



**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
2026-2027**

**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 (Hr/Min)	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	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
2	1SF02	Applied Physics	3	--	--	BSC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
3	1SF03	Engineering Graphics	2	--	--	ESC	2	2	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
4	1SF04	Programming for Problem Solving	2	--	--	ESC	2	2	2Hrs 30Mins	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	2Hrs 30Mins	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				Duratio of paper (Hr/Min)	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	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
2	2SACEMN02	Engineering Chemistry	3	--	--	BSC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
3	2SF03	Basics of Electrical Engineering	2	--	--	ESC	2	2	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
4	2SF04	Biology for Engineers	2	--	--	BSC	2	2	2Hrs 30Mins	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	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
7	2SF06	Indian Knowledge Systems *	2	--	--	IKS	2	2	--	--	--	50	50	25	--	--	--	--
Practical																		
8	2SACEMN07	Engineering 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
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: 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 (Hr/Min)	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	2Hrs 30Mins	60	30	10	100	40	–	–	–	–
2	4SC02	Geotechnical Engineering-I	3	–	–	PCC	3	3	2Hrs 30Mins	60	30	10	100	40	–	–	–	–
3	4SC03	Environmental Engineering - I	3	–	–	PCC	3	3	2Hrs 30Mins	60	30	10	100	40	–	–	–	–
4	4SCMDM1	MDM-1	3	–	–	MDM	3	3	2Hrs 30Mins	60	30	10	100	40	–	–	–	–
5	4SCOE2	OE-2	3	–	–	OE	3	3	2Hrs 30Mins	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 (Hr/Min)	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	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
2	5SC02	Design of Reinforced Concrete Structure	3	--	--	PCC	3	3	3Hrs 30Mins	60	30	10	100	40	--	--	--	--
3	5SC03	Environmental Engineering - II	3	--	--	PCC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
4	5SC04	PEC-1	3	--	--	PEC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
5	5SCMDM2	MDM-2	3	--	--	MDM	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
6	5SCOE3	OE-3	3	--	--	OE	3	3	2Hrs 30Mins	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 (Hr/Min)	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	3Hrs 30Mins	60	30	10	100	40	--	--	--	--
2	6SC02	Surveying - II	3	--	--	PCC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
3	6SC03	Fluid Mechanics	3	--	--	PCC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
4	6SC04	PEC-3	3	--	--	PEC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
5	6SC05	PEC-4	3	--	--	PEC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
6	6SCMDM3	MDM-3	3	--	--	MDM	3	3	2Hrs 30Mins	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 (Hr/Min)	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	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
2	7SC02	Quantity Survey and Estimate	3	--	--	PCC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
3	7SC03	PEC-5	3	--	--	PEC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
4	7SC04	PEC-6	3	--	--	PEC	3	3	2Hrs 30Mins	60	30	10	100	40	--	--	--	--
5	7SCMDM4	MDM-4	3	--	--	MDM	3	3	2Hrs 30Mins	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 (Hr/Min)	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	2Hrs 30Mins	60	30	10	100	40					
2	8SC02	Earthquake Resistant Design*	3			PCC	3	3	2Hrs 30Mins	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	4SEMMDM1	Electronic Instrumentation	IV	AI&DS, CE, CSE, IT, CSE(IoT), ME	Electronics and Telecommunication Engineering
	2	5SEMMDM2	Electronic Devices and Circuits	V		
	3	6SEMMDM3	Analog and Digital Communication	VI		
	4	7SEMMDM4	Electronic Circuit Design	VII		
Telecommunication Engineering	1	4SEMMDM5	Basic Electronic Communication Systems	IV	AI&DS, CE, CSE, IT, ME	
	2	5SEMMDM6	Introduction to Wireless Communication	V		
	3	6SEMMDM7	Introduction to Mobile Computing	VI		
	4	7SEMMDM8	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 Healthcare 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

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

Semester: IV																		
Sem	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			SM Applicable to	Total Hrs/ Week	Credits	Theory					Practical				
			Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper ESE/ ESSE	Max Marks MSE/ MSIE	Max. Marks TA	Total	Overall Min Passing Marks	Max Marks		Total	Min Passing Marks
												Int.	Ext.					
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				Duration of paper (Hr)	Max Mark s Paper ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max Marks		Total	Min Passing 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				–		
															Total		100		

B.Tech. First Semester (Civil Engineering)

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

Course Requisite:

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	Jacobian: Jacobian of explicit functions and implicit functions with properties, functional dependence, maxima and minima of function of two independent variables.	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 Kirchoff'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 Objective:

- 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

B.Tech. Second Semester (Civil Engineering)

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

Course Requisite:

- 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.	8
Unit VI	Integral Calculus III: Triple integration, Transformation to spherical polar coordinates, Volume of solid by triple integration.	7
Total		42

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.
5. Ordinary And Partial Differential Equations By Dr. M. D. Raisinghania, S.Chand & Company Ltd
6. Advanced Engineering Mathematics by R. K. Jain, S. R. K. Iyengar, Satteluri R. Iyengar, Alpha Science International, 2007.

Course Code	Course Title	L	T	P	C
2SACEMN02	Engineering Chemistry (EC)	03	00	00	03

Course Prerequisites:

1. Understanding of fundamental chemical concepts, such as atomic structure, chemical bonding, and chemical reactions.
2. Familiarity with materials science concepts, such as crystal structures, material properties, and phase diagrams.
3. Basic understanding of physical principles, such as thermodynamics, electromagnetism, and quantum mechanics.
4. Fundamentals of redox reactions and electrochemistry.
5. Knowledge of chemical reaction.
6. Basic knowledge of qualitative and quantitative analysis.

Course Learning Objectives:

1. Develop an understanding of conducting polymers, nanomaterials, alloys, and cement engineering, including their synthesis, properties, and applications.
2. Understand the principles of conventional and non-conventional energy sources, energy storage devices, and generation devices, including batteries, solar cells, and fuel cells.
3. Develop knowledge of e-waste management, wastewater management, corrosion mechanisms, and methods of corrosion control.
4. Gain hands-on experience with computational chemistry software packages and apply computational chemistry to structure-based drug design, materials modeling, and environmental modeling.

Course Outcomes:

1. Students will be able to analyze and apply knowledge of engineering materials: Including conducting polymers, nonmaterial and alloys to solve real-world problems.
2. Students will be able to understanding the types of cement, raw materials, manufacturing processes, and physical properties of Portland cement.
3. Students will get the knowledge of sources and storage systems: Including conventional and non-conventional energy sources, energy storage devices, and generation devices.
4. Students will be able to manage waste and control corrosion: Understanding e-waste management, wastewater management, corrosion mechanisms, and methods of corrosion control.
5. Students will be able to apply knowledge of computational chemistry tools and techniques: used in structure-based drug design, materials modeling, and environmental modeling.
6. Students will be able to analyse concepts from materials science, energy, corrosion, waste management, and computational chemistry to address real-world challenges.

	Subject: Applied Chemistry (AC)	L
UNIT I	Engineering Materials: ➤ Electrically Conducting Polymers: Introduction, synthesis, properties and applications of Polyacetylene and Polyaniline. ➤ Photo-conducting Polymers: Introduction, properties and applications of Poly(N-vinyl carbazole) and Poly(N-benzyl glutamate). ➤ Nanomaterials: Introduction, size-dependent properties and applications in Li-ion batteries and photovoltaics. ➤ Alloys: Introduction, classification, properties and applications of important ferrous and non-ferrous alloys.	8
UNIT II	Cement Engineering: ➤ Introduction, types of cement, raw materials and manufacturing of Portland cement by wet process. ➤ Chemical constituents of cement and their functions. ➤ Physical properties of Portland cement: soundness, heat of hydration, setting and hardening.	6
UNIT III	Energy Sources, Storage and Generation Devices: ➤ Introduction and classification of energy sources: conventional and non-conventional. ➤ Batteries: Principle and types; construction, working and application of Dry cell, Mercury cell, Ni-Cd battery and Lithium-ion battery. ➤ Photovoltaic cell and fuel cell: construction, working and application.	6
UNIT IV	Corrosion & Its Control: ➤ Introduction to corrosion. Dry and wet corrosion and their mechanisms. Types of wet corrosion: pitting, waterline, stress and galvanic corrosion. ➤ Methods of corrosion control: cathodic protection (sacrificial anode and impressed current methods) and protective coatings (galvanizing and tinning).	6
UNIT V	Waste Management: ➤ E-waste: Introduction, sources, composition, environmental effects, principles and technologies for e-waste management and resource recovery. ➤ Waste water management: Introduction, characteristics, analysis and purification of wastewater.	7
UNIT VI	Computational Chemistry: ➤ Introduction and importance of computational chemistry. ➤ Molecular drawing, visualization and file conversion using ChemDraw or ISIS Draw, PyMOL and Open Babel. ➤ Demonstration of molecular modeling and structure optimization using free/open-source computational chemistry tools.	7

	➤ Applications in drug design, materials science, atmospheric chemistry and water quality analysis.	
	Total	40

Text Books:

1. Dara, S. S. and Umare, S. S., Engineering Chemistry, S. Chand Publishing.
2. Jain, P. C. and Jain, M., Engineering Chemistry, Dhanpat Rai & Sons.
3. Krishnamurthy, N. and Vallinayagam, P., Engineering Chemistry, PHI Learning.
4. Rath, P., Engineering Chemistry, Cengage Learning.

Reference Books:

1. Maheswaramma, K. S. and Chugh, M., Engineering Chemistry, Pearson Education.
2. Agarwal, S., Engineering Chemistry: Fundamentals and Applications.
3. Prasad, M. A. B. V. and Krishna, S. V. S. R., E-Waste Management, 2012.
4. Frank Jensen, Introduction to Computational Chemistry, 3rd Edition, Wiley.
5. Andrew R. Leach, Molecular Modelling: Principles and Applications, Pearson.
6. Christopher J. Cramer, Essentials of Computational Chemistry: Theories and Models, Wiley

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
2SACEMN07	Engineering Chemistry Lab	00	00	02	01

Course Prerequisites:

1. Knowledge of chemistry lab precautions, prohibitions and safety aids.
2. Knowledge of basic laboratory techniques, such as handling chemicals, using glassware, and operating simple laboratory equipment.
3. Knowledge of qualitative and quantitative analysis.

Course Learning Objectives:

1. To understand the principles and methods of synthesizing and characterizing materials, including nanomaterials and polymers.
2. To learn how to apply experimental techniques to analyze the properties of materials, such as conductivity, pH, and viscosity.
3. To develop skills in designing and fabricating simple devices, such as batteries and solar cells, using semiconductor materials.
4. To apply knowledge of materials science and engineering to solve problems in areas such as wastewater treatment, corrosion, and recycling.

Course Outcomes:

Students will be able to

1. Apply knowledge of materials science and engineering to synthesize and characterize materials, including nanomaterials and polymers.
2. Analyze and solve problems related to materials properties, such as conductivity, pH, and viscosity, using experimental techniques and computational tools.
3. Design and fabricate simple devices, such as batteries and solar cells, and assess their performance using semiconductor materials and computational chemistry software

EXPT.	Subject: Applied Chemistry Lab
1.	Synthesis of Urea Formaldehyde Resin.
2.	Determination of H ⁺ ion concentration by conductivity meter.
3.	Determination of pH of unknown solution using pH meter.
4.	Determination of percentage of CaO in a given cement sample.
5.	Determination of alkalinity of water sample.
6.	Preparation of silica nanomaterial by sol-gel method.
7.	Determination of hardness of water by EDTA method.
8.	Determination of Dissolved Oxygen (DO) in water sample.

9.	Determination of viscosity of lubricating oil using Redwood Viscometer No. 1.
10.	Determination of viscosity of lubricating oil using Redwood Viscometer No. 2.
11.	Determination of mass of zinc coating on galvanized iron article.
12.	Construction of a simple galvanic cell and measurement of EMF.
13.	Study of galvanic corrosion using two dissimilar metals
	Total hours for the completion of minimum nine (09) experiments

Reference Books:

1. Dara, S. S. and Umare, S. S., Engineering Chemistry, S. Chand & Co. Ltd.
2. Fried, J. R., Polymer Science and Technology.
3. Fontana, M. G., Corrosion Engineering.
4. Skoog, D. A. and West, D. M., Analytical Chemistry.

Text Books:

5. Dara, S. S., Experiments and Calculations in Engineering Chemistry, S. Chand & Co. Ltd.
6. Bhasin, S. K. and Rani, S., Laboratory Manual on Engineering Chemistry, Dhanpat Rai Publishing Co.

Course Code	Course Title	L	T	P	C
2SF08	Basic of Electrical Engineering Lab	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