	--	CE, CSE, EXTC, CSE(IoT), ME	3	3	3	60	30	10	100	40	--	--	--	--	
III	4SXSM	Industrial Sensors and Actuators	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	--	--	--	--	
III	4SMSM	Manufacturing Processes -II	3	--	--	AI&DS, CE, CSE, EXTC, IT, CSE(IoT)	3	3	3	60	30	10	100	40	--	--	--	--	
		Total	3		0		3	3					100						
																Total		100	

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati (An Autonomous Institute) Four Year Under Graduate Degree Program in Bachelor of Technology Choice Based Credit System (Semester Pattern) Branch: All Branches HONORS BASKET OF COURSES for 4th Sem																		
Semester: Fourth to Eighth																		
Se m	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			HONORS course Applicabe Branch	Total Hrs/ Wee k	Credit s	Theory			Practical						
			Lecture	Tutorial	P/D				Duratio n of paper (Hr)	Max Mark s Paper ESE/ ESSE	Internal		Tota l	Overal l Min Passin g Marks	Max Marks		Tota l	Min Passin g Marks
			Max Mark s MSE/ MSIE	Max. Mark s TA	Int.	Ext.												
Theory																		
IV	4SAH	Advanced Programming for Data Science	3	--	--	AI & DS		3	3	60	30	10	100	40	--	--	--	--
IV	4SCH	Air Pollution and Control	3	--	--	Civil Engineering		3	3	60	30	10	100	40	--	--	--	--
IV	4SKH	Data Science and Analytics	3	--	--	Computer Science and Engineering		3	3	60	30	10	100	40	--	--	--	--
IV	4SEH	PLC & SCADA	3	--	--	Electronics and Telecomm. Engineering		3	3	60	30	10	100	40	--	--	--	--
IV	4SNH	Advanced Data Science	3	--	--	Information Technology		3	3	60	30	10	100	40	--	--	--	--
IV	4SXH	IoT Architectures and Protocols	3	--	--	Computer Science & Engineering(IoT)		3	3	60	30	10	100	40	--	--	--	--
IV	4SMH	Energy Audit	3	--	--	Mechanical Engineering		3	3	60	30	10	100	40	--	--	--	--
		Total	3					3					100				0	
															Total l		100	

Course Code	Course Title	L	T	P	C
1SF01	Applied Mathematics I	03	00	00	03

Course prerequisite:

1. Basic idea of differential and integral calculus.
2. Fundamental knowledge of trigonometric functions.
3. Essential knowledge of Differential Equation.

Course Learning Objectives:

1. To familiarize with techniques in calculus.
2. To evaluate partial derivatives of explicit, implicit functions, maxima and minima values of the functions.
3. To solve differential equation of certain type of differential equations and its applications.
4. To determine infinite series and their convergence and divergence.

Course Outcomes:

Students will be able to:

1. Make use of derivatives for finding nth derivatives and to solve indeterminate forms.
2. Extend the basic ideas of the calculus of functions of single variables to functions of several variables and its concept.
3. Find maximum and minimum value of a function.
4. Solve certain types of differential equations by various methods.
5. Utilize it for engineering problems of electrical circuit.
6. Determine infinite series and their convergence and divergence.

	Subject: Applied Mathematics I	L
Unit I	Differential Calculus I: Successive differentiation, Leibnitz's theorem on the nth derivative of a product, Indeterminate forms.	7
Unit II	Differential Calculus II: Partial differentiation, Euler's theorem on homogeneous function.	6
Unit III	Differential Calculus II: Partial differentiation, Euler's theorem on homogeneous function.	7
Unit IV	Ordinary differential equations of first order and first degree: Non homogeneous differential equation, Linear differential equation, reducible to Linear differential equation, Exact differential equation and reducible to Exact differential equation.	7
Unit V	Differential equations of first order and higher degree: Solvable for p, solvable for x and solvable for y, Application to Orthogonal Trajectories and Electrical circuits by Kirchhoff's law.	6
Unit VI	Infinite Series: Tests for convergence by p-series test, Comparison test, Ratio test, Rabbe's test and Root test.	7
	Total	40

Text Books:

1. Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics Vol.-I & II, Pune V.G. Prakashan, Pune.
2. Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.

Reference Books:

1. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
2. Ramana B.V. - Higher Engineering Mathematics, (TMH).
3. Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH).
4. Dass H. K. – Advance Engineering Mathematics, S. Chand.

Course Code	Course Title	L	T	P	C
1SF02	Applied Physics	03	00	00	03

Course Prerequisites:

- 1) Elementary idea about electric charge, electricity & magnetism.
- 2) Basic knowledge of material science.
- 3) Fundamental knowledge of optics.

Course Learning Objectives:

- 1) To impart the essential knowledge and applications of ballistics of charged particles in electric and magnetic fields.
- 2) To impart the fundamentals of optics, fiber optics and laser physics and their various applications in engineering fields.
- 3) To impart the knowledge of crystallography, fluid dynamics and cathode ray oscilloscope and their applications.
- 4) To enhance the imagination and creativity in students by performing practical experiments on related topics.

Course Outcomes:

Students will be able to,

- 1) Apply the concepts of electric and magnetic fields in mass spectrograph and Cathode Ray Oscilloscope.
- 2) The students will gain the basic ideas about crystallography and will be able to identify different types of crystal structures in solids.
- 3) The students will be able to utilize the knowledge of interference and diffraction.
- 4) The students will gain the knowledge of LASER, its types and applications.
- 5) The students will acquire the knowledge of fibre optics, its types and applications.
- 6) The students will gain the knowledge of fluid dynamics and its applications.

	Subject: Applied Physics	L
UNIT I	Electron Ballistics: Motion of charged particle in uniform transverse electric and transverse magnetic fields, velocity selector (energy filter), Bainbridge mass spectrograph, Hall effect, cathode ray oscilloscope : working and its block diagram.	8
UNIT II	Crystallography: Crystal structure, Unit cell, Cubic crystal structure: SC, BCC and FCC, Unit cell characteristics: Effective number of atoms per unit cell, atomic radius, coordination number, atomic packing fraction, Miller indices, Bravais lattice Inter-planar distance between adjacent planes.	6

UNIT III	Interference and Diffraction of Light: Fundamental condition of interference, thin film interference due to reflected light, Newton's rings experiment and its applications, Fresnel and Fraunhofer diffraction, plane transmission diffraction grating.	7
UNIT IV	Laser Physics: Absorption, spontaneous and stimulated emission of radiation, population inversion, pumping, metastable state, characteristics and applications of laser, Ruby laser, He-Ne Laser.	6
UNIT V	Fibre Optics: Snell's law, total Internal reflection, construction of optical fibre, acceptance angle and acceptance cone, numerical aperture, types of optical fibre, attenuation, fibre optic communication system.	7
UNIT VI	Fluid Dynamics: Viscosity, Stoke's law, streamline and turbulent flow of liquid, Poiseuille's equation, Continuity equation, Bernoulli's theorem.	6
	Total	40

Text Books:

- 1) R.K.Gaur & S.L.Gupta: Engineering Physics, Dhanpat Rai & Sons.
- 2) Hitendra K. Malik & A.K.Singh: Engineering Physics, Tata McGraw Hill
- 3) M.N. Avadhanulu & P.G. Kshirsagar: Engineering Physics, S.Chand Pub., 2008

Reference Books:

- 1) Orazio Svelto: Principle of Lasers, Springer
- 2) Frank L.Pedrotti, Leno M. Pedrotti, Leno S. Pedrotti: Introduction to optics.

Course Code	Course Title	L	T	P	C
1SF03	Engineering Graphics	02	00	00	02

Course Prerequisites: Nil

1. Knowledge of basic math concepts and terms.
2. Ability to visualize objects in three dimensions.
3. Computer literacy.

Course Learning Objectives:

- 1: To acquire and apply engineering graphics knowledge for communicating ideas, information and instructions.
- 2: To understand the representations of 3D objects and their projections.
- 3: To understand the representations of orthographic and isometric views of objects.
- 4: To introduce & apply different drafting commands of CAD software.

Course Outcomes:

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

1. Use the drawing instruments effectively to dimension the given figures and describe the methods of projection.
2. Construct the various types of plane in different orientation.
3. Apply knowledge of projection to construct different view of regular solid objects
4. Identify the pictorial views of the object.
5. Recognize the pictorial views of the object and construct isometric scale, isometric projection & views
6. Develop the lateral surfaces of primitive solids by using CAD Software.

	Subject: Engineering Graphics	L
UNIT I	Basics of Engineering Drawing and Projection: Introduction to drawing instrument and their uses, concept of dimensioning and scales, geometric construction. Projection of Point, Projection of Line.	04
UNIT II	Projection of Plane: Projection of different types of planes such as triangular plane, square plane, rectangular plane, pentagonal plane, hexagonal plane, circular plane etc. by using change of position method and auxiliary plane method.	04
UNIT III	Projection of Solids: Projection of solids for Prism, Pyramid, Cone and Cylinder.	05
UNIT IV	Orthographic Projection: Construction of elevation, plan and side view of given object by using first and third angle projection methods.	05
UNIT V	Isometric Views and Projection: Construction of isometric scale, isometric views and projection.	06
UNIT VI	Fundamental of CAD Software: Drafting environment and drafting screen, coordinate systems, drafting and dimensioning commands, editing commands, drafting of basic geometrical shapes, display commands, CAD software customization.	06
	Total	30

Text Books:

1. Bhatt N. D. & Panchal V. M. Engineering Drawing, 49th Edn., Charotar Pub. House, Anand, Gujrat, 2007.
2. Shah P. J. – Engineering Drawing, S. Chand Publication, 2008.
3. Dhawan R. K. – Engineering Drawing, S. Chand Publication, (5th edition, 2008).
4. Ingole D.S. – Engineering Graphics, Nirali Publication, Pune (1st Edition 2020).
5. Tickoo Sham – AutoCAD, BPB Publications.

Course code	Course Title	L	T	P	C
1SF04	Programming for Problem Solving	02	00	00	02

Course Prerequisites: Basic Computer Knowledge, Logical Thinking

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of the Programming for Problem Solving

1. Develop a solid understanding of the fundamental concepts of programming and problem-solving, including the input-process-output cycle, algorithms, and program design principles such as top-down and bottom-up approaches.
2. Acquire proficiency in the C programming language, including the ability to write and execute basic C programs, effectively use input-output functions, work with variables, data types, and operators, and understand the concept of program execution.
3. Demonstrate competence in using control constructs such as decision-making statements and looping statements to create efficient and structured programs.

Course Outcomes:

After Successful completion of this course, the student will be able to:

1. Understand the basic concepts of computer organization, program design and Algorithms.
2. Explain the basic structure and fundamentals of C programming.
3. Compare and contrast the decision-making constructs and looping statements in C programming.
4. Understand the concept of arrays and string functions in C language.
5. Demonstrate the ability to write and use the concept of functions.
6. Apply the concepts of pointer declaration, assignment and arithmetic operation

Subject: Programming for Problem Solving		L
Unit-1	Introduction: Characteristics of Computer, Organization of Computer, Input – Process Output Cycle Various Types of Memory (Primary Memory & Secondary Memory), Introduction to C language, Basic structure.	05
Unit-2	C Fundamentals: Program Execution First C Program, Input Output using scanf() and printf(), Data type, Variables, Keywords, Operators and their precedence.	05
Unit-3	C Control construct: Decision making using if, if-else,if-else-if and switch. Looping using for, while, do while, Jumps Statements (break, continue, goto, return), Basic Programs.	05
Unit-4	Array and Strings: Introduction to Array, 1-D array: Declaration & Initialization, 2-D array: Declaration & Initialization, Strings: Declaration & Initialization, String functions.	05

Unit-5	Functions: Function: Pre defined functions; User defined functions, Multi-function Program, Elements of user defined functions, Return value and their types, Function calls, Function Declaration.	05
Unit-6	Pointers: Definition and uses of pointers, pointer declaration, pointer assignment, pointer arithmetic, Pointers and Functions: Call by value and call by reference.	05
	Total	30

Text Book:

- 1) R. S. Salaria : Programming for Problem Solving , Khanna Publication .
- 2) E Balagurusamy: Computing Fundamentals and C Programming- Tata McGraw Hill, Second Edition

Reference Books:

1. Herbert Schildt- C Complete reference (Tata McGraw Hill)
2. Yashwant Kanetkar- Let us C- Seventh Edition

Course Code	Course Title	L	T	P	C
1SF05	Professional Communication Skills	01	01	00	02

Course Prerequisites:

- 1) Basic knowledge of vocabulary and grammar of English.
- 2) Basic knowledge of LSWR skills.

Course Learning Objectives:

- 1) Introduce communication skills and improve vocabulary.
- 2) Enhance the Employability skills and develop problem solving attitude.
- 3) Develop confidence and help them attend interviews successfully.
- 4) Develop the importance of team building and networking.

Course Outcomes:

Students will be able to

- 1) Use words correctly in a sentence.
- 2) Become a competent communicator.
- 3) Express and present their ideas relevant to the given topic.
- 4) Develop critical thinking skills, decision making ability and team spirit.
- 5) To develop skills needed for approaching different types of interviews.
- 6) To become ethical confident individual professionally and socially.

	Subject: Professional Communication Skills	L
Unit I	Communication Skills: Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers	5
Unit II	Unseen passage, vocabulary building (Synonyms & Antonyms, Prefix and Suffix, Error Analysis, one word substitute), developing story on given outline.	5
Unit III	Self-Introduction-organizing the material - introducing the topic – extempore speech Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—Visual presentation	5
Unit IV	Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic -- questioning and clarifying –GD strategies- activities to improve GD skills	5
Unit V	Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview & panel interview – FAQs related to job interviews	5
Unit VI	Recognizing differences between groups and teams- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes.	5
	Total	30

Text Books:

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. Interact English Lab Manual for Undergraduate Students, OrientBlackSwan: Hyderabad, 2016.

3. M.Ashraf Rizvi, Effective technical communication. Tata McGraw-Hill Publishing Company Limited. New Delhi.

Reference Books:

1. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015.
2. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014.
3. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.
4. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011.

Term Work (50 marks):

- 1) **Oral Communication:** Self introduction, Extempore, Group discussion, Presentation, Role plays and Mock interview (Students should complete any two oral activities).
- 2) **Non verbal communication:** Body language, facial expressions, tone of voice.
- 3) **Written communication:** Test (short answers, developing story, expanding an idea, comprehending unseen passage) and Assignments based on the syllabus.

Marking Scheme:-

- 1) Oral activity I: 10 marks
- 2) Oral activity II: 10 marks
- 3) Written test based on syllabus: 10 marks
- 4) Assignments based on syllabus: 10 marks
- 5) Personal Interview: 10 marks

Course Code	Course Title	L	T	P	C
ISC01	Fundamentals of Civil Engineering	3	0	0	3

Course Prerequisites: Nil

Course Learning Objectives:

1. Concepts related to building components and foundation.
2. Application and use of different building components.
3. Application of different masonry and damp-proof course in building.
4. Basic concepts of Surveying.

Course Outcomes:

Students will be able to –

1. Understand Load bearing and Frame structure.
2. Know the types of staircases, doors, windows and other related fixtures.
3. Recognize the various bonds in brick masonry.
4. Understand the objectives and need of surveying instrument.
5. Understand the elements of Transportation Engineering.
6. Understand the physical properties of cement, sand and aggregate.

	Subject: Fundamentals of Civil Engineering	L
UNIT I	Building Foundation Definition, types of buildings as per national building code, components of buildings and their functions, Types of structure – load bearing structure & framed structures, their relative advantages & disadvantages. Foundation: Definition and necessity, Types of foundation – shallow foundation & deep foundations for buildings.	7
UNIT II	Building Components Stairs: Functions, technical terms and types of staircases, Types of Floors: Basement floor, ground floor and upper floors, Roofs: Flat & pitched roof, steel roof trusses, Doors: Purpose& its types, size of door, door frames, Windows: Purpose, types of windows & their suitability, Ventilators, Scaffolding: Purpose, types, suitability.	7
UNIT III	Masonry Construction Definition, Types of Masonry, Brick Masonry: Classification of bricks, tests on bricks, properties of burnt bricks, Brick masonry construction: Technical terms, general principles, commonly used types of bonds and their suitability. Damp proofing: causes of dampness, its effects, various methods of damp proofing.	7
UNIT IV	Introduction to Surveying Definition of surveying, primary divisions, object and classification of surveying, principles of surveying, instruments for chaining and taping, methods of chain and tape surveying, Symbols used in Surveying.	7
UNIT V	Introduction to Transportation Engineering Modes of Transportation, Role of Transportation in National development, Road Transport characteristics,	7

	Classification of Roads, Alignment principles, Traffic Control devices.	
UNIT VI	Introduction to Concrete Technology Cement: Physical properties of Portland cement, types of cement, laboratory tests on cement. Aggregate: Classification of aggregate, physical properties of aggregate, bulking and moisture content, specific gravity, bulk density. Properties of fresh concrete: Workability, mixing, centering & formwork, placing, compaction and curing of concrete.	7
	Total	42

Text Books:

- 1) Sushilkumar: Building Construction, Standard Publishers Distributors.
- 2) T.P. Kanetkar & Kulkarni: Surveying & Levelling Part I
- 3) Gambhir M.L.: Concrete Technology, Dhanpat Rai & Sons
- 4) Khanna S.K. & Justo C.E.: Highway Engineering

Reference Books :

- 1) Mackay W.B.: Building Construction, Vol. I, Longmans.
- 2) Punmia B.C.: Building Construction.
- 3) D. Clarke: Plane and Geodatic Surveying, Volume I

Course Code	Course Title	L	T	P	C
1SF06	Design Thinking	01	00	00	01

Course Prerequisites: Nil

Course Learning

Objectives:

- 1) To familiarize students with design thinking concepts and principles.
- 2) To ensure students can practice the methods, processes and tools of design thinking.
- 3) To ensure students can apply the design thinking approach and have ability to model real world situations.

Course Outcomes:

Students will be able to –

- 1) Understand design thinking principles and concepts.
- 2) Practice the methods, processes, and tools of design thinking.
- 3) Describe the role and purpose of the observation phase.
- 4) Explain the purpose and structure of the point-of-view phase.
- 5) Illustrate the purpose, flow, and importance of the ideate phase.
- 6) Clarify the role and purpose of the prototype phase.

	Subject: Design Thinking	L
Unit I	Fundamentals of Design Thinking: Principles of Design Thinking, the process of Design Thinking, how to plan a Design Thinking project	2
Unit II	Understanding the Design Problem: Search field determination, Problem clarification, Understanding of the problem, Problem analysis, Reformulation of the problem	3
Unit III	Observing the Problem: Observation Phase, Empathetic design, Tips for observing, Methods for Empathetic Design	2
Unit IV	Defining the Problem: Point-of-View Phase, Characterization of the target group, Description of customer needs	3
Unit V	Finding and Selecting Ideas: Ideate Phase, The creative process and creative principles, Creativity techniques, Evaluation of ideas	2
Unit VI	Prototyping: Prototype Phase, Lean Startup Method for Prototype Development, Visualization and presentation techniques	2
	Total	14

Text Books:

- 1) Christian Mueller-Roterberg, Handbook of Design Thinking, Research Gate November 2018.
- 2) Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Amazon books.

Reference Books: Dr. D. Ravindran, Introduction to Design Thinking, Notion Press.

Term Work (50 marks)

Students should complete the following activities

- 1) Participate in a design challenge to solve the real-world problem using design thinking principles.
- 2) Analyze case studies on design thinking application in various industries.
- 3) Design a project that applies design thinking principles to a specific problem or opportunity.

Marking Scheme:-

- 1) Participation in a design challenge -10
- 2) Case Study-10
- 3) Designing of a project-10
- 4) Assignments-10

5) Attendance in theory classes- 10

Course Code	Course Title	L	T	P	C
1SF07	Applied Physics Lab	0	0	2	1

Course Prerequisites:

1. Identify and handle various equipment likes vernier calliper, micrometer screw gauge, multimeter, spectrometer.
2. Basic knowledge of graphical representation of observed values.

Course Learning Objectives:

1. To gain practical knowledge by applying experimental methods to correlate with the theory.
2. Apply the analytical techniques and graphical analysis to the experimental data.
3. To develop basic understanding of various experimental principles involved.

Course Outcomes:

Students will be able to,

1. Develop experimental skills to impart practical knowledge in real time.
2. Understand principle, concept, working and applications of areas in physics and compare the results obtained with theoretical calculations.
3. Conduct experiment and record experimental data, Analyse the obtained data and Draw conclusions from the Laboratory exercise based on the analysed data.

	Subject: Applied Physics Lab
Expt. 1	Study of CRO I: To measure A.C voltage, D.C voltage and frequency using CRO.
Expt. 2	Study of CRO II: To determine frequency of unknown signal by using Lissajous patterns.
Expt. 3	To determine wavelength of monochromatic light by using Newton's Ring experiment.
Expt. 4	To determine wavelength of monochromatic light by using Plane transmission diffraction grating.
Expt. 5	Determination of grating element of diffraction grating, using LASER beam.
Expt. 6	Study of various crystal structures.
Expt. 7	To determine Miller Indices of crystal planes.
Expt. 8	To plot the V-I characteristics of LED and to find it's striking potential.
Expt. 9	To measure the intensity and divergence of given LASER beam.
Expt.10	To determine the coefficient of viscosity using Stoke's law.
Expt.11	Study of Hall effect in semiconductor.
	Total (Minimum 8 particles are to be performed)

Text Books:

1. Dr. Ruby Das & C. S. Robinson: Engineering Physics Practical, Laxmi Publications.
2. Dr. B. Shriniwas Rao: Engineering Physics Practical, Laxmi Publication.

Reference Books:

1. William David Cooper: Electronic Instrumentation and Measurement Techniques, Eastern Economy Edition publications.

Course Code	Course Title	L	T	P	C
1SF08	Engineering Graphics Lab	00	00	02	01

Pre-requisites:

1. Knowledge of basic math concepts and terms.
2. Ability to visualize objects in three dimensions.
3. Computer literacy.

Course Learning Objectives:

1. To understand the concepts of drawing as a language of communication of Engineers
2. To improve the visualization skills for better understanding of solids using CAD software.
3. To acquire skills to interpret and convert multi-views drawing into single view and vice-versa.

Course Outcomes:

At the end of course, Learner will be able to –

1. Illustrate the projection of points, lines and surfaces
2. Understand the concept of orthographic and isometric projection
3. Construct different types of solids in different positions by using CAD software

List of Practical:

Every student will submit a set of at least FIVE drawing sheets (from 1 to 6 listed below) and perform at least TWO practical (from 7 to 9 listed below) using CAD software.

Examination will consist of viva-voce based on the syllabus.

1. Projection of straight line
2. Projection of plane
3. Projection of solids
4. Orthographic projection
5. Isometric projection/view
6. Free hand sketches of simple machine elements, like
 - (a) Screw threads ISI profile
 - (b) Types of nuts, bolts, studs, set screws, washers, locking arrangement of nuts & bolts
 - (c) Foundation bolts – Rag, eye, lewis types
7. Drafting of basic 2D geometrical shapes using CAD software
8. Drafting of basic 3D geometrical shapes using CAD software
9. Drafting of 2D and 3D objects using surface modelling commands

Course Code	Course Title	L	T	P	C
1SF09	Programming for Problem Solving Lab	00	00	02	01

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of Programming for Problem Solving Lab by being able to do each of the following:

1. Set up and use a C programming development environment (IDE, compiler, etc.) to write, compile, and run programs.
2. Understand and apply fundamental programming constructs such as variables, control structures, functions, arrays, strings, and pointers in C.
3. Develop algorithmic thinking using flowcharts or pseudocode to solve problems through a structured, top-down approach.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Develop and execute basic C programs to solve simple problems using appropriate programming constructs.
2. Analyze and apply control flow mechanisms and data structures (arrays, strings, functions, and pointers) to implement efficient C programs.
3. Demonstrate problem-solving skills through the application of algorithmic logic and programming techniques

List of Experiment:

Minimum 8 to 10 practical's are to be conducted based on subject 1SF04 Programming for Problem Solving

List of Experiments/ Practical's:

Minimum 8 experiments are to be performed.

1. Set up a C programming environment (compiler, IDE, etc.).
2. Write a simple program to display "Hello, World!".
3. Solve a simple problem using a top-down approach and develop a program accordingly.
4. Use flowcharts or pseudo code to represent the algorithm for a specific problem.
5. Write program to illustrate precedence of operator
6. Write programs that demonstrate the use of if, if-else, and switch statements for decision making.

7. Create and manipulate 1-D, 2-D arrays (declaration, initialization, accessing elements).
8. Explore string manipulation functions (strcpy, strcat, strlen, etc.)
9. Write programs using user-defined functions to solve specific tasks
10. Understand and use return values and their types.
11. Explore the concept of call by value using pointers.
12. Explore the concept of call by reference using pointers

Course Code	Course Title	L	T	P	C
1SC02	Fundamentals of Civil Engineering Lab	0	0	2	1

Course Prerequisites: Nil.

Course Learning Objectives:

1. Detailing of different types of doors.
2. Drawing of develop plan from line plan.
3. Laying of layout on the field.
4. To visit and observed the various building components.

Course Outcomes:

Students will be able to –

1. Design different types of staircases for buildings
2. Provide layouts for different structures
3. Understand the application of various laboratory instruments on the field.

List of Experiments/ Practical's:

Minimum Eight (08) experiments

- 1) Drawing of following building elements on A-3 size sheet.
 - a) Panelled door, flush door, and glazed window and aluminum sliding window.
- 2) Drawing of any four staircases. [On A-3 size sheet, plan & section.]
- 3) Preparation of developed plan from given line plan of a two-room building [On a A-3 size sheet.]
- 4) Layout of the above, in field.
- 5) Fields visits to building under construction and its report writing including material of construction, construction processes, Human recourses required, and construction details.
- 6) Sketch book containing Free hand sketches of following:
Symbols used for construction materials, Different types of foundations.
- 7) Sketch book containing Free hand sketches of following:
Fixtures & fastenings of doors & windows, Bonds in brick masonry.
- 8) Introduction to instruments of Surveying laboratory
- 9) Introduction to instruments of Transportation Engineering laboratory
- 10) Introduction to instruments of Concrete Technology laboratory

Course Code	Course Title	L	T	P	C
1SF10	NSS/Sports/Yoga/Cultural/Community Service	0	0	2	1

Course Prerequisites:

1. Basic physical and mental fitness.
2. Willingness to volunteer time.

Course Learning Objectives:

1. To develop a sense of responsibility, discipline and social values through participation in community base activity.
2. To enhance physical, mental and emotional wellbeing while fostering teamwork.
3. To strengthen, problem solving, decision making and organizing skill by addressing real world issues in the community.

Course Outcomes:

Students will be able to –

1. Demonstrate and understand community service and social responsibility through the participation in NSS activities.
2. Demonstrate proficiency in basic yoga posture and breathing techniques.
3. Develop leadership, creativity, self-expression and time management skills through the participation in sports activities, music, dance, drama or fine art.

	Subject: NSS/Sports/Yoga/Cultural/Community Service
ACTIVITY-I	NSS- Cleanliness drive, Blood donation, Tree plantation, Health and hygiene awareness program, Plastic waste management.
ACTIVITY-II	SPORTS- Introduction to Sports, Importance of health and fitness, Brief information of any one outdoor game, Brief information of any one indoor game, Article writing on any recent match of your choice.
ACTIVITY-III	YOGA- Introduction to yoga, Importance of yoga, Suryanamaskar (12 yoga postures) with benefits, Importance of balanced diet, Meditation for mental health.
ACTIVITY-IV	CULTURAL- Skit, Mime & Street play, Light music (singing), Any one dance form, Poster/Rangoli (any theme).
ACTIVITY-V	COMMUNITY SERVICE- Visit to blind home, Visit to Old age home, Visit to Orphanage, Distribution of clothes, medicine to needy people.

Text Book:

1. “National Service Scheme: A Handbook for Volunteers” by Dr. A. R. Anuradha.
- 2) “Sports and Physical Education” by Dr. S. K. Sharma.

Reference Book:

1. “The Yoga Sutras of Patanjali” by Swami Sivananda.

Term Work (50 marks):

1. Field visits to ‘Old age home’, Orphanage or Ashram shala to run activities such as cleaning the premises, tree plantation, donating medicines, cloths etc., to develop the values of selfless service.
2. Participation in yoga sessions to promote physical and mental fitness and also to get aware about yoga.
3. Participation in outdoor and indoor games to promote physical
4. Participation in various cultural activities for the development of skills and to encourage creativity and talent.
5. Participation in community services such as making water bowls for birds, tree plantation, distribution of food to underprivileged families, etc.

Marking Scheme:

1. Field visit: 10
2. Participation in yoga: 10
3. Participation in outdoor and indoor games: 10
4. Participation in various cultural activities: 10
5. Participation in community services: 10

Course Code	Course Title	L	T	P	C
2SF01	Applied Mathematics II	03	00	00	03

Course prerequisite:

- 1) Basic Knowledge of Matrix and Complex number.
- 2) Elementary Integral Calculus.

Course Learning Objectives:

- 1) To deal with system of equations and solutions of Eigen value problem.
- 2) To express real valued periodic function in terms of sines and cosines
- 3) To Use Complex number theory in engineering application such as signal processing.
- 4) To familiarize with techniques in double and triple integrals and its applications.

Course Outcomes:

Students will be able to:

1. Make use of system of equations in matrix forms.
2. Find the periodic functions as an infinite series.
3. Apply De Moivre's theorem in various concepts of complex number.
4. Use new technique DUIS and to evaluate Beta and Gamma function.
5. Evaluate double integrals over bounded regions.
6. Evaluate triple integral and its applications.

	Subject: Applied Mathematics II	L
Unit I	Matrices: Rank of a matrix, Consistency of linear system of equations by matrix method, Eigen values and Eigen vectors, Cayley-Hamilton theorem (without proof).	7
Unit II	Fourier series: Fourier expansion of function in $(C, C+2L)$, half range Fourier series.	6
Unit III	Complex Numbers: Roots of complex number by deMoivre's theorem, Hyperbolic and inverse hyperbolic functions, Separation of real and imaginary parts, Logarithm of complex numbers.	7
Unit IV	Integral Calculus I: Differentiation under integral sign, Beta Function and Gamma Function.	7
Unit V	Integral Calculus II: Double integration, change of order of integration, transformation to polar coordinates, Evaluation of area by double integration.	6
Unit VI	Integral Calculus III: Triple integration, Transformation to spherical polar coordinates, Volume of solid by triple integration.	7
Total		40

Text Books:

1. Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics Vol.-I & II, Pune V.G. Prakashan, Pune.
2. Grewal B.S. - Higher Engineering Mathematics, 40/e, Khanna Publishers.

Reference Books:

1. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
2. Ramana B.V. - Higher Engineering Mathematics, (TMH).
3. Singh R.R. & Bhatt M. - Engineering Mathematics, (TMH).
4. Dass H. K. – Advance Engineering Mathematics, S. Chand.

Course Code	Course Title	L	T	P	C
2SF02	Applied Chemistry	03	00	00	03

Course Prerequisites:

1. Fundamentals of redox reactions and electrochemistry.
2. Knowledge of chemical reaction.
3. Basic knowledge of qualitative and quantitative analysis.

Course Learning Objectives:

1. To enable students to manufacture functional materials on the basis of chemical forces.
2. To provide the knowledge of characteristics and application of cement, fuels and lubricants.
3. To impart knowledge of characteristics of water and methods for the removal of impurities from water.
4. To summarize students with operating principles, working processes and applications of energy conversion, storage devices and also with corrosion and corrosion control methods.

Course Outcomes:

Students will be able to

1. Apply the knowledge of chemical forces to design functional materials.
2. Apply the knowledge of useful engineering materials such as cement and lubricant.
3. Describe properties of hard water, its disadvantages and various processes for removal of water impurities.
4. Describe properties of chemical fuels, analysis methods and its applications.
5. Identify various types of corrosion, mechanism and control methods to protect metals.
6. Describe operating principles working processes and applications of energy conversion and storage devices.

	Subject: Applied Chemistry	L
UNIT I	Engineering Materials and Their Properties: Introduction, Classification of Engineering materials, Chemical Forces in materials- Primary forces and Secondary forces, Properties of materials, Role of chemical forces in alteration of magnitude of the properties such as Density, Melting Point, Solubility, Strength, Stiffness, Elasticity and Plasticity. Real life examples where these interactions played major role to enhanced their properties: - vulcanized rubber and plasticized PVC.	6
UNIT II	Cement Engineering: Introduction, Types of cement, Raw materials used for the manufacturing of Portland cement, Manufacturing of Portland cement by wet process. Functions of chemical constituents of cement: Tri-calcium aluminate, Tri-calcium silicate, Di-calcium silicate, Tetra-calcium alumino ferrite, magnesia,	6

	sulphur trioxide, iron oxide, alkalis, free lime, alumina. Physical Properties of Portland cement: Heat of hydration, Fitness, Soundness, Strength, Setting and hardening.	
UNIT III	Water Characteristics & Their Effects on Boiler: Introduction. Characteristics of water: - Hardness, pH, alkalinity, DO, TDS and Chloride ion concentration. Disadvantages of characteristics of water in Boiler: - Scale & sludge, Priming & Foaming, Caustic embrittlement and Boiler corrosion. Methods of analysis: - EDTA method, Iodometric method and conductometric titration. Methods for removal of impurities: Sedimentation, Neutralization, Zeolite process, De-Ionization process and Reverse osmosis. Calculation of hardness by data obtained from EDTA and zeolite processes.	8
UNIT IV	Fuel and Lubricant: Introduction, Types of Fuels, Properties of Fuels: Ignition Temperature, Calorific value. Types of calorific value. Solid Fuel: Coal, classification of coal, analysis of coal: ultimate analysis. Liquid Fuel: Crude oil, Fractional distillation of crude oil, Properties of liquid fuel: Octane number and Cetane number. Gaseous Fuel: Hydrogen gas, economy of hydrogen gas as fuel. Lubricants: Introduction, classification of lubricants, properties of lubricants, uses of lubricants.	7
UNIT V	Energy Sources & Storage Devices: Introduction, Principle of batteries, Types of Batteries: Primary Batteries-Dry Cell, Mercury cell, Secondary Batteries- NICAD (Ni-Cd) battery, Lithium-ion battery. Green energy sources: Photo voltaic cell (Solar Cell), Fuel Cell.	6
UNIT VI	Corrosion & Its Control: Introduction, Types of corrosion: Dry and Wet corrosion, Mechanism of dry and wet corrosion, Factor affecting corrosion: Nature of metal and nature of environment, Types of wet corrosion- Pitting corrosion, waterline corrosion, stress and galvanic corrosion, Methods of corrosion control- Cathodic protection: Sacrificial anode and impressed current method, Protective coating: Galvanizing and Tinning process.	7
	Total	40

Text Books:

1. Textbook of Engineering Chemistry by Dara S S and Umare S S.
2. Engineering Chemistry by Jain & Jain (Dhanpat Rai & Sons)
3. Engineering chemistry by S. S. Dara, S. Chand Publication
4. Engineering & Technology by Shashi Chawala, Dhanpat Rai & Sons.
5. Engineering Chemistry by K. Sesha Maheswaramma, Mridula Chugh, Pearson.

Reference Books:

- 1) Engineering Chemistry: Fundamentals and Applications by Shikha Agarwal.
- 2) Chemistry for Engineers by B K Ambasta
- 3) Engineering Chemistry by N Krishnamurthy and P Vallinayagam.
- 4) Engineering & Technology Vol-I & II-by Rajaram& Kuriocose.
- 5) Engineering Chemistry by Prasanta Rath (Cengage learning).

Course Code	Course Title	L	T	P	C
2SF03	Basic of Electrical Engineering	2	0	0	2

Course Prerequisites:

1. Concepts of Electrostatics and Current Electricity.
2. Fundamentals of Magnetic effect of electric current, magnetism and Electromagnetic Induction.

Course Learning Objectives:

1. To introduce students with different terminologies in electrical engineering and network simplification methods of resistances.
2. To understand DC and AC Circuit analysis.
3. To understand magnetic circuits and Electromagnetic induction.
4. To understand single phase Transformer and Safety in electrical installation.

Course Outcomes:

After completion of this course the student shall be able to:

1. Understand fundamentals of Electrical Engineering and be adequately trained to solve Network of resistances by using transformation techniques.
2. Demonstrate DC circuits by finding different parameters like voltage, currents, resistance using laws and theorems.
3. Explain different properties of electromagnets and phenomenon of electromagnetic induction in magnetic circuits.
4. Illustrate the different terms of AC and analyze single phase AC circuits.
5. Explain Three phase A.C circuits
6. Explain single phase Transformer and Safety in electrical installation.

Unit No.	Subject – Basic of Electrical Engineering	L
Unit I	Fundamentals of Electrical Engineering: Basic concepts of Current, Voltage, Power, energy and relationship between them. Resistance, Resistivity, Conductance, Conductivity, Network simplification of Resistances (Series, Parallel, Delta-Star and Star-Delta transformation)	05
Unit II	DC Circuit Analysis: Types of Sources, Current and voltage division principle, Source Transformation, Ohm's Law, Kirchoff's Laws (KCL and KVL), Superposition Theorem, Thevenin's Theorem.	05
Unit III	Magnetic circuits and Electromagnetic Induction: Basic concepts of Flux, flux density, MMF, Reluctance, Permeance, Magnetic field intensity and their relationship. Series Magnetic circuits, B-H curve, Principle of electromagnetic induction, Types of Magnetically induced EMF, Concept of self and mutual Inductance.	05
Unit IV	A.C. Fundamentals: Generation of sinusoidal alternating voltages and currents, Different terminologies associated with AC circuit. Behavior of AC	05

	circuit containing Pure R, L, and C. Phasor representation in rectangular & polar form, Impedance and admittance concept. Series R-L, R-C and R-L-C circuit, Resonance in Series R-L-C circuit, Power in single phase circuit: - Concepts of active, reactive and apparent power, Power factor.	
Unit V	Polyphase Circuits : Generation of Three phase voltages, current and power, Star connected and delta connected balanced circuits, Relationship between line current, phase current and line voltage, phase voltage , analysis of balanced three phase circuits Power measurement in Three phase circuit .	05
Unit VI	Single phase Transformer: Single-phase transformer construction and working (Ideal and practical), Types of Transformer, EMF equation of Transformer, Efficiency & Regulation of transformer, condition for maximum efficiency. Electrical Safety : Safety precautions in electrical installation, Earthing, Types of Earthing (Plate and Pipe Earthing)	05
	Total	30

Recommended Text Books:

1. B. L. Thereja, Basic electrical engineering, S. Chand Publications.
2. D.P. Kothari, I.J. Nagrath, “Basic Electrical Engineering”, TMH Publishing Co. Ltd., New Delhi, 3rd edition
3. Leonard S. Bobrow, “Fundamentals of Electrical Engineering”, 2nd Edition, Oxford Press.
4. Kulshreshtha D.C., “ Basic Electrical Engineering” , First Ed., TMH

Reference Books:

1. Leonard S. Bobrow, “Fundamentals of Electrical Engineering”, 2nd Edition, Oxford Press. R
2. A.E. Fitzgerald, D.E. Higginbotham, “Basic Electrical Engineering”, McGraw Hill Book Co., New York, 2nd edition
3. Dr.S.L.Uppal, “Electrical Wiring, Estimating and Costing”, Khanna Publishers.

Course Code	Course Title	L	T	P	C
2SF04	Biology for Engineers	02	00	00	02

Course Prerequisites: Nil

Course Learning Objectives:

1. To acquire the knowledge of basic concepts of biology and the need of the subject in Engineering.
2. To study the human organs and their analogy with engineering applications.
3. To be acquainted with the latest trends in bio-engineering.
4. To become familiar with the concept of Bio-mimicry and understand how nature has inspired innovations in technology.

Course outcomes:

1. Understand basic biological concepts and define the terminologies.
2. Understand various organs in body, their function; it's analogy with engineering applications.
3. Acquire knowledge of medical tools and machineries used in the treatment.
4. Understand the concepts of 3D printing and its biomedical applications and trends in bio-engineering
5. Understand the concepts like biosensors, biofuels and biochips.
6. Understand the concept of Bio-mimicry and nature inspired technology

	Subject: Biology for Engineers	L
UNIT I	Introduction to Basic Biology: Cell: What is a Cell, Cell theory, Cell shapes, structure of a Cell, Cell cycle chromosomes, The Plant Cell and animal Cell, protoplasm, prokaryotic and eukaryotic Cell, Plant Tissue and Animal Tissue. Carbohydrates, proteins, Amino acid, nucleic acid (DNA and RNA) and their types	04
UNIT II	Human Organ Systems and Bio Designs – 1 Brain as a CPU system (architecture, CNS and Peripheral Nervous System, signal transmission, EEG, Robotic arms for prosthetics.). Eye as a Camera system (architecture of rod and cone cells, optical corrections, cataract, lens materials, bionic eye). Heart as a pump system (architecture, electrical signaling - ECG monitoring and heart related issues, reasons for blockages of blood vessels, design of stents, pace makers, defibrillators).	04
UNIT III	Human Organ Systems and Bio Designs – 2 Lungs as purification system (architecture, gas exchange mechanisms, spirometry, abnormal lung physiology - COPD, Ventilators, Heart-lung machine). Kidney as a filtration system (architecture, mechanism of filtration, CKD, dialysis systems).	05

UNIT IV	Trends in Bioengineering-1 Bioprinting techniques and materials, 3D printing of ear, bone and skin. 3D Printed tooth, Dental implants, DNA origami and Biocomputing, Bioimaging and Artificial Intelligence for disease diagnosis	05
UNIT V	Trends in Bioengineering-2 Cloning in microbes, plants and animals, Basics of biosensors, biochips, Bio fuels. Tissue engineering And its application, transgenic plants and animals	06
UNIT VI	Nature-Bioinspired Materials and Mechanisms: Bio-mimicry, Echolocation (ultrasonography, sonars), Photosynthesis (photovoltaic cells, bionic leaf). Bird flying (GPS and aircrafts), Lotus leaf effect (Super hydrophobic and self-cleaning surfaces), Plant burrs (Velcro), Shark skin (Friction reducing swim suits), Kingfisher beak (Bullet train). Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perfluorocarbons (PFCs).	06
	Total	30

Reference Books:

1. Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022
2. Biology for Engineers, Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., and Jaganthan M.K., Tata McGraw-Hill, New Delhi, 2012.
3. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
4. Biomedical Instrumentation, Leslie Cromwell, Prentice Hall 2011.
5. Biology for Engineers, Sohini Singh and Tanu Allen, Vayu Education of India, New Delhi, 2014.
6. Bio-Inspired Artificial Intelligence: Theories, Methods and Technologies, D. Floreano and C. Mattiussi, MIT Press, 2008.
7. Bioremediation of heavy metals: bacterial participation, by C R Sunilkumar, N Geetha A C Udayashankar Lambert Academic Publishing, 2019.
8. 3D Bioprinting: Fundamentals, Principles and Applications by Ibrahim Ozbolat, Academic Press, 2016.

Course Code	Course Title	L	T	P	C
2SF05	Universal Human Values	2	0	0	2

Course Prerequisites: NIL

Course Learning Objectives:

1. To facilitate in students the understanding of Universal Human Values.
2. To imbibe professional Ethics in students.
3. To aware students about their role in all aspects of life, including their place in the family, society and nature.

Course Outcomes:

Students will be able to

1. Understand the need for value education and its significance in personal and societal development.
2. Understand the harmony between the 'I' and the body and its significance for overall well- being.
3. Identify and appreciate the values in human-human relationships, emphasizing trust (Vishwas) and respect (Samman).
4. Develop a holistic perception of harmony at all levels of existence.
5. Communicate effectively about the importance of harmony in nature, promoting awareness and inspiring others to adopt sustainable practices.
6. Recognize the relevance of a humanistic constitution and humanistic universal order.

	Subject: Universal Human Values	L
UNIT I	Process for Value Education: Understanding nature and scope for Value Education, Self-Exploration–concept and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being	5
UNIT II	Understanding Harmony in the Human Being - Harmony in Myself: Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ – Understanding the Body as an instrument of ‘I’ (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	5
UNIT III	Understanding Harmony in the Family and Society- Harmony Human - Human Relationship: Understanding harmony in the Family- the basic unit of human interaction, understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas.	5

UNIT IV	Building the Universal Harmonious Order: Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)- from family to worldfamily!	5
UNIT V	Understanding Harmony in the Nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self- regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence	5
UNIT VI	Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics, Strategy for transition from the present state to Universal Human Order:a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.	5
	Total	30

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

Reference Books:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA.
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi STantra Shodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Term Work (50 marks):

1. Analyze case studies on universal human values, such as ethical dilemmas or social issues.
2. Participate in group discussions on universal human values, including debates and presentations.
3. Visit community centers or NGOs working to uplift communities to demonstrate the values of selfless service.
4. Reading an article or literature on the people who were involved in selfless activities and prepare the report to express a view on the article.

Marking Scheme:-

1. Case Study: 10 Marks
2. Group Discussion: 10 Marks
3. Visit to community Centre: 10 Marks
4. Report on Article Reading: 10 Marks
5. Attendance -10 Marks

Course Code	Course Title	L	T	P	C
2SCM01	Engineering Mechanics	3	0	0	3

Course Prerequisites: Nil

Course Learning Objectives:

1. Concepts related to Forces and its effects, resolution and composition of coplanar forces.
2. Application of principles of statics to the system of rigid bodies.
3. Analysis of simple structures like trusses and beams.
4. Concepts related to friction, its application.

Course Outcomes:

Students will be able to –

1. Compose and resolve the forces, analyse the equilibrium force systems.
2. Analyse the statically determinate structures.
3. Calculate frictional forces for simple contact, wedges and belt friction.
4. Locate centroid and calculate moment of inertia.
5. Calculate various kinematic quantities.
6. Apply the equations of kinetics.

	Subject: Engineering Mechanics	L
UNIT I	Resultant and Equilibrium Concept of force, force systems, moment, couple, resolution and compositions of coplanar forces. Free-body diagrams, equations of equilibrium-Lami's theorem, problems on equilibrium of co-planar forces acting on a rigid body and system of rigid bodies.	07
UNIT II	Analysis of Determinate structure (Beams, Trusses and Frames) Determinate and Indeterminate structure, introduction to the types of beams, trusses and frames. Analysis of beams and trusses using principles of statics (Determinate only).	07
UNIT III	Friction Friction, types of friction, angle of friction, angle of repose, cone of friction, Coulomb's laws of friction, wedge friction and belt friction.	07
UNIT IV	Center of Gravity and Moment of Inertia Centroid, First Moment of Area, Centroid of composite sections, Second Moment of Area, Radius of Gyration, product of inertia, perpendicular and parallel axis theorem, polar moment of inertia, radius of gyration, Definition of principal axes and principal moment of inertia.	07

UNIT V	Kinematics Definitions of displacement, velocity and acceleration and their relations, rectilinear motion under variable & constant accelerations, curvilinear motion using rectangular coordinates, normal and tangential components.	07
UNIT VI	Kinetics Application of D'Alembert's Principle, concept of dynamic equilibrium, Work-Energy Equation, Impulse-Momentum Equation to the bodies in motion.	07
	Total	42

Text Books :

1. Bhattacharyya Basudeb, Engineering Mechanics, Oxford University Press.
2. Bhavikatti, S. S. and Rajashekarappa, K. G., Engineering Mechanics, New Age International Publishers, New Delhi.

Reference Books :

1. Singer, F. L., Engineering Mechanics, Harper Collins Pub., Singapore
2. Timoshenko, S. P. and Young, D. H., Engineering Mechanics, McGraw-Hill International C., Auckland.
3. Beer, F. P. and Johnston, E. R., Vector Mechanics for Engineers, McGraw-Hill International C., Auckland.
4. Shames, I. H., Engineering Mechanics, P.H.I. Pvt. Ltd., New Delhi.

Course Code	Course Title	L	T	P	C
2SF06	Indian Knowledge System	02	00	00	02

Course Prerequisites: Nil

Course Learning Objectives:

In this course students will know and understand contribution of ancient Indian scientists through

- 1) Introduction to contribution of Indian scientist in various fields of Science and Technology and Astronomy
- 2) Introduce to contribution of Indian scientist in Chemistry, Metallurgy and Mathematics.
- 3) Introduction to contribution of Indian scientist in Medical Sciences and Life Sciences.

Course Outcomes:

Students will be able to –

1. Discuss contribution of Indian Scientists in various fields of scientists and technology.
2. Narrate contribution of Indian Scientists in the field of Astronomy.
3. Discuss contribution of Indian Scientists in the field of Chemistry and Metallurgy.
4. Discover contribution of Indian Scientists in the field of Mathematics.
5. Collect contribution of Indian Scientists in the field of Medical Science and Ayurveda.
6. Discuss contribution of Indian Scientists in the field of Plant and Animal Science.

	Subject: Indian Knowledge System	L
UNIT I	India's Contribution to Science and Technology: Pre-Independence contribution. Brief information about various fields of contributions.	4
UNIT II	Contribution in Astronomy: The Beginnings of Indian Astronomy, The Early Historical Period, The Siddhāntic Era, The Kerala School, Other Post-Siddhāntic Developments.	4
UNIT III	Contribution to Chemistry and Metallurgy: Early Chemical Techniques, Atomism in Vaiśeṣika, Chemistry in Early Literature, Classical Age, Laboratories and Apparatus Metallurgy before and during the Harappan Civilization, Iron Metallurgy and its applications, Zinc Metallurgy	4
UNIT IV	Contributions to Mathematics: First Steps, contributions from: early historical period, the classical period, the classical period: post Aryabhata, contributions of Shri P C Mahalanobis, Shri Shrinivasa Ramajujan.	4
UNIT V	Contributions to Medical Science and Ayurveda as way of life, health and well being The tradition of surgery, Inoculation for smallpox, Microbiology and Paracitology, Communicable diseases and epidemics, An evolving pharmacopoeia, Cross-cultural interactions, What is Ayurveda? Integrative approach to healthcare, Integrative approach to healthcare, Principles of Ayurvedic healing, Five elements, three Doshas and Treating diseases to restore health.	4
UNIT VI	Contributions to Plant and Animal Science Plant Science in Ancient India, Animal Science in Ancient India, Indian Traditional Knowledge on Environmental Conservation.	4
	Total	24

Text Books:

- 1) Indian Contributions to Science compiled by Vijnana Bharati

Reference Books:

- 1) History of Science and technology in India by Dr. Binod bihari satpathy
- 2) Hindu achievements In exact science by Benoy Kumar Sarkar
- 3) Science in Ancient India by Subhash C. Kak

Term Work: (50 Marks)

- 1) Interaction with traditional practitioners (Vaidyas, artists, craftsmen) and prepare a report after the interaction.
- 2) Drawing or designing based on traditional Indian art (Madhubani, Warli, etc).
- 3) Project on traditional agriculture, water harvesting system, mathematics in ancient India etc.
- 4) Research paper on specific topics in IKS, such as the significance of Ayurveda in modern healthcare, chemistry in ancient era etc.

Marking scheme:

- 1) Report on the interaction: 10 marks
- 2) Drawing or designing on traditional Indian art: 10 marks
- 3) Project on traditional activities: 10 marks
- 4) Research paper on specific topic of IKS: 10 marks
- 5) Attendance in theory classes: 10 marks

Course Code	Course Title	L	T	P	C
2SF07	Applied Chemistry Lab	00	00	02	01

Course Prerequisites:

1. Basic knowledge of qualitative and quantitative analysis.
2. Basic knowledge of titrations-based experiments.
3. Knowledge of chemistry lab precautions, prohibitions and safety aids.

Course Learning Objectives:

1. To impart skills of quantitative and qualitative analysis.
2. To provide knowledge of synthesis of co-crystal.
3. To familiar students with some fundamental of chemistry experiments.

Course Outcomes:

Students will be able to

1. Determine the properties of water, chemical fuel, lubricant and cement based on laboratory techniques.
2. Synthesis of co-crystals and determination of its melting point.
3. Handle some important analytical instruments.

	Subject: Applied Chemistry Lab
Expt. 1	Preparation of Paracetamol and oxalic acid co-crystal and determination of its melting point.
Expt. 2	Determination of hardness of water by EDTA method.
Expt.3	Determination Alkalinity (NaOH and Na ₂ CO ₃) in given water sample
Expt.4	Determination of chlorine in water sample. (Iodometry)
Expt.5	Determination of Dissolved Oxygen in Water Sample.
Expt.6	Determination of pH of unknown sample by pH meter
Expt.7	Determination of H ⁺ ion concentration by conductivity meter.
Expt.8	Determination of % CaO in given cement sample.
Expt.9	Determination of % of moisture in coal sample by proximate analysis.
Expt.10	Determination of viscosity of lubricating oil by Redwood viscometer No.1
Expt.11	Determination of viscosity of lubricating oil by Redwood viscometer No. 2
Expt.12	Determination of flash point of lubricating oil by Abel's apparatus
Expt.13	Determination of acid value of lubricating oil.
Expt.14	Determination of mass of Zn coating on galvanized article
	Total hours for the completion of minimum nine (09) experiments

Text Books:

1. Experiments and Calculations in Engineering Chemistry by S. S. Dara, S. Chand & Company LTD.
2. Engineering Chemistry Practical Book by Dipika Jaspal and Arti Malviya.
3. Laboratory Manual on Engineering Chemistry by S. K. Bhasin and Sudha Rani, Dhanpat Rai Publishing Company.

Reference Books:

- 1) Experiments In Engineering Chemistry by Payal B Joshi.
- 2) Principles of Analytical Chemistry by Miguel Valcarcel

Course Code	Course Title	L	T	P	C
2SF08	Basic of Electrical Engineering Laboratory	00	00	02	01

Course Learning Objectives:

- 1: To analyse DC Circuits.
- 2: To analyse single phase and three phase AC circuits.
- 3: To understand single phase transformers.

Course Outcomes:

After completion of this course the student shall be able to:

1. Estimate different electrical parameters like voltage, current in DC circuits using basic laws and theorems.
2. Determine various parameters of AC circuits and find relation between them in single phase AC circuits.
3. Analyze relation between electrical parameters of balanced three phase AC circuits and transformers.

List of Experiments:

Minimum 08 practicals are to be conducted out of the following:

1. To validate Kirchoff's Current Law for DC Circuits.
2. To validate Kirchoff's Voltage Law for DC Circuits
3. To verify Thevenin theorems for DC Circuits.
4. To verify Superposition theorem for DC Circuits.
5. To analyze RLC Series circuit and to plot its phasor diagram.
6. To verify relationships between line and phase values for Star connected load.
7. To verify relationships between line and phase values for Delta connected load.
8. To conduct load test on single phase transformer and pre-determine its efficiency and regulation.
9. Open circuit and short circuit test on Single phase transformer.
10. Demonstration of Earthing

Course Code	Course Title	L	T	P	C
2SCM02	Engineering Mechanic Lab	00	00	02	01

Course Prerequisites: Nil

Course Learning Objectives:

Students will be taught -

1. Performance of practical's based on concepts related to engineering mechanics.
2. Working of Lifting Machines
3. Graphical analysis to verify analytical concepts.

Course Outcomes:

Students will be able to -

1. Prove the concepts related to engineering mechanics.
2. Calculate lifting machine parameters.
3. Perform graphical analysis of force systems and simple structures. List of Experiments/

List of Experiments/ Practical's:

Minimum Eight (08) experiments/ *Practicals* are to be performed

1. To verify Law of Polygon of forces
2. To determine reactions at the supports of simple beam.
3. To determine forces in members of Jib crane.
4. To determine coefficient of friction on inclined plane.
5. To determine Coefficient of coil friction.
6. To verify law of machine for screw jack.
7. To verify law of machine for differential axle wheel.
8. To verify law of machine for single purchase crab.
9. To verify law of machine for double purchase crab.
10. Three compulsory graphical solutions.

Course Code	Course Title	L	T	P	C
2SF09	Workshop/Digital Fabrication Lab	00	00	02	01

Course Prerequisites: Nil

Course Learning

Objectives:

1. To make familiar with different tools, equipment and to understand their basic purposes.
2. To develop skills and get hands on experience of marking, measuring, cutting, machining, shaping, forming processes and joining processes
3. To make the students well versed with basic electrical, electronics and computer components.
4. To learn the modern manufacturing techniques such as CNC, Robotic Operations and 3D printing.

Course Outcomes:

1. Upon completion of this course, the students will gain knowledge of different manufacturing processes, tools & equipment's, which are commonly employed in industries.
2. On completion of this course, the students will be able to improve craftsmanship & fabricate the components using various manufacturing techniques.
3. Students will be conversant with modern electrical, electronics & computer components & their applications

Group A

- 1) **Fitting :** Introduction to different tools , equipment's and operations in Fitting Shop. Prepare one job in the Fitting shop, involving operations like marking, filing, hacksaw cutting, drilling and tapping etc.
- 2) **Sheet Metal :** Introduction to Sheet Metal tools and equipment's, their uses, different sheet metal joints and operations in Sheet Metal. Prepare one job in the Sheet Metal shop.
- 3) **Welding :** Introduction to Welding, welding tools and equipment's, their uses. Brief introduction to different welding processes, different welding joints. Prepare one job in the Welding shop.

4) **Smithy** : Introduction to different tools , equipments and Smithy operations like upsetting, drawing ,bending, forming etc. Prepare one job in the smithy shop.

5) **Carpentry** : Introduction to different wood working tools , equipment's and machines , types of joints and operations performed in Carpentry Shop. Prepare one job in the Carpentry shop.

6) **Machining** :- Introduction and practice of basic machining operations on Drilling , Lathe and shaper machine tools.

Group B

1) To identify the computer hardware parts, understand working of these parts, & Assemble demonstrate its working

2) Identification of various electrical & electronic components & tools used in domestic/industrial applications

3) Development of circuit schematic using EDA tools

4) 3D printing demonstration

5) Robotic operations demonstration

6) CNC operations demonstrations

Note- Students have to perform any 4 practical from group A & any 3 practical from group B

B.Tech. Third Semester (Civil Engineering)

Course Code	Course Title	L	T	P	C
3SC01	Strength of Materials	03	00	00	03

Course Prerequisite : Nil

Course Learning Objectives:

1. Concepts related to mechanical properties of material.
2. Application of principles of statics to find and draw axial force, shear force & bending moment diagrams.
3. Concepts related stresses in beams (Bending, Shear), principal stresses and Combined stresses.
4. Concepts related to torsion, column theory and methods to find slope & deflection of beams

Course Outcomes:

After successfully completing the course, students will be able to-

1. Explain and find mechanical properties of material, the concepts of stress and strain and the stress-strain relationships for homogenous, isotropic materials.
2. Analyze the beam and draw axial force, shear force and bending moment for all types of loading.
3. Explain and find bending stresses and shear stresses for the different cross section of beam also will be able to draw bending and shear stress distribution diagram.
4. Solve problems on the principal stresses and strains and combined stresses in structural members.
5. Explain fundamental concepts related to torsion and analyze thin cylinders subjected to internal pressures also find crippling load on column using Euler, Rankine's theory.
6. Develop slope and deflection equations to find values of slope and deflection of beams subjected to loads.

	Subject: Strength of Materials	L
Unit-1	Mechanical properties: Concept of direct and shear stresses and strains, stress-strain relations, biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, tor steel, generalized Hook's law, factor of safety. Uniaxial stresses and strains: stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.	07

Unit-2	Axial force, shear force & bending moment diagrams: Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear forces, bending moment and loading intensity.	07
Unit-3	Stresses in beams (Bending, Shear): Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section. Shear: Distribution of shear stresses on beam cross sections.	07
Unit-4	Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains. Combined direct & bending stresses.	07
Unit-5	Torsion and column theory: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, simple problem based on torsion equation. Thin cylinders subjected to internal pressures. Theory of long columns, Euler, Rankine's formula.	07
Unit-6	Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macauley's method.	07
	Total	42

Text Book:

1. Strength of Materials by S. Ramamrutham, Dhanpat Rai Publishing Co Pvt Ltd
2. Engineering Mechanics by Bhavikatti, S. S. and Rajashekarappa, K. G., New Age International Publishers, New Delhi.
3. Mechanics of Materials by E. P. Popov, Prentice Hall of India, New Delhi.

References:

1. Elements of Strength of Materials by S.Timoshenko and O. H. Young, East West Press Private Ltd., New Delhi.
2. Strength of Materials by Ferdinard L. Singer, Harper and Row, New York.
3. Introduction to Solid Mechanics by Shames, I. H., Prentice Hall of India, New Delhi.
4. Strength of materials by R. K. Bansal, Laxmi Publications Pvt Ltd.
5. Mechanics of materials by Junnarkar, S. B.,
6. Mechanics of solids by Mubeen, A., Pearson education (Singapore) Pvt. Ltd.
7. Mechanics of materials by Beer and Johnston, Mc-Graw Hill.
8. Engineering Mechanics by Bhattacharyya Basudeb, Oxford University Press.

Course Code	Course Title	L	T	P	C
3SC02	Concrete Technology	02	00	00	02

Course Prerequisite: Nil

Course Learning Objectives:

1. About strength of hardened concrete, special concrete and test to be performed on it.
2. Uses of different admixtures and understand elastic theory
3. About mixing proportion of concrete and durability for desirable strength.

Course Outcomes:

After successfully completing the course, students will be able to-

1. To recognize concrete and RCC and will be able to perform desired test for suitability.
2. To decide and utilize the admixtures as per the need of Concrete.
3. To understand importance of mix design. .
4. To understand need of special concrete as per different conditions. .
5. To understand causes of cracking in concrete and factors affecting durability.
6. To decide the way to design as per WSM.

	Subject: Concrete Technology	L
Unit-1	Properties of hardened concrete: Hardened Concrete: Strengths of hardened concrete (Tensile & Compressive strength, Flexural & Bond strength), standard test methods as per IS, Failure mechanism under compression & tension, Stress-strain behavior of concrete, Overview of Modulus of elasticity, Creep & Shrinkage.	05
Unit-2	Pozzolana and Admixtures: Admixtures and construction chemicals: Introduction, admixtures, plasticizers (Water reducers), action of plasticizers, dispersion, retarding effect, superplasticizers (High range water reducers), site problems in the use of plasticizers, retarders, accelerators, air-entraining admixtures, pozzolanic or mineral admixtures, fly ash, silica fume, rice husk ash, metakaolin, ground granulated blast furnace slag (GGBFS), IS code provisions for admixtures.	05
Unit-3	Mix design: Introduction of mix design, factors governing mix design, IS Code method of mix design (IS: 10262 -2019) and Ambuja method.	05

Unit-4	Special concrete: Ready Mix Concrete Light weight concrete, fiber reinforced concrete, Roller compacted concrete, self-compacted concrete, high strength concrete, high performance concrete, high volume fly ash concrete. Special concreting techniques: Guniting, grouting and shotcrete concrete. Introduction & application of Ferrocement.	05
Unit-5	Durability & Permeability of concrete: Causes of deterioration in concrete and durability problems, Factors affecting durability, cracking & causes of cracking, Carbonation induced & corrosion induced cracking, Alkali-aggregate reaction, Degradation by freeze & thaw, Sulphate attack, Durability under sea-water (marine environment)	05
Unit-6	Basic elastic theory: Basic elastic theory and concept of reinforced concrete, types of reinforcement, Analysis of rectangular sections by working stress method, design of singly reinforced beams.	05
	Total	30

Text Book:

1. The Chemistry of Cement and Concrete by Lea, F. M. Edward, Arnold (Publishers) Ltd.
2. Properties of Concrete by Neville, A. M., Pitman Publishing Company.
3. Concrete Technology by Neville A. M., ELBS.

References:

1. Concrete Technology by Gambhir, M. L., Dhanpat Rai and Sons
2. Concrete Technology by Orchard D. F., Applied Science Pub Ltd.
3. Concrete Technology by Shetty, M. S., S. Chand
4. Concrete Technology by Varshney, R. S., Oxford Pub. house.
5. IS: 456-2000.
6. IS: 10262-2019.
7. Design of Concrete Mixes by Krishna Raju, Mc-Graw Hill.
8. Ambuja Cement Concrete Mix Design- Ambuja Technical Literature series 79

Course Code	Course Title	L	T	P	C
3SC03	Transportation Engineering	03	00	00	03

Course Prerequisite: Nil

Course Learning

Objectives:

1. Basics of Road construction like surveys, alignment principles safe road design principles and essential geometry.
2. Various road pavements its construction and maintenance procedure.
3. Concepts regarding railway transportation and Airport Construction.
4. Concepts regarding Tunnels and Bridges components types and related transportation study.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Identify type of roads and its utility.
2. Understand the application of various road studies at time of survey and actual construction.
3. Understand design concepts of the various types of road pavements.
4. Understand rules regulations, signals, type of gauges and railway sleepers density.
5. Recognise the Airport features and design concept of components for aeroplane movement.
6. Identify types and components of Tunnels and bridges and its design components.

	Subject: Transportation Engineering	L
Unit-1	Highway: Road Transport characteristics, classification of Roads, Road Patterns, Alignment principles, Survey for highway.	7
Unit-2	Geometric Design: Cross sectional elements, Right of way, Camber, Gradient, Typical Highway cross section in embankment and in cutting, PIEV Theory, stopping sight distance, overtaking sight distance, super elevation.	7
Unit-3	Pavement and Traffic Engineering: Components of Flexible and Rigid pavement, Design factors, Traffic Characteristics, Traffic Studies, and construction procedure of Roads. Road parking system, traffic control devices and 3 E's of traffic	7
Unit-4	Railway: Railway transportation, track sections, embankment & cutting. Points and crossing Left & right Hand turnouts. Permanent way, gauges, coning of wheels, components of permanent way, Sleeper density, Rail fixtures & fastening. Rail types and functions.	7

Unit-5	Airport: Agencies controlling national & international aviation, various surveys to be conducted, airport site selection, Aeroplane component parts, Aircraft characteristics. Airport obstructions: Zoning laws, wind rose diagram, Apron layout, Aircraft parking & parking system.	7
Unit-6	Tunnel and Bridge Engineering: Tunnels- necessity, types, tunnel alignment, Size and shape of tunnels, and Tunnel Lining. Tunnel drainage, ventilation & lighting of tunnels. Bridge Engineering-Components, classification and identification, data collection, site selection, economic span, water way, scour depth, depth of foundation, Afflux, clearance and free board, different structural form culverts, types of foundation, abutments, piers and wing wall.	7
	Total	42

Text Book:

1. Highway Engineering by Khanna S.K. & Justo C.E., Nem Chand & Bros; 2013th edition (1 January 2014)
2. Principles of Transportation & Highway Engg., Rao G.V. , Publisher, Tata McGraw-Hill, 1996 ; ISBN,
3. Traffic Engg. & Transport Planning by Dr.Kadiyali L.R. Khanna Publishers 2013 ; Edition: 8th ed

References:

1. Principles & Practice of Bridge Engg. by Bindra S.P. Dhanpat Rai Publications co Pvt Ltd
2. Railway Engineering. By Saxena & Arora, Dhanpat Rai Publishing Co Pvt Ltd
3. Airport Planning & Design by Khanna S.K., Arora M.G., Jain S.S. ,published by Nem Chand & Bros
4. Tunnel Engineering by Srinivasan, published by Charotar Publishing House Pvt. Ltd.; 30th Edition 2022 (1 January 2022)
5. Practice & Design of Highway Engg. by Shrirama S.K. : Principles. By S Chand & Company (1 July 2014)

Course Code	Course Title	L	T	P	C
3SC04	Surveying I	03	00	00	03

Course Prerequisite: Nil

Course Learning

Objectives:

1. To learn about the term surveying, various instruments and possible error.
2. To learn Linear Measurement methods and way of conduction.
3. To learn about the measurement at elevation and of Directions, contour development process.
4. To understand and learn performing Plane table surveying.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Develop a sound knowledge of fundamental principles of Surveying.
2. Find out the vertical, horizontal, linear and angular measurements to arrive at solutions to basic surveying problems.
3. Determine the reduced levels of the points from staff readings using auto level and create contour maps.
4. Make use of magnetic bearings for traversing using compass.
5. Determine angle measurement, distance measurement, and co-ordinate measurement by Traversing.
6. To perform survey at elevation and conduct Plane Table survey.

	Subject: Surveying I	L
Unit-1	INTRODUCTION: Plane and geodetic surveys. Methods of location of a point-classification of surveys; principles of surveying, Errors in measurements- sources, types of errors and their treatment. Surveying instruments-temporary and permanent adjustment concept, principle of reversal.conventional symbols, and generalization.	7
Unit-2	LINEAR MEASUREMENTS: Direct and indirect methods; Chain and tape measurements- corrections to tape measurements; Electronic methods- EDMs, Introduction and purpose of total stations.	7
Unit-3	MEASUREMENT OF ELEVATIONS: Various terms; Methods of height determination; Spirit leveling- different types of levels and staves; booking and reduction of data, classification and permissible closing error; profile leveling and cross sectioning; curvature & refraction and collimation errors; reciprocal eveling. Contours- characteristics, uses.	7
Unit-4	MEASUREMENT OF DIRECTIONS: Bearings and angles; Compass surveying-magnetic bearings, declination, local attraction errors and adjustments.	7

Unit-5	TRAVERSING: Purpose and classifications; Compass and theodolite traverses, theodolites- different types, uses, methods of observation and booking of data, balancing of traverses, computation of coordinates, omitted Measurements.	7
Unit-6	PLANE TABLING: Merits and demerits, accessories; orientation and resection; methods of plane tabling; three-point problem and solutions.	7
	Total	42

Text Book:

1. Plane and Geodatic Surveying, Volume I & II by D. Clarke:

References:

1. Surveying & Levelling, Part I & II. By T.P. Kanetkar& Kulkarni: Vidyarthi Griha Prakashan.
2. Surveying I & II. By B.C. Punmia : Firewall Media, 2005.
3. Surveying & Levelling. By N.N. Basak : McGraw Hill Education.

Course Code	Course Title	L	T	P	C
3SCOE1A	Open Elective-I– Social Science	03	00	00	03

Course Prerequisite: Nil

Course Learning

Objectives:

1. Understand key social science concepts, Indian culture, social structures, and governance.
2. Study the impact of industry and environment on society and sustainable development.
3. Identify and evaluate major social problems in the context of Indian society.

Course Outcomes:

After successfully completing the course, students will be able to:

1. Understand the basic concepts in social science in the era of globalization
2. Comprehend the knowledge of Indian Culture, social structure and marriage institutions in India
3. Understand the environment in industry and its impact on society
4. Understand the Indian federal system and its executive framework
5. Explore the major social problems in India
6. Understand the human society and social sustainable development.

	Subject: Social Science	L
Unit-1	Introduction to Social Science: Importance to Engineer, Seven categories of Social Sciences (Anthropology, Sociology, History, Geography, Political science, Economics and Linguistics), Rural and Urban problems associated with society.	7
Unit-2	Fundamental concept in social science: I. Indian Culture- Aryan culture and Dravidian Culture ii. Social structure and social system in India. iii. Family and marriage institutions in India.	7
Unit-3	Impact of Industrialization on society: i. Environment in industry with development of science and technology. ii. Fatigue of workers. iii. Motivation, selection and training of workers.	7
Unit-4	Indian Constitution and Parliament: Salient features of Indian constitution. Fundamental Rights and Duties. Directive Principles of State, Composition and powers of Indian Parliament, President of India: Election and Powers. Prime Ministers and Council of Minister.	7

Unit-5	Major social problems in India: i. Illiteracy ii. Un-employment iii. High population. iv. Poverty. v. Corruption.	7
Unit-6	Human Society and Environment: i. Human values and professional ethics. ii. General issues on environment ecology, bi-diversity and climate change. iii. Economics and social sustainable development iv. Human resource management, public health, law enforcement and good governance.	7
	Total	42

Text Books:

1. Social Problems in India, Ram Ahuja, Rawat Publication New Delhi.
2. A New Look into Social Sciences: Sheikh Sabir, A.M. Shiekh and Jaya Dwadshiwar, Sage Publication New Delhi.
3. Ethical Science, Dr. G. N. Nimbarte, Dattson Publication, Nagpur.

Reference Books:

1. Labour Problems and Social Welfare: R. C.
2. Saxsena, Prakashan Kendra, Lucknow.
3. Introduction to Sociology, Vidhyabhushan and Sachdeva, KitabMahal, New Delhi

Course Code	Course Title	L	T	P	C
3SCOE1C	Economics & Costing	03	00	00	03

Course Prerequisite: Nil

Course Learning Objectives:

1. Basics of Economics and its application in the field of engineering.
2. Concepts of the time value of money and techniques for evaluation of engineering project
3. Skills required understanding cost statements/records of the product and its effect on decision making

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the microeconomics concepts related to business and its impact on enterprise.
2. Develop an awareness and understanding time value of money and techniques for evaluation of engineering project.
3. Evaluate depreciation charges incurred for various projects with the help of sensitivity analysis.
4. Choose appropriate method for budget calculation of infrastructural/ commercial projects.
5. Apply cost concepts to analyse common business management decisions such as pricing a product and services.
6. Examine the functions of Indian government as well as commercial banks.

	Subject: Economics & Costing	L
Unit-1	Engineering Economics: Nature and scope, General concepts on micro & macro economics , The Theory of demand, Demand function, Law of demand and its exceptions, Elasticity of demand, Law of supply and elasticity of supply, Theory of production, Law of variable proportion, Law of returns to scale.	7
Unit-2	Time Value of Money: Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time – value equivalences, Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.	7
Unit-3	Depreciation: Definition, Computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Sensitivity analysis: single and multiple parameter sensitivity.	7

Unit-4	Capital Budgeting: Use and situations for equivalent annual worth comparison, Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions. Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.	7
Unit-5	Cost Concepts: Elements of costs, Preparation of cost sheet, Segregation of costs into fixed and variable costs. Fixed and variable cost, Product and Process Costing, Standard Costing, Cost estimation, Relevant Cost for decision making, Cost estimation, Cost control and Cost reduction techniques.	7
Unit-6	Banking System: Banks: Meaning, nature, characteristic of the Indian banking system, functions of commercial banks, functions of Reserve Bank of India, Overview of Indian Financial System.	7
	Total	42

Text Book:

1. Cost Accounting by Horn green, C.T., Prentice Hall of India
2. Engineering Economics, Riggs by J.L., Dedworth, Bedworth, D.B, Randhawa, S.U. McGraw Hill International Edition, 1996 (Chapter 2,3,4,5,7,8,9,11,12)
3. Engineering Economics & Costing by Sasmita Mishra, PHI

References:

1. Engineering Economy by Sullivan and Wicks, Pearson
2. Engineering Economics by R. Paneer Seelvan, PHI
3. Managerial Economics by Gupta, TMH
4. Cost Accounting by Lal and Srivastav, TMH

Course Code	Course Title	L	T	P	C
3SCOE1D	Disaster Management	03	00	00	03

Course Prerequisite: Nil

Course Learning Objectives:

1. Basic conceptual understanding of disasters.
2. Different types of hazards and disaster and the challenges posed by disasters.
3. Approaches of Disaster Management.
4. Broad understanding about the basic concepts of safety and Disaster Management.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the basics about Disaster.
2. Understand hazards posed by various disaster.
3. Understand Disaster Management strategies.
4. learn Concept of safety in various Disasters.
5. Learn About the preparedness in disaster.
6. Develop skills to responds to the disaster.

	Subject: Disaster Management	L
Unit-1	Introduction: Concepts and definitions: disaster, hazard, vulnerability, risks severity, frequency and details, impact, prevention, mitigation.	7
Unit-2	Disasters: Categories of disasters - natural and manmade Natural disasters (origin, causes and their management) – earthquake, tsunami, cyclone, flood, land slide. Disaster Profile of India.	7
Unit-3	Disaster Impacts: Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.	7
Unit-4	Disaster Preparedness: Pre-Disaster – Risk Assessment and Analysis, Early Warning System; Awareness. During Disaster – Evacuation, Search and Rescue, Relief and Rehabilitation. Post-disaster – Damage and Needs Assessment, Early Recovery, Reconstruction and Redevelopment;	7

Unit-5	Disaster Management Mechanism: Institutional mechanism for Disaster Management, Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Disaster Management Act 2005, Disaster Management Authority (NDMA). Role of Various Agencies. Key responsibility of engineers in disaster reduction techniques	7
Unit-6	Study of Important Disasters in India: Earthquakes in India, seismic zones of India, major fault systems of India plate. Major floods in India and various flood plains and rivers in India. Droughts in India, case study on Bhopal gas tragedy.	7
	Total	42

Text Book:

1. Action Plan for Earthquake, Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
2. Disasters in India Studies of grim reality, Rawat Publishers, Jaipur, 2005.

References:

1. Disaster management, Savindra Singh, Jeetendra Singh, Pravalika Publications, Allahabad, 2016
2. Natural Disasters, Mukta Girdhar, Amy publication, Dariyaganj, New Delhi, 2019.
3. Management of Natural Disasters in developing countries, H.N. Srivastava & G.D. Gupta, Daya Publishers, Delhi, 2006.

Course Code	Course Title	L	T	P	C
3SC05	Project Management	02	00	00	02

Course Prerequisite: Nil

Course Learning

Objectives:

1. Students should be able to understand Project Life Cycle and Project Development Steps.
2. Student should be able to carry out project planning using tools like BAR chart, Networking methods like CPM, PERT etc.
3. Student should know process and need of Resource Smoothing / Leveling.
4. Students should know the various software skills related to planning

Course Outcomes:

After successfully completing the course, students will be able to-

1. Apply the knowledge of management functions like planning, scheduling, executing and controlling to construction projects.
2. Solve and apply various planning tools like BAR chart, Milestone Chart, to compare and control the project at the time of execution.
3. Demonstrate their capability for preparing the project networks to work out best possible time for completing the project.
4. To understand the concept of PERT.
5. Develop the various management techniques for successful completion of construction projects.
6. To understand importance and application of various management like, Quality, Safety, Risk handling and Inventory

	Subject: Project Management	L
Unit-1	Project: Project, Project life cycle - Conceptual Phase, Planning Phase, Execution Phase, Termination phase, Project Stakeholders. Conceptual Phase - Concept of feasibility study, Risk assessment plan. Project planning- Steps, Scheduling, DPR	05
Unit-2	Introduction on Bar Chart : Work break down structure, Project Monitoring & Controlling, Planning Tools: Basic concept of Gantt Chart, Bar Chart, their advantage, limitations and overcoming measures	05

Unit-3	Networking : Networking – Activity, Event, Dummy Activity, Fulerson’s numbering rule. Introduction of Critical Path Method. Numerical on TF,FF,IF	05
Unit-4	PERT: PERT: Concept, technique, three time estimates, average time, Critical path, slack computation, S.D, Variance, Numerical on Probability computation	05
Unit-5	Management: Organization & Management : Concept & Types of Organization, Feyol’s Principals of Management, Safety Management.	05
Unit-6	Introduction to Software: Introduction to planning and Scheduling Software MSP and Primavera, One Compulsory assignment for planning, scheduling and resource allocation for construction project using software.	05
	Total	30

Text Book:

1. Construction Project Management- Planning, schedule and controlling, second edition by K. K. Chitkara, Tata McGraw Hill Education pvt. Ltd, New Delhi.
2. Project management for engineers, business and technology by John M. Nicholas and Herman Steven, fourth edition, Routledge Publication, New York.

References:

1. Projects Planning, analysis, selection, financing, implementation and review by Prasanna Chandra, 7th edition, McGraw Hill Education India Pvt. Ltd., New Delhi.
2. Project Management system approach to planning, scheduling and controlling, Harold Kerzner,
3. Construction Project Management- Theory and Practice by Kumar NeerajJha, Pearson Education, New Delhi
,17.

Term Work: 50 Marks

Marking Scheme:

1. Attendance – 10 Marks
2. Class Test (Internal) – 20 Marks
3. Assignment – 20 Mark

Course Code	Course Title	L	T	P	C
3SC06	Environmental Studies	02	00	00	02

Course Prerequisite: Nil

Course Learning

Objectives:

1. The importance of Environmental Studies.
2. The need of renewable and non-renewable energy resources.
3. The components, structures and types of ecosystems.
4. The Impact of different types of pollution.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the scope and importance of environmental studies.
2. Apply the knowledge of renewable and non-renewable energy resources.
3. Understand the concept of ecosystem.
4. Apply the knowledge of environmental pollution.
5. Understand the current environmental issues of India.
6. Understand the role of Information Technology in environment and human health.

	Subject: Environmental Studies	L
Unit-1	The Multidisciplinary nature of environmental studies: Definition, scope and importance, Need for public awareness.	05
Unit-2	Renewable and non renewable resources: Natural resources and associated problems, Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people. Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. Energy Resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources, case studies, Role of individual in conservation of natural resources.	05

Unit-3	Eco Systems: Concept of an eco system, structure and function of an eco system, Producers, consumers, decomposers, Food chains, food webs. Introduction, types, characteristic features, structure and function of the following eco systems: Forest ecosystem, Grass land ecosystem, Desert ecosystem, Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries)	05
Unit-4	Environmental Pollution: Definition, Causes, effects and control measures of: Air pollution, Water pollution, Noise pollution, role of an individual in prevention of pollution, Pollution Case Studies.	05
Unit-5	Current Environmental Issues in India: Water conservation-development of watersheds, Rain water harvesting and ground water recharge, Eutrophication and restoration of lakes, Conservation of wetlands, Ramsar sites in India. Climate Changes – Global warming, Acid rain, Ozone layer Deflection, Waste Management - Swachha Bharat Abhiyan.	05
Unit-6	Human population and the environment: Population explosion- family welfare program, Environment and human health, Human rights, Women and child welfare, Role of information technology in Environment and human health. Visit to environment assets-river / forest / grassland / hill / mountain. Visit to a polluted site-urban/rural/industrial/agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hills slopes, etc (field work equal to 5 lecture works)	05
	Total	30

Text Book:

1. Textbook of Environmental studies by Erach Bharucha, UGC

References:

1. Fundamental concepts in Environmental Studies by D D Mishra, S Chand & Co Ltd
2. Environmental studies, Nidhi Dhawan, Kiran Bist by I.K. International House Pvt Ltd.

Term Work: 50 Marks

Marking Scheme:

1. Field Visit – 10 Marks
2. Attendance – 10 Marks
3. Class Test (Internal) – 10 Marks
4. Assignment (2 Nos.) – 20 Mark

Course Code	Course Title	L	T	P	C
3SC07	Concrete Technology Lab	00	00	02	01

Course Prerequisite: Nil

Course Learning

Objectives:

1. To learn Procedure of mix design.
2. To understand different properties of cement.
3. To be able to find out properties of sand. And study several properties of concrete.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Prepared different grades of concrete based on mix design.
2. Choose grade of cement and quantity as per requirement.
3. Know significance of mix design and testing of concrete in laboratory.

List of Experiments/ Practicals:

List of Practicals in Concrete Technology & RCC Lab (Minimum eight practical from the list should be performed):

1. Mix Design (Compulsory).
2. Site visit and submission of site visit report (Compulsory).
3. Fineness of cement
4. Consistency and setting time of the cement
5. Soundness of cement
6. Compressive strength of cement
7. Sieve analysis of aggregate.
8. Bulking of sand (fine aggregate).
9. Silt content of sand.
10. Workability by slump cone test & compaction factor test
11. Admixture test as per IS 9103 & 6925.
12. Workability by flow table method.
13. Compressive & Tensile strength of concrete.
14. Nondestructive method-Rebound hammer.
15. Test on self-compacting concrete i.e. L-box test, V-funnel test etc.

Course Code	Course Title	L	T	P	C
3SC08	Transportation Engineering Lab	00	00	02	01

Course Prerequisite: Nil

Course Learning Objectives:

1. Testing on construction materials for their suitability & economic utilization.
2. Identification & classification of the pavement materials into different groups according to their characteristics.
3. The classification, suitability, strength & stability of pavement materials.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Identify the grade & properties of bitumen.
2. Identify engineering properties of aggregate.
3. Develop technical skills for pavement Construction.

List of Experiments/ Practicals: (Minimum six practical from the list should be performed)

1. Determination of Los Angeles value of aggregate.
2. Determination of Abrasion value of Aggregates by the use of devil machine
3. Determination of Aggregate Impact value
4. Determination of Aggregate Crushing value
5. Determination of Flakiness and Elongation Index of Aggregate.
6. Determination of Viscosity of Bituminous material
7. Determination of softening point of bituminous material.
8. Determination of ductility of bitumen.
9. Determination of Marshal Stability value.
10. Field Visit. (**Mandatory**)

Course Code	Course Title	L	T	P	C
3SC09	Strength of Materials Lab	00	00	02	01

Course Prerequisite: Nil

Course Learning Objectives:

1. Performance of practical's based on concepts related to Strength of Material.
2. Verify theoretical concept (laws) using practical performing

Course Outcomes:

After successfully completing the course, students will be able to-

1. Apply & utilize the theoretical & practical knowledge for performing shear, torsion and Tension test on steel specimen.
2. Verify theoretical concept (laws) using practical performing on deflection of beam for given specimen.
3. Apply & utilize the theoretical & practical knowledge for performing compression, modulus of rupture, hardness and Impact test on specimen (eg.-Wood, MS, Al, Cu, Brass etc).

List of Experiments/ Practicals: (Minimum Seven practical from the list should be performed)

1. Tension test on metals.
2. Compression test on timber.
3. Shear test on metals.
4. Impact test on metals.
5. Hardness test on metals.
6. Torsion test on metals.
7. Deflection of beams.
8. Modulus of rupture test.
9. Buckling of columns.

Course Code	Course Title	L	T	P	C
3SC10	Surveying I Lab	00	00	02	01

Course Prerequisite: Nil

Course Learning Objectives:

1. Apply the principle of surveying for civil engineering applications.
2. Methods to calculate horizontal and vertical distances
3. Calculation of area, drawing plans using different measuring equipment at field level.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the concept of EDM, and measure the distance, area of the field using the instrument chain, compass.
2. Determine R.L's area and volume.
3. Study about types of compass, local attraction and its error.

List of Experiments/ Practical's:

(Minimum eight practical from the list should be performed)

1. Distance measurement by chain tape and EDM.
2. To Find the RL by Simple Leveling.
3. To Find the RL by Differential Leveling.
4. Profile and cross section leveling for road.
5. Measurement of bearings with prismatic compass.
6. Chain and compass traversing.
7. Local attraction detection- correction of bearings.
8. Measurement of Horizontal and Vertical angles using Theodolite.
9. To measure area of figure (Regular and irregular shape) by using digital planimeter.
10. Plane table surveying- Radiation, Intersection Method.

B.Tech. Fourth Semester (Civil Engineering)

Course Code	Course Title	L	T	P	C
4SC01	Structural Analysis – I	3	0	0	3

Course Prerequisite: Nil

Course Learning Objectives:

1. Concept of statically determinate and indeterminate structures.
2. Analysis of continuous, cantilever and propped cantilever beams.
3. Analysis methods for beam, frame, trusses and 3 Hinge Arches.
4. Concept of Plastic Analysis.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the concept of Degree of Freedom, Condition of Equilibrium and Determinacy of Element and analyze Fixed Beams,
2. Analyze Continuous Beams and 3 Hinged Arches.
3. Apply the knowledge of Influence Line Diagram.
4. Analyze Beams, Portal Frames by using Slope Deflection Method without side Sway.
5. Analyze Beams, Portal Frames by using Moment Distribution Method without side Sway.
6. Concept of Plastic Analysis.

	Subject: Structural Analysis – I	L
Unit-1	Analysis of Fixed Beam: Classification of Structures, Concept of statically indeterminate Structures, Analysis of fixed beam and propped cantilever, Rotation and sinking of support.	7
Unit-2	Analysis of Continuous Beam: Analysis of Continuous beam by theorem of three moments, sinking of support. Analysis of Three Hinge Arch: Three hinged arches subjected to static loads, bending moment, radial shear and axial thrust.	7
Unit-3	Influence Line Diagram- Influence line diagrams for reactions, bending moment and shear force for determinate beams. Rolling loads on simply supported beams concentrated and uniformly distributed loads, maximum shear force and bending moment, focal length.	7

Unit-4	Slope Deflection Method (SDM)- Analysis of continuous beams with and without sinking of support. Analysis of portal frames without side sway.	7
Unit-5	Moment Distribution Method (MDM) - Analysis of continuous beams with and without sinking of support. Analysis of portal frames without side sway.	7
Unit-6	Plastic Analysis: Introduction to plastic analysis of steel structure, shape factor, plastic section modulus, Redistribution of moment, upper and lower bound theorems, collapse loads for beams.	7
Total		42

Text Book:

1. Mechanics of Structure by Junnarkar, S. B., Volume I and II.
2. Theory and Analysis of Structures by Jain and Arya
3. Basic Structural Analysis by Reddy. C. S, Tata-McGraw hill

References:

1. Elementary Analysis of Structures by Wang, C. K.
2. Elementary Structural analysis., Norris and Wilbur.

Course Code	Course Title	L	T	P	C
4SC02	Geotechnical Engineering I	3	0	0	3

Course Prerequisite: Nil

Course Learning

Objectives:

1. The various types of soil, its classification, index and engineering properties of soil.
2. The mechanics of compaction and factors affecting the compaction.
3. The concept of permeability and factors affecting to it.
4. The concept of seepage discharge, stress distribution in soil mass and its engineering applications.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Determine the Index properties and Atterberg limits for soil classification.
2. Understand the mechanics of compaction and quality control in field.
3. Explain permeability of soil and methods of dewatering.
4. Calculate the seepage discharge.
5. Calculate the shear strength of soil.
6. Understand the concept of consolidation and stress distribution in soil mass.

	Subject: Geotechnical Engineering-I	L
Unit-1	Soil Fundamentals and Its Properties: History of development of soil mechanics, formation of soil, its significance to the field problems. Soil properties and its classification, Definition of soil, soil as a three phase system, weight volume relationship, Index properties of coarse and fine grained soil, BIS classification of fine grained and coarse grained soil.	7
Unit-2	Compaction of Soil: Compaction of soil, mechanics of compaction, factors affecting compaction, standard and modified Proctor test, their field Determination, zero air void line, concept of wet of optimum and dry of optimum, different structures of soil, field compaction and their control, CBR test and CBR values for soaked and unsoaked conditions.	7
Unit-3	Permeability of Soil: Permeability of soil, Darcy's law and its validity, discharge and seepage velocity, factors affecting permeability, determination of coefficient	7

	of permeability in laboratory and field, permeability for stratified soil deposits, drainage and dewatering of soil and its various methods.	
Unit-4	Seepage Analysis: Laplace equation and its derivation in Cartesian co-ordinate system, its application for the computation of discharge seepage, seepage pressure, quick sand condition, concept of flow net, characteristics and uses of flow net, preliminary problem of discharge, estimation of discharge through homogenous earthen embankment, concept of effective neutral and total stress in soil mass, methods of arresting seepage.	7
Unit-5	Shear Strength of Soil: A physical concept of shear strength, introduction of Mohr's stress diagram, Mohr's failure criteria, Mohr-Coulomb's theory and development of failure envelopes, unconfined compression test, laboratory measurement of shear strength for different drainage conditions by direct shear test, triaxial test, merits and demerits of various shear strength tests.	7
Unit-6	Stresses in Soil Mass and Consolidation Theory: State of stress at a point, stress distribution in soil mass, Boussinesq's theory and its applications for point load, uniformly loaded, rectangular and circular area. Compression of laterally confined soil, concept of consolidation using spring analogy, Terzaghi's theory of one-dimensional consolidation. e-p curve, compression index, swelling index, coefficient of compressibility, Consolidometer test, determination of C_v by Cassagrande's method for determination of pre-consolidation pressure.	7
Total		42

Text Book:

1. Soil Mechanics by Craig R. F.
2. Soil Mechanics by Lambe T. W. and Whitman R. V., John Wiley and Sons, 1969
3. Soil Mechanics in Engg. Practice by Terzaghi K. and Peck R. B. John Wiley & Sons, 1967
4. Properties of Soils, Gulhati S. K.: Engg., Tata McGraw Hill, New Delhi, 1978
5. Soil Engg. In Theory and Practice by Singh A. Asia Publishing House, Mumbai

References:

1. Soil Mechanics and Foundation Engineering by Venkataramiah C.
2. Advanced Soil Mechanics B. M. Das.
3. Soil Mechanics and Foundation Engineering by S. K. Garg.
4. Soil Mechanics and Foundation Engineering by Arora K. R.
5. Geotechnical Engineering, Principles and Practices of Soil Mechanics and Foundation Engineerin by Murthy V. N

Course Code	Course Title	L	T	P	C
4SC03	Environmental Engineering I	3	0	0	3

Course Prerequisite: Nil

Course Learning

Objectives:

1. Concept of sources and the demand of water
2. Basic characteristics of water and its determination
3. Design and concept of water treatment processes.
4. Operation and maintenance of water supply

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the water supply scheme and be able to estimate the quantities and quality of water for municipal use.
2. Explain the basic characteristics of water & its determination.
3. Understand the types of processes used to treat for municipal purposes.
4. Understand the fundamental engineering and science principles that are used to design and operate the processes used in treatment processes.
5. Explain the disinfection processes and introduce tertiary treatment.
6. Explain the different distribution systems.

	Subject: Environmental Engineering I	L
Unit-1	Quantity Estimation of water - Introduction, Importance and necessity of water supply scheme, Water demand: Types of demand, factors affecting per Capita demand, variation in demand, design period and methods of population forecasting. Sources: Surface source, groundwater sources, Intakes - type, location, requirement & features.	7
Unit-2	Water quality and Aeration - Water quality: General idea of water borne diseases, Physical, Chemical, and bacteriological characteristics and analysis of water, Standards of drinking water I.S. & WHO. Flow diagrams and layouts of different water treatment works.	7
Unit-3	Aeration and Sedimentation - Aeration: Purpose, types of aerators. Sedimentation: Plain and with coagulation, different coagulants used, dose of coagulant, Jar test, Flocculation, clariflocculator. Design criteria for sedimentation tanks, surface loading, simple problems on design of sedimentation tanks.	7

Unit-4	Filtration - Filtration: Mechanism of filtration, types of filters, working, operational problems in filters, Simple design problems on rapid sand filters.	7
Unit-5	Disinfection - Disinfection: Purpose, Mechanism, criteria for good disinfectant, Method of disinfectants, Types of chlorination. Use of bleaching powder -Simple problems.	7
Unit-6	About Tertiary treatments & Distribution system - Introduction to tertiary treatments-Reverse Osmosis, Softening and Defluoridation. Distribution systems: Requirements for a good distribution system, methods of distribution, systems and their layouts.	7
Total		42

Text Book:

1. “Water Supply and Sanitary Engineering” by Birde G. S., Dhanpat Rai and Sons, Delhi.
2. “Water Supply Engineering”. By Punmia B. C. Laxmi publication.
3. Water Supply Engineering, by Garg S.K. Khanna Publishers.

References:

1. “Water Supply and Sewerage” by Steel E. W, Mc-Graw Hill.
2. “Water Supply Engineering”, by Kshirsagar S. R., Roorkee Pub house, Roorkee.

Course Code	Course Title	L	T	P	C
4SCOE2A	Fundamentals of Vastushastra	3	0	0	3

Course Prerequisite: Nil

Course Learning

Objectives:

1. To understand ideology behind the use of vastushastra.
2. Understand the whole purpose of vastushastra .
3. To introduce the historical background and philosophical foundation of vastushastra.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the fundamentals of vastushastra.
2. Understand the element of vastushastra.
3. Understand the basics of interior and exterior of various building units.
4. Understand the orientations of various rooms of residential as per vastushastra and understand the importance of direction.

	Subject: Fundamentals of Vastushastra	L
Unit-1	Introduction of Vaastu - Scientific background of Vaastu, Understanding Life force Energy, nature of the globe as per vaastu the birth of vaastu purusha,	7
Unit-2	Element of Vast - Importance of Five Elements. Earth, Water, fire, Air, Space. Use of Magnetic Compass, Types, shapes and selection of Land.	7
Unit-3	Interiors and Exteriors - Open Space planning and Building Design, Floor level, Height factors, Verandas, Balconies, Porch, Basements, Sumps & Borings, Boundary Walls, Parking, Security Guard Room, Overhead Tanks, Septic Tanks, Water flow, Plants and Greenery.	7
Unit-4	Orientation of Home - Master Bed Room , Kids room, Living Room, Kitchen, Dining Room, Bathroom, Drawing room, Study Room, Puja Room, Library, Store room, strong room, Furniture making, Doors, Windows and ventilators, Main Entrance, Staircase, Servants room, Guest room.	7

Unit-5	Ashtalaxmi and Quality of Directions - Directions and elements, importance of north-east direction as per vastu, importance of south –east direction as per vastu for home or workplace, importance of south direction as per vastu, importance of south-west direction as per vastu, importance of north direction as per vastu, importance of east direction as per vastu, importance of center (brahmasthan) direction as per vastu, importance of north – west direction as per vastu, importance of west direction as per vastu.	7
Unit-6	Remedial Vaastu - Identifying the Vastu Defects, Rectification of Vastu Defects in Existing Building, Color therapy, Discussion on different building plans.	7
Total		42

Text Book:

1. Ancient Science of Vastu by Siddharth Board and Dr. JayshreeOm.
2. Remedial Vaastu for home by Janhavi N. Sahasrabuddhe and Narendra Hari Sahasrabuddhe.
3. Scientific Vaastu Shastra in Home by Patel Sarjoo

Course Code	Course Title	L	T	P	C
4SCOE2B	Basics of Geology	3	0	0	3

Course Prerequisite: Nil

Course Learning

Objectives:

1. The different branches of geology and its importance.
2. The study of rock mineralogy and petrology.
3. The structural geology and its effect on foundation design.
4. The different zones of earthquake in India, its magnitude and intensity and different types of geological investigation

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand the different branches of geology and its importance in civil engineering.
2. Classify the different types of rocks based on its formation and textures.
3. Analyze the effect of different structural geology in design of foundation.
4. Understand the different earthquake zones of India and its seismic coefficient.
5. Understand the different types of geological investigation
6. Select the suitable construction sites based on concepts of engineering geology related to civil engineering structures.

	Subject: Basics of Geology	L
Unit-1	Introduction to Mineralogy - Different branches of Geology and importance of Geology in Civil Engineering, Mineralogy: Study of common rock forming and ore minerals with reference to its physical properties.	7
Unit-2	Introduction to Petrology - Petrology: Rock cycle, rock weathering and soil formation, Origin, classification and textures of igneous, sedimentary and metamorphic rocks, study of common rock types.	7

Unit-3	Structural Geology - Outcrop, dip strike, elementary ideas about folds, faults, joints and unconformity, effect of these structures in foundation.	7
Unit-4	Earthquake Engineering - Earthquake waves, causes and effects, magnitude and intensity, earthquake zones of India, seismic coefficient.	7
Unit-5	Geological Investigation - Surface and sub-surface investigation, direct and indirect investigation, rock as a material of construction, study of engineering properties of rocks and soils.	7
Unit-6	Applications of Engineering Geology - Geological studies related to site selection for dams and reservoirs, tunnel alignment, hydroelectric plants, bridges, roads, air fields etc. Case histories of some major projects of tunnels, dams and reservoirs.	7
Total		42

Text Book:

1. General and Engineering Geology by Singh Parbin.
2. A Text Book of Geology by Mukherjee.
3. The Principle of Petrology by Tuyrell G. W.
4. Geology of India by Wadia D. N.
5. Geology of India By Krishan M.S.

References:

1. Geological Maps by Day S. Y. and Mukharjee D. M.
2. Engineering Geological Maps. By Deshmukh D. N. and Mukherjee D. M.:
3. Geology of Engineering Gupte R. B.
4. Engineering Geology by Reddy Venkata:

Course Code	Course Title	L	T	P	C
4SCOE2C	Principle of Management	3	0	0	3

Course Prerequisite: Nil

Course Learning Objectives:

1. Basic concept of Management.
2. About scientific management process.
3. Importance of strategic management.
4. Concept of organization.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand about concept of management
2. Learn about scientific management process.
3. Understand Importance of strategic management.
4. learn Concept of organization.
5. Learn About Leadership and role of a leader.
6. Understand Importance of Communication in the Workplace.

	Subject: Principle of Management	L
Unit-1	Introduction to Management - Management – An Emerging Profession, Definition, Nature, Scope, Purpose, and characteristics of Management, Functions, roles, skills of an effective Manager	7
Unit-2	Evolution of Management - Classical Theory, Scientific Management, Management Process or Administrative Management, Bureaucracy, Behavioral Science Approach, Quantitative Approach, Systems Approach, Contingency Approach, Operational Approach	7

Unit-3	Planning - Types of Plans, Planning Process, Introduction to Strategic Management, Types of Strategies, Understanding environment of business: Environmental appraisal – Industry Analysis - Porter’s Model of competitive advantage, analysis of organizational resources and capabilities	7
Unit-4	Organizing and Directing - Introduction, Organizational Design, Hierarchical Systems, Organization Structure, Types of Organization Structure, Formal and Informal Organization, Centralization and Decentralization, understanding authority and responsibility.	7
Unit-5	Leadership styles of Managers - Leadership Concept, Nature, Importance, Attributes of a leader, Role of a leader in demonstrating awareness of legal, personnel, and strategic issues relating to globalization, culture and gender diversity in an organization, Role of leader in conflict resolution and negotiations	7
Unit-6	Organizational Communication - Communication in Organizations: Introduction, Importance of Communication in the Workplace; Understanding Communication Process, Barriers to Communication, Use of tone, language and styles in Communication, Role of Perception in influencing communication, Role of culture in communication	7
Total		42

Text Book:

1. Fundamentals of Management by Stephen P. Robbins, David A. Decenzo, 2016., Pearson Education, 9th Edition
2. Management Fundamentals: Concepts, Applications, & Skill Development, 6th edition, Sage. 2014
3. Principles of Management by Richard L. Daft, Cengage Learning. 2009
4. Essentials of Management. By Harold Koontz, O'Donnell and Heinz Weihrich, 2012. New Delhi, 9th edition, Tata McGraw Hill

References:

1. Marketing Management by Kotler, P., Keller, Kevin Lane Keller et al., 3rd Edition, 2016.
2. Statistical management Richard I Levin, David S Rubin, 7th Edition, Prentice Hall India, 2011.

Course Code	Course Title	L	T	P	C
4SC04	Technical Report Writing	2	0	0	2

Course Prerequisite: Nil

Course Learning

Objectives:

1. The Characteristics of technical report.
2. To develop effective planning for technical reports.
3. The technical writing styles and terminology.
4. About the structure of technical report writing and the importance of Presentation Skills.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Explain the key characteristics of technical report, their types and importance.
2. Do effective planning for well-organized technical reports writing.
3. Understand and use different writing styles.
4. Understand technical reports formats.
5. Prepare a technical report.
6. Understand the process of sound technical presentation.

	Subject: Technical Report Writing	L
Unit-1	Introduction to Technical Writing - Characteristics of technical report, Importance and its types. Routine Reports. Considerations in Technical Writing.	5
Unit-2	Planning and Preparation - Important Preparatory Steps, Sources of Data, Evaluation of Material, Note- Making, Organizing content, Principles of organization, Making Outline.	5
Unit-3	Writing Style - Definition of Style, The Scientific Attitude, Readability- Readability Formulas, Choice of words and phrases, Construction and Length of sentences, Construction and Length of paragraphs, Incorporating Visual Elements: Tables, Figures, and Graphs.	5
Unit-4	Technical Report - Structure and Layout Elements of Structure, Front Matter- Cover, Frontispiece, title page, copyright notice, forwarding letter, preface,	5

	acknowledgement, table of content, list of illustration, abstract. Main Body- Introduction, discussion, conclusion, recommendation. Back Matter- appendices, references, Bibliography, Glossary, Index.	
Unit-5	Writing the Report - Rough Draft, Process of Writing, Order of Writing, The Final Draft, Check-List for Reports. Different types of Report. Prepare a technical report.	5
Unit-6	Oral Presentation - Importance of Acquiring Oral Presentation Skills, Body Language, Voice Modulation, Audience Awareness, Presentation Plan, Visual Aids, Use of Connectives, Checklist, Evaluation, Brochure, Conducting a Meeting, Participating in a Meeting.	5
Total		30

Text Book:

1. "Business Correspondence and Report Writing", by R. C. Sharma and Krishna Mohan. Tata McGraw Hillbooks.
2. Technical Communication: Principles and Practice" by Meenakshi Raman and Sangeeta Sharma
3. "Business and Technical Communication: A Guide to Writing Professionally" by Paul V. Anderson
4. "Handbook of Technical Writing" by Gerald J. Alred, Charles T. Brusaw, and Walter E. Oliu

References:

1. "Effective Technical Communication" by M. Ashraf Rizvi
2. "Technical English: Writing, Reading, and Speaking" by Nell Ann Pickett and Ann Appleton Laster
3. "Communication Skills for Engineers and Scientists" by Patrick J. Garrity

Term Work: 50 Marks

Marking Scheme:

1. Attendance – 10 Marks
2. Class Test (Internal) – 20 Marks
3. Assignment (2 Nos.) – 20 Mark

Course Code	Course Title	L	T	P	C
4SC05	Entrepreneurship Development*	2	0	0	2

Course Prerequisite: Nil

Course Learning

Objectives:

1. Understand the fundamentals of entrepreneurship and its relevance to civil engineering.
2. Identify opportunities for innovation within the civil engineering sector.
3. Develop skills to create simple business plans for civil engineering ventures.
4. Analyze market trends and conduct market research specific to civil engineering projects.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Identify challenges and opportunities in the civil engineering industry.
2. Analyze the importance of having an entrepreneurial mindset in business and personal development
3. Understand the various types of enterprises within the civil engineering sector.
4. Apply market research techniques to uncover hidden opportunities within niche markets.
5. Explain the significance of market research in the context of civil engineering projects.
6. Understanding of various government schemes aimed at providing financial assistance to new businesses.

	Subject: Entrepreneurship Development	L
Unit-1	Introduction to Entrepreneurship in Civil Engineering Definition, concept of entrepreneurship, Need of Entrepreneurship, Importance of entrepreneurship in civil engineering	5
Unit-2	Characteristics and types of Entrepreneur Entrepreneurial Mindset, Characteristics of entrepreneur, types of entrepreneur, functions of an entrepreneur, Characteristics of successful entrepreneurs.	5
Unit-3	Types of Enterprises in Civil Engineering Introduction to Civil Engineering Enterprises, Construction Enterprises, Consulting Enterprises, Infrastructure Development Enterprises, Government Enterprises, Design Enterprises, Environmental Enterprises	5

Unit-4	Business opportunity Identification Understanding niche markets within civil engineering, Methods for identifying untapped markets and unmet needs, Identifying opportunities for innovation in civil engineering Identification of opportunities arising from new technologies.	5
Unit-5	Business opportunity Evaluation: Conducting market research specific to civil engineering ventures, Identifying target markets and customer segments, methods for evaluating market demand and feasibility	5
Unit-6	Financial Assistance to New Businesses Different Government schemes to start a business such MSME, PMEGP, DIC, KVIC, MIDC, MCED, Khadi-udyog	5
Total		30

Text Book:

1. "Entrepreneurship Development" by S. Anil Kumar and C. Sankar
2. "Entrepreneurship and Small Business Management" by Vasant Desai
"Civil Engineering: Conventional and Objective Type" by R.S. Khurmi and J.K. Gupta
3. "Opportunity Identification and Entrepreneurial Behavior" by Jay Mitra

References:

1. "Market Research and Analysis" by G.C. Beri
2. "Entrepreneurial Finance" by J. Chris Leach and Ronald W. Melicher
3. "The Entrepreneurial Instinct: How Everyone Has the Innate Ability to Start a Successful Small Business." Author - Mehta, Monica. Publication - McGraw-Hill Education,

Term Work: 50 Marks

Marking Scheme:

1. Attendance – 10 Marks
2. Class Test (Internal) – 20 Marks
3. Assignment (2 Nos.) – 20 Mark

Cours Code	Course Title	L	T	P	C
4SC06	Geotechnical Engineering-I Lab	0	0	2	1

Course Prerequisite: Nil

Course Learning Objectives:

1. The various index properties of soil and its determination.
2. The classification of soil based on its index properties
3. The various engineering properties of soil and its significance in the field of civil engineering

Course Outcomes:

After successfully completing the course, students will be able to-

1. Identify the type of soil based on its soil properties
2. Determine all index properties and engineering properties of soil
3. Understand the critical behaviour of soil based on its properties.

List of Experiments/ Practical's: (Minimum Eight (08) experiments/ Practical's are to be performed.)

1. Determination of specific gravity of soil solids by Pyconometer or density bottle method.
2. Determination of moisture content by oven drying method/torsion balance method.
3. Determination of field density of the soil by sand replacement / core cutter method.
4. Determination of grain size distribution by mechanical sieve analysis.
5. Determination of Atterberg's limits (LL, PL and SL).
6. Determination of compaction properties by standard proctor test/modified proctor test.
7. Determination of permeability of soil by using falling head test/constant head method.
8. Determination of shear strength parameters by direct shear test (box shear test)
9. Determination of shear strength by unconfined compressive strength test.
10. Determination of shear strength parameters by triaxial shear test (UU type).
11. Determination of CBR value by conducting lab CBR test (soaked/unsoaked).
12. Determination of Coefficient of consolidation by conducting consolidation

Cours Code	Course Title	L	T	P	C
4SC07	Environmental Engineering-I Lab	0	0	2	1

Course Prerequisite: Nil

Course Learning

Objectives:

1. Importance of water quality standards.
2. An ability to perform various physical and chemical tests on water sample.
3. An ability to understand various biological tests performed on water sample and to perform a few biological tests on water.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Examine water quality standards and relate water quality with permissible standards
2. Experiment on various characteristics of water.
3. Evaluate different characteristics of water.

List of Experiments/ Practical's: (Minimum Eight (08) experiments/practical are to be performed. Field visit is Compulsory.)

1. Determination of Turbidity of water.
2. Determination of pH of the water.
3. Analysis of Dissolved, Suspended and Total solids
4. Analysis of Volatile and Fixed solids
5. Optimum coagulant dose
6. Determination of Temporary and Permanent Hardness of water.
7. Determination of residual chlorine in the given water.
8. Determination of Acidity and alkalinity of water.
9. Determination of Iron and Manganese
10. Determination of Electrical Conductivity of water.
11. Total Count of Bacteria Test
12. Report of Field visit to Municipal water treatment plant

Course Code	Course Title	L	T	P	C
4SC08	Building Planning Designing & CAD	0	0	2	1

Course Prerequisite: Nil

Course Learning

Objectives:

1. Need of engineering drawings and methods of drawing.
2. About building bylaws and its application on residential and public buildings.
3. To draw submission and working drawings.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Understand different lines, symbols and abbreviations use in building.
2. Understand and prepare drawings of different buildings by using building regional bylaws
3. Design of working and submission drawing.

List of Experiments/ Practical's: (Minimum Eight (08) experiments/practical are to be performed.)

1. To write and draw abbreviations and graphical symbols for materials, doors, windows, sanitary and water supply installations, electrical installations as per IS 962:1989.
2. To study and draw different types of Footings/ Foundations (Draw free hand sketches on sketchbook)
3. To study and draw section through wall (Draw free hand sketches on sketchbook)
4. To study and draw different types of stairs (At least 02 on sketchbook)
5. To study components of RCC Framed structure building (At least 02 using Auto CAD)
6. Study of the IS code provisions for the building drawing and building bylaws for government authorities (Amravati Region)
7. To draw line plan of residential (1 sheet) with staircase, WC and bath. (on A3 size graph paper)

8. To draw line plan of public buildings. (2 sheets) (on A3 size graph paper)
9. To draw submission drawing (RCC frame structure) of given line plan, showing developed plan, elevation, section passing through staircase **and** W.C. and Bath, site plan with area statement and other details. **{Draw drawing on A2 size sheet and Auto-CAD software}. (Compulsory)**
10. To draw working drawing (Load Bearing structure) of given line plan, showing developed plan, elevation, side view, section passing through staircase **and** W.C. and Bath, site plan. **{Draw drawing on A2 size sheet and Auto-CAD software} (Compulsory)**

Course Code	Course Title	L	T	P	C
4SC09	Field Project	0	0	4	2

Course Prerequisite: Nil

Course Learning

Objectives:

1. Application of class knowledge for field problems.
2. Apply the knowledge of surveying with comprehensive and systematic approach on the field
3. Apply knowledge of Civil engineering in field problem

Course Outcomes:

After successfully completing the course, students will be able to-

1. Demonstrate the application of knowledge acquired from classes for the development of project.
2. Determine the project related activities effectively and communicate it efficiently
3. Elaborate the methods studied in the course to the team in the development of technical projects.

List of Experiments/ Practical's:

1. Irrigation Project
2. Rehabilitation of Village / Town
3. Water Supply Project
4. Sewerage System
5. Bridge on River
6. Flood Relief Structures
7. Any project related to Civil Engineering.

Students should conduct a detailed survey in a seven-day camp. Data Analysis, Design & Submit Report & Drawing sheets

Course Code	Course Title	L	T	P	C
4SCH	Air Pollution and Control	3	0	0	3

Course Prerequisite: Nil

Course Learning Objectives:

1. The basic concepts of air pollution.
2. Air pollution episodes.
3. Sampling types and methods for ambient air and stack.
4. Macro and micrometeorology for understanding the dispersion of pollutants.

Course Outcomes:

After successfully completing the course, students will be able to-

1. Classify and identify the sources of air pollutants and predict the effects of air pollutants on human health and the environment.
2. Apply and relate the significance of various air pollution dispersion models.
3. Identify various environmental transformation processes of pollutants under extreme weather conditions.
4. Understand meteorological data and develop the capability to the assessment of the project proposals, and air quality pollution index for any region.
5. Justify the use of pollution control equipment and their design.
6. Design of emission control devices and control of gaseous emission..

	Subject: Air Pollution and Control	L
Unit-1	Elements of Air Pollution - History of air pollution, Definitions, sources and classification of air pollution, Natural versus polluted atmosphere, Primary and secondary air pollutants, Stationary and mobile sources. Photochemical Smog.	7
Unit-2	Effects of air pollution - Effect on human health, on vegetation, on animals and on materials. Global effects: Global Warming, Acid Rain, Ozone layer depletion, Air pollution episodes. Economic effects.	7

Unit-3	Meteorology and Air Pollution - Meteorological factors influencing air pollution, Plume behavior, Wind rose, Air pollution modellings-Box model, Gaussian plume model, Stack height and problems on determination of Stack height.	7
Unit-4	Sampling procedures - Classification of sampling, Sampling methods, Sampling Suspended Particulates by High Volume Sampler, Determination of Mass Concentration and Problems, Stack sampling, Gaseous Samplings.	7
Unit-5	Regulatory Control of Air Pollution - Air quality criteria & standards, Elements of Regulatory Control, Air Pollution Index.	7
Unit-6	Engineering Control of Air Pollution - Engineering Control concept, control device & systems, Control of stationery sources, Control of mobile sources, source sampling & monitoring.	7
Total		42

Text Book:

1. Air Pollution by M.N. Rao & H.V.N. Rao
2. Fundamentals of Air Pollution by Stern, Wohlers, Bouble, Lower.
3. Air Pollution by A.C. Stern., Vol. I To IV.
4. Air Pollution & Control by P. P. Mowli & N. Venkata Subbayya,
5. Air Pollution Seinfeld J. H.,

References:

1. Air Pollution by Perkins.,
2. Air Quality Monitoring – A Course Manual by NEERI, 19981.