



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

(An Autonomous Institute)

Affiliated to Sant Gadge Baba Amravati University, Amravati, Maharashtra (India)

PROGRAMME SCHEME & SYLLABI 2024-2025

**B.Tech
Department of
Electronics and Telecommunication 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: Electronics & Telecommunication Engineering

SEMESTER: I (GROUP-A/GROUP-B)																			
Sr No	Course Code	Course Name	Teaching Scheme							Examination Scheme									
			Hours / Week			Group	Total Hrs/Week	Credits		Theory						Practical			
			Lecture	Tutorial	P/D					Duration of paper (Hr)	Max Marks Paper 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	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/HSSM	2	2		3	60	30	10	100	40	--	--	--	--
6	1SET01	Electrical Measurements & Measuring Instruments	3	--	--	PCC	3	3		3	60	30	10	100	40	--	--	--	--
7	1SF06	Design Thinking *	1	--	--	LLC	1	1		--	--	--	50	50	25	--	--	--	--
Practical's																			
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	1SET02	Electrical Measurements & Measuring Instruments Lab	--	--	2	PCC	2	1		--	--	--	--	--	--	25	25	50	25
12	1SF10	NSS/Sports/Yoga/Cultural/ Community Service **	--	--	2	VSEC	2	1		--	--	--	--	--	--	50		50	25
			15	1	10		26	21						650				250	
																Total		900	

* Assessment will be based on Case study and Assignments

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati

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Four Year Under Graduate Degree Program in Bachelor of Technology

Choice Based Credit System (Semester Pattern)

Branch: Electronics & Telecommunication Engineering

SEMESTER: II (GROUP-A/GROUP-B)																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hrs/Week	Credits	Theory						Practical			
			Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper 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	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/HSSM	2	2	3	60	30	10	100	40	--	--	--	--
6	2SAEKNT01	Introduction to Python	3	--	--	ESC	3	3	3	60	30	10	100	40	--	--	--	--
7	2SF06	Indian Knowledge Systems *	2	--	--	IKS/HSSM	2	2	--	--	--	50	50	25	--	--	--	--
Practicals																		
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	2SAEKNT02	Introduction to Python Lab	--	--	2	ESC	2	1	--	--	--	--	--	--	25	25	50	25
11	2SF09	Workshop/Digital Fabrication Lab	--	--	2	VSEC	2	1	--	--	--	--	--	--	25	25	50	25
		Total	17		8		25	21					650				200	
															Total		850	

* Assessment will be based on Unit Tests and Assignments

Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Fourth semesters) to qualify for UG Certificate

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	8
OR	
Internship (Min 120 hrs)	8

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati

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Four Year Under Graduate Degree Program in Bachelor of Technology

Choice Based Credit System (Semester Pattern)

Branch: Electronics & Telecommunication Engineering

SEMESTER: III																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hrs/Week	Credits	Theory						Practical			
			Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper 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	3SE01	Applied Mathematics - III	2	--	--	BSC	2	2	3	60	30	10	100	40	--	--	--	--
2	3SE02	Electronic Devices & Circuits	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
3	3SE03	Digital System Design	2	--	--	PCC	2	2	3	60	30	10	100	40	--	--	--	--
4	3SE04	Electromagnetic Waves	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
5	3SEOE1	OE-1	3	--	--	OE-I	3	3	3	60	30	10	100	40	--	--	--	--
6	3SE05	Fundamentals of Entrepreneurship [#]	2	--	--	EEMC	2	2	--	--	--	50	50	25	--	--	--	--
7	3SE06	Environmental Science*	2	--	--	VEC-01	2	2	--	--	--	50	50	25	--	--	--	--
Practicals																		
8	3SE07	Electronic Devices & Circuits Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
9	3SE08	Digital System Design Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
10	3SE09	Object Oriented Programing Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
11	3SE10	Community Engagement Project / Field Project			4	ELC	4	2	--	--	--	--	--	--	50	0	50	25
		Total	17		10		27	22					600				200	
															Total		800	
OE-1 : 3SEOE1A Operation Management 3SEOE1B Marketing Management 3SEOE1D Introduction to Cyber Laws																		

[#] Evaluation will be based on subject related activities,

* Evaluation will be based on Field Visit, Environment based project or other relevant activities

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Four Year Under Graduate Degree Program in Bachelor of Technology

Choice Based Credit System (Semester Pattern)

Branch: Electronics & Telecommunication Engineering

SEMESTER: IV																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hrs/Week	Credits	Theory						Practical			
			Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper 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	4SE01	Analog Circuits	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
2	4SE02	Analog and Digital Communication	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
3	4SE03	Network Theory	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
4	MDM1	MDM-01	3	--	--	MDM	3	3	3	60	30	10	100	40	--	--	--	--
5	4SEOE2	OE-II	3	--	--	OE	3	3	3	60	30	10	100	40	--	--	--	--
6	4SE04	Signals and systems	2	--	--	AEC/VSEC	2	2	3	60	30	10	100	40	--	--	--	--
7	4SE05	Engineering Economics*	2	--	--	EEMC	2	2	--	--	--	50	50	25	--	--	--	--
Practicals																		
8	4SE06	Analog Circuits Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
9	4SE07	Analog and Digital Communication Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
11	4SE08	Network Theory Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
12	4SE09	Signals and systems Lab	--	--	2	AEC/VSEC	2	1	--	--	--	--	--	--	25	25	50	25
		Total	19		8		27	23					650				200	
*Evaluation will be based on subject related activities															Total		850	
OE-2 :- 4SEOE2A Aptitude for Engineers 4SEOE2B Financial Planning 4SEOE2C Accounting & Costing																		

Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Fourth semesters) to qualify for Diploma

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	8
OR	
Internship (Min 120 hrs)	8

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Choice Based Credit System (Semester Pattern)
Branch: Electronics & Telecommunication Engineering

SEMESTER: V																			
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme										
			Hours / Week			Group	Total Hrs/Week	Credits	Theory						Practical				
			Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max Marks		Total	Min Passing Marks	
						Max Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.								
Theory																			
1	5SE01	Microcontroller and Applications	3	--	--	PCC	3	3		3	60	30	10	100	40	--	--	--	--
2	5SE02	Power Electronics	3	--	--	PCC	3	3		3	60	30	10	100	40	--	--	--	--
3	5SE03	Digital Signal Processing	3	--	--	PCC	3	3		3	60	30	10	100	40	--	--	--	--
4	5SE04	PEC-01	2	--	--	PEC	2	2		3	60	30	10	100	40	--	--	--	--
5	5SE05	PEC-02	2	--	--	PEC	2	2		3	60	30	10	100	40	--	--	--	--
6	MDM2	MDM-02	3	--	--	MDM	3	3		3	60	30	10	100	40	--	--	--	--
7	5SEOE3	OE-III	3	--	--	OE	3	3		3	60	30	10	100	40	--	--	--	--
Practicals																			
8	5SE06	Microcontroller and Applications Lab	--	--	2	PCC	2	1		--	--	--	--	--	--	25	25	50	25
9	5SE07	Power Electronics Lab	--	--	2	ELC	2	1		--	--	--	--	--	--	25	25	50	25
10	5SE08	Digital Signal Processing Lab	--	--	2	PCC	2	1		--	--	--	--	--	--	25	25	50	25
		Total	19		6			25	22					700				150	
																Total		850	
PEC- 1:- 5SE04PE1A Control Systems , 5SE04PE1B Speech and Audio Processing , 5SE04PE1C Fiber Optic Communication																			

PEC- 2:- 5SE05PE2A Sensors and Transducers , 5SE05PE2B Introduction to JAVA , 5SE05PE2C Cryptography & Network Security

OE-III :- 5SEOE3A Waste to Energy , 5SEOE3B Intellectual Property Rights(IPR), 5SEOE3C Human Resource Management

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Choice Based Credit System (Semester Pattern)

Branch: Electronics & Telecommunication Engineering

SEMESTER: VI																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hrs/Week	Credits	Theory						Practical			
			Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max		Total	Min Passing Marks
											Max Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
Theory																		
1	6SE01	Microwave Theory & Techniques	3	-	-	PCC	3	3	3	60	30	10	100	40	--	--	--	--
2	6SE02	Digital Image Processing	3	-	-	PCC	3	3	3	60	30	10	100	40	--	--	--	--
3	6SE03	Embedded systems	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
4	6SE04	PEC-03	3	--	--	PEC	3	3	3	60	30	10	100	40	--	--	--	--
5	6SE05	PEC-04	3	--	--	PEC	3	3	3	60	30	10	100	40	--	--	--	--
6	MDM3	MDM-03	3	--	--	MDM	3	3	3	60	30	10	100	40	--	--	--	--
7	6SDMP	Disaster Management and Preparedness	2					2	0									
Practical's																		
7	6SE06	Microwave Theory & Techniques Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
8	6SE07	Digital Image Processing Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
9	6SE08	Embedded System Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
10	6SE09	Mini Project	--	--	2	ELC	2	1	--	--	--	--	--	--	50		50	25
		Total	20		8			28	22				600				200	
															Total		800	

PEC- 3 :- 6SE04PE3A IOT, 6SE04PE3B Biomedical Electronics, 6SE04PE3C Data Base Management System

PEC- 4 :- 6SE05PE4A Adaptive Signal Processing, 6SE05PE4B Renewable Energy Sources, 6SE05PE4C Antenna & Wave Propagation

Exit Option: Two relevant skill-based courses (excluding from list of courses undertaken in First to Sixth semesters) to qualify for B.Voc.

Title	Credit
Two relevant MOOC/NPTEL courses as decided by BOS	8
OR	
1. Internship (Min 120 hrs)	8

Prof. Ram Meghe Institute of Technology and Research, Badnera-Amravati

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Four Year Under Graduate Degree Program in Bachelor of Technology

Choice Based Credit System (Semester Pattern)

Branch: Electronics & Telecommunication Engineering

SEMESTER: VII																		
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Group	Total Hrs / Week	Credits	Theory						Practical			
			Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max		Total	Min Passing Marks
											Max Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
Theory																		
1	7SE01	Communication Networks	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
2	7SE02	VLSI Design	3	--	--	PCC	3	3	3	60	30	10	100	40	--	--	--	--
3	7SE03	PEC-05	2	--	--	PEC	2	2	3	60	30	10	100	40	--	--	--	--
4	7SE04	PEC-06	2	--	--	PEC	2	2	3	60	30	10	100	40	--	--	--	--
5	MDM4	MDM-04	3	--	--	MDM	3	3	3	60	30	10	100	40	--	--	--	--
Practical's																		
6	7SE05	PROJECT	--	--	8	ELC	12	6	--	--	--	--	--	--	100	100	200	100
7	7SE06	Cryptography and Network Security Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
8	7SE07	VLSI Design Lab	--	--	2	PCC	2	1	--	--	--	--	--	--	25	25	50	25
9	7SE08	Research Methodology				ELC	4	2							50	0	50	25
		Total	13		12		27	23					500				350	
															Total		850	

* Evaluation will be based on subject related activities

PEC- 5 :- 7SE03PE5A High Speed Electronics , 7SE03PE5B Computer Architecture , 7SE03PE5C Error Correcting Codes

PEC- 6 :- 7SE04PE6A Introduction to MEMS , 7SE04PE6B Introduction to Artificial Intelligence & Machine Learning, 7SE04PE6C Printed Electronics

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

SEMESTER: VIII																						
Sr No	Course Code	Course Name	Teaching Scheme						Examination Scheme													
			Hours / Week			Group	Total Hrs/Week	Credits	Theory						Practical							
			Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max Marks		Total	Min Passing Marks				
											Max Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.						
Theory																						
1	8SE01	Satellite Communication	3	--	--	PCC	3	3		3	60	30	10	100	40							
2	8SE02	Mobile Communication Networks	3	--	--	PCC	3	3		3	60	30	10	100	40							
		Total	6		0		6	6						200			200					
AND															Total		200					
3	8SE03	Internship / Apprenticeship / On the Job Training	--	--		ELC	24	12		--	--	--	--		--	150	150	300	150			
		Total					30	18								Total		500				
OR																						
3	8SE03	Research Internship	--	--		ELC	24	12		--	--	--	--		--	150	150	300	150			
		Total					30	18								Total		500				

* Theory Subjects will be based on self-learning or online learning without MSE/MSIE.

* The internal assessment for theory subjects will be as follows.

1. There will be online objective type examination of 15 Marks based on Unit I and Unit II.
2. There will be online assignment of 15 Marks based on Unit III to Unit VI.
3. The 10 Marks of Teachers Assessment will be based on overall performance of the student.

Name of Degree Offered	Semesters								Total Credits
	I	II	III	IV	V	VI	VII	VIII	
B. Tech. EXTC with Multidisciplinary Minor	21	21	22	23	22	22	23	18	172

Prof. Ram Meghe Institute of Technology and Research, Badnera-
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Four Year Under Graduate Degree Program in Bachelor of
Technology Choice Based Credit System (Semester Pattern)
Branch: ELECTRONICS & TELECOMMUNICATION ENGINEERING

B.Tech with Honors																			
Sr No	Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme									
				Hours / Week			Group	Total Hrs/Week	Credits	Theory						Practical			
				Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max Marks		Total	Min Passing Marks
												Max Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
1	IV	4SEH	Electrical Machines & Drives	3			Honor		3	3	60	30	10	100	40				
2	V	5SEH	Electronics Circuit Design	3			Honor		3	3	60	30	10	100	40				
3	VI	6SEH	PLC & Scada	3			Honor		3	3	60	30	10	100	40				
4	VII	7SEH1	Biomedical Signal Processing	3			Honor		3	3	60	30	10	100	40				
6	VII	7SEH2	Mini Project	3			Honor		3							50	50	100	50
5	VIII	8SEH	VLSI Design Verification and Testing	3			Honor		3	3	60	30	10	100	40				
			Total	18		0			18					500				100	
																Total:		600	

* The internal assessment for theory subjects for Semester VIII (8SEH) will be as follows.

1. There will be online objective type examination of 15 Marks based on Unit I and Unit II.
2. There will be online assignment of 15 Marks based on Unit III to Unit VI.
3. The 10 Marks of Teachers Assessment will be based on overall performance of the student.

***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, IIoT, 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, IIoT, 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, IIoT, 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, IIoT, 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, IIoT, 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		

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

***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	
Software Engineering	1	4SKMDM5	Software Requirements Engineering	IV	AI&DS, CE, EXTC, IT, IIoT, ME	Computer Science and Engineering	
	2	5SKMDM6	Software Architecture	V			
	3	6SKMDM7	Software Project Management	VI			
	4	7SKMDM8	Software Testing and Quality Assurance	VII			
Electronics and Communication Engineering	1	4SEMDM1	Electronic Instrumentation	IV	AI&DS, CE, CSE, IT, IIoT, 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, IIoT, 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, IIoT, ME		
	2	5SNMDM6	Fundamentals of Cryptography	V			
	3	6SNMDM7	Basics of Ethical Hacking	VI			
	4	7SNMDM8	Blockchain Technology	VII			

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

***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
IoT	1	4STMDM1	Fundamentals of IoT	IV	AI&DS, CE, CSE, EXTC, IT, ME	Industrial IoT
	2	5STMDM2	Sensors and Actuators	V		
	3	6STMDM3	Single Board Computers	VI		
	4	7STMDM4	Industrial Internet of Things	VII		
Mechanical Engineering	1	4SMMDM1	Energy Engineering	IV	AI&DS, CE, CSE, EXTC, IT, IIoT	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, IIoT	
	2	5SMMDM6	Rapid Prototyping	V		
	3	6SMMDM7	Automation Engineering	VI		
	4	7SMMDM8	Robotics and industrial Application	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	IV	CSE, CE, EXTC, IT, IIoT, ME	Artificial Intelligence and Data Science
	2	4SASM	Advanced Java Programming	V		
	3	5SASM	Mobile Application Development	VI		
	4	6SASM	Introduction to Gaming	VII		
	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, IIoT, 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, IIoT, 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

Double Minor / Specialization Minor Basket Track Name	Sr. No.	Course Code	Course Name	Semester	Students from following Departments can Register	Offered by Department of
Information Processing	1	3SNSM	Fundamentals of Information Technology	III	CE, CSE, EXTC, IIoT, 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		
Industrial IoT	1	3STSM	Introduction to Internet of Things	III	AI&DS, CE, CSE, EXTC, IT, ME	Industrial IoT
	2	4STSM	Industrial Sensors and Actuators	IV		
	3	5STSM	Industrial Networks	V		
	4	6STSM	Embedded System for Internet of Things	VI		
	5	7STSM	Edge and Fog Computing	VII		
	6	8STSM	Internet of Things Security	VIII		
Manufacturing Techniques	1	3SMSM	Manufacturing Processes-I	III	AI&DS, CE, CSE, EXTC, IT, IIoT,	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		

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	7SEH1	Biomedical Signal Processing	VII
	5	7SEH2	Minor Project	VII
	6	8SEH	VLSI Design Verification and Testing	VIII

Honors Baskets of Courses for all Departments

Name of Department	Sr. No.	Course Code	Course Name	Semester
Information Technology	1	4SNH	Advanced Data Science	IV
	2	5SNH	Advanced Machine Learning	V
	3	6SNH	Advanced Artificial Intelligence	VI
	4	7SNH	Advanced Deep Learning	VII
	5	8SNH1	Advanced Speech and Natural Language Processing	VIII
	6	8SNH2	Minor Project	VIII
Industrial IoT	1	4STH	IoT Architectures and Protocols	IV
	2	5STH	Internet of Things Security	V
	3	6STH	Embedded Systems and IoT	VI
	4	7STH	Machine Learning For IoT	VII
	5	8STH1	Data Science in IoT	VIII
	6	8STH2	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

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 3rd Semester

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			SM Applicable to	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.		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
Theory																		
III	3SASM	Advanced Programming for Data Science	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	--	--	--	--
III	3SCSM	Environmental Pollution and Control	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	--	--	--	--
III	3SKSM	Introduction of HTML	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	--	--	--	--
III	3SESM	Fundamentals of Digital Electronics	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	--	--	--	--
III	3SNSM	Fundamentals of Information Technology	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	--	--	--	--
III	3STSM	Introduction to Internet of Things	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	--	--	--	--
III	3SMSM	Manufacturing Processes-I	3	--	--	AI&DS, CE, CSE, EXTC, IT, IIoT	3	3	3	60	30	10	100	40	--	--	--	--
		Total	3	--	--		3	3					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

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

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			SM Applicable to	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.		Total	Min. Passing Marks
											Max. Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.		
Theory																		
IV	4SASM	Advanced Java Programming	3	--	--	CE, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SCSM	Water Treatment Engineering	3	--	--	AI&DS, CSE, EXTC, IT, IIoT, ME	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SKSM	Javascript	3	--	--	AI&DS, CE, EXTC, IT, IIoT, ME.	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SESM	Digital System Design	3	--	--	AI&DS, CE, CSE, IT, ME	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SNSM	Database Processing	3	--	--	CE, CSE, EXTC, IIoT, ME	3	3	3	60	30	10	100	40	--	--	--	--
IV	4STSM	Industrial Sensors and Actuators	3	--	--	AI&DS, CE, CSE, EXTC, IT, ME	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SMSM	Manufacturing Processes - II	3	--	--	AI&DS, CE, CSE, EXTC, IT, IIoT	3	3	3	60	30	10	100	40	--	--	--	--
		Total	3				3	3					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

HONOURS BASKET OF COURSES for 4th Semester

Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme									
			Hours / Week			Honors Course Applicable to Students of	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/	Max. Marks TA			Int.	Ext.		
IV	4SAH	Advanced Programming for Data Science	3	--	--	Artificial Intelligence & Data Science	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SCH	Air Pollution and Control	3	--	--	Civil Engineering	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SKH	Data Science and Analytics	3	--	--	Computer Science and Engineering	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SEH	PLC & SCADA	3	--	--	Electronics and Telecomm. Engineering	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SNH	Advanced Data Science	3	--	--	Information Technology	3	3	3	60	30	10	100	40	--	--	--	--
IV	4STH	IoT Architectures and Protocols	3	--	--	Industrial Internet of Things	3	3	3	60	30	10	100	40	--	--	--	--
IV	4SMH	Energy Audit	3	--	--	Mechanical Engineering	3	3	3	60	30	10	100	40	--	--	--	--
		Total	3				3	3					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: ELECTRONICS & TELECOMMUNICATION ENGINEERING

Specialization Minor: Embedded System																				
Sr No	Semester	Course Code	Course Name	Teaching Scheme						Examination Scheme										
				Hours / Week			Group	Total Hrs/Week	Credits	Theory						Practical				
				Lecture	Tutorial	P/D				Duration of paper (Hr)	Max Marks Paper ESE/ ESSE	Internal		Total	Overall Min Passing Marks	Max Marks		Total	Min Passing Marks	
						Max Marks MSE/ MSIE	Max. Marks TA			Int.	Ext.									
Theory																				
1	III	3SESM	Fundamentals of Digital Electronics	3			SM	3	3		3	60	30	10	100	40				
2	IV	4SESM	Digital System Design	3			SM	3	3		3	60	30	10	100	40				
3	V	5SESM	Introduction to Microprocessors	3			SM	3	3		3	60	30	10	100	40				
4	VI	6SESM	Microcontroller and Applications	3			SM	3	3		3	60	30	10	100	40				
5	VII	7SESM	Advanced Microcontrollers	3			SM	3	3		3	60	30	10	100	40				
6	VIII	8SESM	Embedded System and RTOS	3			SM	3	3		3	60	30	10	100	40				
			Total	18		0		18	18						600					
																	Total	600		

* The internal assessment for theory subjects for Semester VIII (8SESM) will be as follows.

1. There will be online objective type examination of 15 Marks based on Unit I and Unit II.
2. There will be online assignment of 15 Marks based on Unit III to Unit VI.
3. The 10 Marks of Teachers Assessment will be based on overall performance of the student.

B.Tech. First Semester (Electronics & Telecommunication Engineering)

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

Pre-requisites:

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.

UNIT	Subject: Applied Mathematics II	No. of Lectures Required
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.

B.Tech. First Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite:

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.

UNIT	Subject: Applied Chemistry (AC)	No. of Lectures Required
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 aluminoferrite, magnesia, sulphur trioxide, iron oxide, alkalis, free lime, alumina. Physical Properties of Portland cement: Heat of hydration, Fitness, Soundness, Strength, Setting and hardening.	6
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).

B.Tech. First Semester (Electronics & Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
2SF03	Basics of Electrical Engineering	02	00	00	02

Pre-requisites:

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	Content: Basics of Electrical Engineering	No. of Lectures Required
1	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

2	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
3	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
4	A.C. Fundamentals: Generation of sinusoidal alternating voltages and currents, Different terminologies associated with AC circuit. Behavior of AC 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.	05
5	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
6	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

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.

B.Tech. First Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite: 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

UNIT	Subject: Biology for Engineers	No. of Lectures Required
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.

B.Tech. First Semester (Electronics & Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
2SF05	Universal Human Values (UHV)	02	00	00	02

Pre-requisite: 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.

UNIT	Subject: Universal Human Values	No. of Lectures Required
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:

2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA.
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. Susan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991.
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
6. A Nagaraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
7. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
8. A N Tripathy, 2003, Human Values, New Age International Publishers.
9. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi STantra Shodh, Amravati.
10. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
11. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
12. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
13. 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

B.Tech. First Semester (Electronics & Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
2SAEKNX01	Introduction to Python	03	00	00	03

Pre-requisite: Basic Knowledge of Computer.

Course Learning Objectives: Throughout the course, students will be expected to demonstrate their understanding of Introduction to Python by being able to do each of the following:

1. Develop a strong foundational understanding of the Python programming language, including its basic concepts, data types, operators, and control flow structures.
2. Gain proficiency in working with strings, functions, and various data structures such as lists, tuples, and dictionaries.
3. Acquire skills in file handling, data manipulation using Pandas and NumPy, and object-oriented programming principles.

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

1. Define the basic concepts of Python, including variables, data types, and operators.
2. Explain different string manipulation techniques and functions.
3. Use python program flow to explore logic.
4. Create module to understand modularity.
5. Implement the concepts and procedures of file handling in Python for real-world scenarios.
6. Demonstrate the application of object-oriented programming principles in Python.

UNIT	Subject: (2SAEKNX01) Introduction to Python	No. of Lectures Required
Unit-1	An Introduction to Python: Characteristics of Python, Why Python, Print statement, Comments, Python Variables, Data types, Operators in Python, Global and local variables, Basic Programs.	07
Unit-2	Data Structures in Python: Python Data Structures (List, Tuples, Dictionaries, Sets), Function related to data structure, Basic String Operations in Python (String Manipulation, Accessing Strings, Basic Operations, String slices), Simple Input and Output, Output formatting, Basic Programs	07
Unit-3	Python Program Flow: Indentation, if statement, and its related statements, while loop, for loop, range statement, break and continue, Assert, Examples of Looping.	07
Unit-4	Functions and Modules: Function: Functions, defining a function, Calling a function, Types of functions, Function Arguments, Create a Module, Standard Modules, Exception Handling	07
Unit-5	Working with Data in Python: Modes of file handling (Opening and closing file, Reading and writing files), Date and Time with its functions, Introduction to Modules and packages.	07
Unit-6	Classes and Objects: Overview of OOP, Class Definition, Creating Objects, Objects as Arguments, Objects as Return Values, Built-in Class Attributes, Inheritance, Overloading, Overriding, Programs.	07
	Total	42

Text Book:

1. Martin C Brown, —Python: The Complete Reference, McGraw Hill.
2. J. Mueller and L. Massaron, Python for data science. 2nd edition. Hoboken, NJ, John Wiley & Sons, Inc, 2019.

Reference Books:

1. Larry Lutz, — Python for Beginners: Step By Step Guide to Learning Python Programming, CreateSpace Independent Publishing Platform, First edition, ISBN: 1717410588, 9781717410580, 2018.
2. Nicholas Ayden, — Python Programming, Independently Published, First Edition, ISBN: 1707051933, 9781707051939, 2019.
3. Michal Jaworski, Tarek Ziadé, — Expert Python Programming, Packt Publishing Ltd., Third Edition, ISBN: 9781789808896, 2019.

B.Tech. First Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite: 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.

UNIT	Subject: Indian Knowledge System	No. of Lectures Required
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.	5
UNIT V	Contributions to Medical Science and Ayurveda as way of life, health and wellbeing 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.	5
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	26

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

B.Tech. First Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite:

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

B.Tech. First Semester (Electronics & Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
2SF08	Basics of Electrical Engineering Lab	00	00	02	01

Pre-requisite: Nil

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 practical's 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 the 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.

B.Tech. First Semester (Electronics & Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
2SAEKNX02	Introduction to Python Lab	00	00	02	01

Pre-requisite: Nil

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

1. To introduce the fundamentals of Python programming including syntax, control structures, functions, and data types relevant to problem-solving.
2. To develop skills for working with Python libraries and modules that support data structures, file handling, and object-oriented programming.
3. To enable students to write, test, and debug Python programs for solving problems.

Course Outcomes:

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

1. Apply foundational knowledge of Python programming to design and conduct experiments aligned with specified objectives.
2. Use computer hardware, software tools, and relevant resources for the execution of Python-based practical tasks.
3. Analyze outputs, interpret results, formulate findings, and draw appropriate conclusions based on the objectives of the given practical.

List of Experiment:

Minimum 8 to 10 practical's are to be conducted based on subject 2SAEKNX01 Introduction to Python.

List of Experiments/ Practical's:

The following is a probable list of experiments/practical's; however, the teacher may prepare or design and conduct other relevant practical's based on the syllabus.

1. Introduction and Installation of Python.
2. Write a python program to find largest of three numbers.
3. Write a python script that prints prime numbers less than 20.
4. Write python program in which a function is defined and calling that function prints Hello World
5. Write python program to store data in list and then try to print them.
6. Write python program to print list of numbers using range and for loop
7. Write python program to demonstrate working with dictionaries in python.
8. Write python program to demonstrate working with tuples in python.
9. Write python program to create, concatenate and print the string and accessing substring from given string.
10. Write python program to load data from dataset and analyze the data.
11. Write python program to subtract five days from current date.
12. Write python program to convert string to date-time.

Software Tools:

Python (Basic Programming: math, random, datetime; Data Handling: pandas, NumPy; Visualization matplotlib, seaborn; File Handling and OS: os, sys, shutil, Json; Data Analysis and visualization Libraries: Pandas, NumPy, Matplotlib, Seaborn, Plotly, Bokeh).

Python Interpreter Tool: Python (CPython) Version: 3.8 or above

Integrated Development Environments (IDEs): VS Code (Visual Studio Code), PyCharm Community Edition, Thonny, Jupyter Notebook, Anaconda Distribution.

B.Tech. First Semester (Electronics & Telecommunication Engineering)

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

Pre-requisites: 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:

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

1. understand manufacturing processes, tools & equipment's, which are commonly employed in industries.
2. Apply craftsmanship & fabricate the components using various manufacturing techniques.
3. Understand the 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. Second Semester (Electronics & Telecommunication Engineering)

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

Pre-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.

UNIT	Subject: Applied Mathematics I	No. of Lectures Required
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 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.

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite:

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, fibre 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.

UNIT	Subject: Applied Physics (AP)	No. of Lectures Required
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.

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite:

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.

UNIT	Subject: Engineering Graphics	No. of Lectures Required
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.

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite: 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.

UNIT	1SF04 Programming for Problem Solving	No. of Lectures Required
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

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite:

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. Develop skills needed for approaching different types of interviews.
6. Become ethical confident individual professionally and socially.

UNIT	Subject: Professional Communication Skills (PCS)	No. of Lectures Required
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

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
1SET01	Electrical Measurement & Measuring Instruments	02	00	00	02

Pre-requisites:

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 Measurements, Measurement Systems and its significance
2. To analyse of Static characteristics, types of Errors , Statistical Parameters
3. To Understand Measurement of Resistance and Wheatstone Bridge
4. To Understand Measurement of Inductance and Capacitance
5. To Understand Measurement of Current, Voltage and PMMC Instruments.
6. To Understand Measurement of Power, Energy and Transducer with its classification.

Course Outcomes:

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

1. Understand fundamentals of Electrical Measurements, Measuring instruments and its significance.
2. Analyse Static characteristics, Comprehend types of Errors and exhibit the knowledge of various Statistical Parameters.
3. Measure medium and low resistances using appropriate bridges.
4. Measure Capacitance and inductance using appropriate bridges.
5. Demonstrate the knowledge of DC & AC Current & Voltage measurements using PMMC & Moving Iron Instruments
6. Demonstrate the knowledge of measurement of Power using Electrodynamometer type Wattmeter & Energy using Induction type single phase Energy meter & understand importance of Transducers along with its classification.

UNIT	Subject: Electrical Measurement & Measuring Instruments	No. of Lectures Required
Unit I	Measurements and Measurement Systems: Measurements and its significance, Methods of measurements, Types and classification of measuring instruments, Analog and digital modes of operations, Functions and applications of measurement systems, Elements of generalized measurement systems.	7

Unit II	Static characteristics: Accuracy, Precision, Sensitivity, Linearity, Threshold, Resolution, Repeatability and Hysteresis. Errors: Gross error, Systematic error, Random error, Limiting error. Statistical Parameters: Arithmetic mean, Range, deviation, average deviation, Standard deviation, variance Probable error. (Numerical Expected)	8
Unit III	Measurement of Resistance: Classification of Resistance, Wheatstone Bridge, Sensitivity of Wheatstone Bridge, Precision measurement of medium resistances with Wheatstone Bridge, Low resistance measurement using Kelvin double bridge.	7
Unit IV	Measurement of Capacitance and Inductance: Measurement of Capacitance using Schering Bridge and modified De Sauty's Bridge. Measurement of Inductance using Maxwell's Bridge and Hay's Bridge.	7
Unit V	Electrical Measuring Instrument: Measurement of Current and Voltage, Construction, Principle of working of PMMC and Moving Iron Instruments, Range extensions of ammeters and voltmeters, Numerical on Range extensions.	6
Unit VI	Measurement of Power and Energy: Electrodynamometer type Wattmeter & Induction type single phase Energy meter. Introduction to Transducers: Transducer and its primary classification, Generalized Instrumentation system.	7
	Total	40

Text Books:

1. H. S. Kalsi, Electronic Instrumentation, McGraw Hill Education Pvt Ltd., New Delhi, 1995.
2. A.K.Sawhney, A course in Electrical and Electronic Measurement and Instrumentation – Dhanpat Rai and Sons, New Delhi, 1999
3. B.C.Nakra and K.K.Chaudary, Instrumentation Measurement and Analysis, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1985.

Reference Books:

1. David A. Bell, Electronic Instrumentation and Measurements, Third Edition, Oxford Higher Education,
2. D.Patranabis, Principles of Industrial Instrumentation, Tata McGraw Hill Publishing Ltd., New Delhi, 1999.
3. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999.
4. Ernest O. Doebelin, Measurement systems Application and Design, International Student Edition, IV Edition, McGraw Hill Book Company, 1998.4. Robert L.Boylestad, —Electronic Devices and Circuit theory, Publ. Pearson Education

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite: 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.

UNIT	Subject: Design Thinking	No. of Lectures Required
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:

1. 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

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
1SF07	Applied Physics Lab	00	00	02	01

Pre-requisite:

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.

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite:

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

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

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

Pre-requisite:

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

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
1SET02	Electrical Measurement & Measuring Instruments Lab	00	00	02	01

Pre-requisites:

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 Measurements, Measurement Systems and its significance
2. To analyse of Static characteristics, types of Errors , Statistical Parameters
3. To Understand Measurement of Resistance and Wheatstone Bridge
4. To Understand Measurement of Inductance and Capacitance
5. To Understand Measurement of Current, Voltage and PMMC Instruments.
6. To Understand Measurement of Power, Energy and Transducer with its classification.

Course Outcomes:

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

1. Understand fundamentals of Electrical Measurements, Measuring instruments and its significance.
2. Analyse Static characteristics, Comprehend types of Errors and exhibit the knowledge of various Statistical Parameters.
3. Measure medium and low resistances, Capacitance and inductance using appropriate bridges.

Contents: This is a representative list of practicals. The student is required to perform Minimum Eight practical's as per his choice so as to cover entire contents of this course.

➤ □ **List of Experiments:**

1. Measurement of resistance using Wheatstone's Bridge.
2. Measurement of resistance using Kelvin double bridge.
3. Measurement of capacitance using Schering Bridge.
4. Measurement of capacitance using modified De Sauty's Bridge.
5. Measurement of Inductance using Maxwell's Bridge.
6. Measurement of Inductance using Hay's Bridge.
7. Measurement of Power using two wattmeter method.
8. Measurement of single phase Energy using wattmeter method.
9. Design of multi-range DC ammeter.
10. Design of multi-range DC voltmeter.
11. Study of various types of Transducers.
12. Measurement of high resistance using Megger.

B.Tech. Second Semester (Electronics & Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
1SF10	NSS/Sports/Yoga/Cultural/Community Service	00	00	02	01

Pre-requisites:

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. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SE01	Applied Mathematics – III	02	00	00	02

Pre-requisites:

1. Essential knowledge of differential and Integral Calculus
2. Knowledge of Vector Algebra.

Course Learning Objectives:

1. To solve linear differential and difference equations with constant coefficients and study partial differential equations using appropriate mathematical techniques.
2. To apply Laplace and Fourier transforms to analyze mathematical functions and understand their applications in engineering problems.
3. To comprehend and implement fundamental numerical methods and vector calculus techniques for computational and analytical problem-solving.

Course Outcomes:

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

1. Apply the knowledge to solve differential equations and difference equations by different methods.
2. Find Laplace Transform by making use of its properties.
3. Solve certain forms of difference equations and find Fourier transforms.
4. Use numerical methods to obtain appropriate solutions.
5. Identify and solve partial differential equation of first order.
6. Apply the knowledge of vector calculus to solve physical problem.

Unit No.	Content: Applied Mathematics – III	No. of Lectures Required
1	Ordinary differential equations: Complete solution of linear differential equation by using complementary function and particular integral, Cauchy's linear differential equations.	05
2	Laplace transform: Definition, Standard forms, Properties of Laplace transform, inverse Laplace transform, Convolution theorem.	05
3	a) Difference equation: Complete solution of linear difference equation with constant coefficients. b) Fourier Transform: - Definition, standard forms Fourier transforms, Fourier sine and Fourier cosine transforms and its inverse transforms.	05
4	Numerical Methods: Solution of algebraic and transcendental equations by Newton-Raphson method, Solution of system of linear equations by Gauss-Seidal method, Numerical solution of differential equations by Picard's method, Taylor's series method and Runge-Kutta fourth order method.	05
5	Partial differential equation: Partial differential equation of first order of following form: (i) $f(p, q) = 0$; (ii) $f(p, q, z) = 0$; (iii) $f(x, p) = g(y, q)$; (iv) $Pp + Qq = R$ (Lagranges Form); (v) $z = px + qy + f(p, q)$ (Clairauts form).	05
6	Vector calculus: Scalar and vector point functions, Differentiation of vectors, Gradient of a scalar point function, Directional derivatives, Divergence and curl of a vector point.	05
	Total	30

Text Books:

1. Wartikar P.N. & Wartikar J.N.- A Text Book of Applied Mathematics Vol.- 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.

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SE02	Electronic Devices & Circuits	03	00	00	03

Pre-requisites:

1. Basic knowledge of Semiconductor Physics

Course Learning Objectives:

1. To study the characteristics, construction, and key parameters of semiconductor devices such as PN junction diodes, BJTs (in CB, CE, and CC configurations), JFETs, and MOSFETs, along with their practical applications.
2. To analyze various transistor biasing and stabilization techniques, emphasizing the importance of BJT biasing methods in achieving thermal and operational stability.
3. To understand the design and analysis of amplifier and oscillator circuits, including single-stage and multistage amplifiers as well as RC oscillator configurations.

Course Outcomes:

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

1. Understand fundamentals of PN Junction diode, Static and Dynamic Resistance and application of diode as rectifier.
2. Learn the working of BJT, its modes and regions of operation with characteristics.
3. Analyze various stabilization techniques in BJT.
4. Study the concept of amplifier and RC oscillator and its types.
5. Learn numerous types of multistage amplifiers.
6. Comprehend JFET and MOSFET with parameters and Characteristics.

Unit No.	Content: Electronic Devices & Circuits	No. of Lectures Required
1	PN junction diode: Formation of p-n junction, biasing the diode, V-I characteristics of diode, static and dynamic resistance, Analysis of Half Wave Rectifier (HWR), Full Wave Rectifier (FWR), introduction to C, L, LC and CLC filters, Zener diode and its application as voltage regulator.	08
2	Bipolar Junction Transistors: Operation of PNP and NPN transistor, CB, CE and CC configurations with characteristics and parameters, transistor as a switch	07
3	Biassing & Stabilization Techniques in BJT: DC load line, transistor biasing methods, bias stability, Introduction to voltage divider biased CE amplifiers using h-parameter model	08
4	Feedback amplifiers: Feedback concept, effects of negative feedback with analysis, Sinusoidal oscillators: Barkhausen's criteria for sustained oscillations, Hartley, Colpitts, RC Phase shift, Wein bridge and crystal oscillators	07
5	Multistage Amplifiers: Need of multistage, direct coupled amplifier, RC coupled amplifier, transformer coupled amplifier, emitter follower, Darlington emitter follower, bootstrapping principle	07
6	JFET: Theory, construction, characteristics and parameters MOSFET: Theory, construction and characteristics of enhancement & depletion type MOSFET	08
	Total	45 – Lectures

Text Books:

1. David Bell: Electronic Devices and Circuits, Oxford University Press, 2010.
2. Milliman and Halkias: Integrated Electronics, Tata McGraw Hill, New Delhi.

Reference Books:

1. Robert L. Boylestad, "Electronic Devices and Circuit theory", Publ. Pearson Education.
2. Floyd, "Electron Devices" Pearson Asia 5th Edition, 2001.
3. Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.

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Course Code	Course Title	L	T	P	C
3SE03	Digital system design	02	00	00	02

Pre-requisites:

1. Engineering Physics

Course Learning Objectives:

- CLO 1: To study the fundamental concepts and techniques used in digital electronics.
- CLO 2: To illustrate reduction of logical expressions using Boolean algebra and k-map
- CLO 3: To inculcate the design procedure of combinational logic circuits.
- CLO 4: To understand the concept of Sequential logic circuits
- CLO 5: To understand the Synchronous logic circuits.
- CLO 6: To study the design procedure synchronous state machines using flip-flops

Course Outcomes:

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

- CO 1: Apply Boolean algebra and number system to solve logic function
- CO 2: Simplify Combinational logic circuit using K-Map
- CO 3: Analyze and design MSI circuit using 74xx series chip
- CO 4: Apply the knowledge of flip-flops to design Sequential logic circuits
- CO 5: Implement synchronous logic circuits.
- CO 6: Analyze and design synchronous state machines using flip-flops

Unit No.	Content	No. of Lectures Required
1	Boolean algebra: Number system (Binary, Octal, Decimal, Hexadecimal) & their conversions, logic Gates, Boolean algebra & its Simplification.	05
2	Minimization of Boolean functions: Canonical and Standard Form, Karnaugh Map Method - Up to four Variables, Don't Care K-Map Entries upto 4 variables & Implementation using Logic gates.	05
3	Combinational Logic Circuits design using MSI 74xx ICs: Design Procedure, Adders: Half & full adder, Multiplexers, Demultiplexers, Decoders, Encoders, Magnitude Comparators, Parity Generator/Checker.	05
4	Sequential logic circuit: Concept of Sequential circuits, Memory element: flip-flops, SR, JK, Master Slave JK, D and T Type Flip Flops, Excitation Table of all Flip Flops.	05
5	Registers and counters: Registers: SISO, SIPO, PISO, and PIPO. Counter: Ripple counters, Synchronous Up counters.	05
6	Synchronous Sequential Circuits: Mealy Machine, Moore Machine, Analysis of clocked sequential circuit with state machine designing, State reduction and assignment, Design Procedure, Sequence detector using D, J-K, T FF	05
	Total	30 Lectures

Text Books:

1. R. P. Jain. "Modern Digital Electronics" McGraw Hill Publication 5th Edition, 2022.
2. A. Anand. Kumar "Fundamental of Digital Circuits" PHI 4th edition, 2018.
3. A. K. Maini "Digital Electronics: Principles, Devices and Applications", John Wiley & Sons Ltd. 1st Edition, 2007.

Reference Books:

1. Morris Mano, "Digital Design", Prentice Hall of India, 3rd Edition, 2002
2. Malvino and Leach "Digital Principles and Applications" Tata McGraw Hill 8th Edition, 2014
3. Soumitra Kumar Mandal "Digital Electronics: Principles, Devices and Applications" McGraw Hill Education Private Limited 3rd edition, 2012.

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SE04	Electromagnetic Waves	03	00	00	03

Pre-requisites:

1. Applied Mathematics-I
2. Applied Mathematics-II

Course Learning Objectives:

1. To understand fundamentals of orthogonal coordinate systems and interrelation with 1-D, 2-D & 3-D vectors.
2. To impart knowledge of Static Electric field and the associated laws.
3. To analyze time varying electric and magnetic fields at various boundary conditions and to understand concepts of propagation of EM waves.
4. To understand the concept of radiation due to monopole and Quarter wave monopole & half wave dipole.

Course Outcomes:

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

1. Apply concepts of vector calculus in three dimensional coordinate systems.
2. Explain and analyze the concept of electrostatic fields.
3. Explain and analyze the concept of magneto statics.
4. Analyze plane electromagnetic waves at boundaries between homogeneous media and elaborate Maxwell's equations.
5. Describe and analyze electromagnetic wave propagation in different media.
6. Analyze the electromagnetic radiation from localized charges considering retardation effects and from monopoles & dipoles.

Unit No.	Content: Electromagnetic Waves	No. of Lectures Required
1	Review of Vector Analysis: Cartesian, Cylindrical and Spherical Co-ordinate Systems, Vector products, Projection of Vectors, Gradient, Divergence and Curl, line, surface, volume integrals, Divergence Theorem and Stokes theorem.	07
2	Electrostatics: Coulomb's Law, Electric field intensity, Evaluation of Electric field intensity due to line charge, Surface charge and Volume charge distribution, Electric flux and Electric flux density, Gauss Law, Electrostatic potential, Potential gradient, Electric dipole and Polarization.	07
3	Magnetostatics: Biot-Savart Law, Ampere's Circuital Law, Magnetic field intensity, Magnetic field intensity evaluation due to infinite, finite and circular current carrying conductors, Magnetic flux and Flux density, Magnetic dipole and Magnetization.	07
4	Boundary Conditions & Maxwell's Equations: Boundary condition at Dielectric – Conductor interface, Dielectric – Dielectric interface, Boundary conditions for magnetic materials interface, Current continuity equation, Maxwell's equations.	07
5	Electromagnetic wave propagation: Electromagnetic wave equation for free space, lossy dielectric material and perfect conductor, Propagation constant, Attenuation constant & Phase shift constant, Skin depth, Poynting Theorem, Reflection of a plain wave in a normal incidence at Dielectric – Dielectric interface	07
6	Radiation: Scalar and Vector magnetic potential, Retarded potential, Electric & Magnetic fields, Power radiated and Radiation resistance due to oscillating dipole, Quarter wave monopole & Half wave dipole.	07
	Total	42

Text Books:

1. Hayt W.H.: "Engineering Electromagnetic" Tata Mc Grawhill
2. Jordan E.C. and Balmain K.C.: "Electromagnetic Waves and Radiating System" Prentice Hall of India Private Limited.

Reference Books:

1. Mathew N.O., Sadiku "Principles of Electromagnetics" (Fourth Edition), Oxford University Press
2. Kranss J.D.: "Electromagnetic" Mc Grawhill Books co. (Third Edition)
3. Ramo S. and Whinnery R.: "Fields and Waves in Communication Electronics" John Wiley and sons, New Delhi.
4. Dr. TVS Arun Murthy, "Electromagnetic Fields (Theory & Problems)" S. Chand & Company Ltd.

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SEOE1A	Operation Management	03	00	00	03

Pre-requisites: Nil

Course Learning Objectives:

1. To understand the fundamentals of production systems, including production classification, system design, and capacity planning.
2. To analyze decision-making methodologies, forecasting techniques, correlation methods, and their applications in production planning.
3. To study process and facility design, including location theory, layout classifications, and the functions of materials management.

Course Outcomes:

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

1. Describe Production system, types of production and Factors affecting the productivity.
2. Analyze the different models in decision methodology.
3. Analyze the manufacturing system and importance of capacity decisions.
4. Analyze the Selecting a Suitable Location and economic location for plant layout.
5. Describe the different forecasting methods and applications and Control of Forecast.
6. Analyze the Purpose of a Product Design and scope of Materials Management.

Unit No.	Content: Operation Management	No. of Lectures Required
1	Operations Management Concepts: Historical Development, Concept of Production, Production System, Classification of Production System, Production Management, Operations System, Operations Management & its Objectives, The Strategic Role of Operations, Productivity & Factors affecting the productivity.	07
2	Operations Decision-Making: Management as a Science, Characteristics of Decisions, Framework for Decision-Making, Types of Decision Methodology, Decision Support System, Economic Models, Statistical Models, Decision Tree.	07
3	Systems Design and Capacity: Manufacturing and Service Systems, Design and Systems Capacity, Capacity Planning, Process of Capacity Planning, Importance of Capacity Decisions.	07
4	Facility Location and Layout: Need for Selecting a Suitable Location, Factors Influencing Plant Location/Facility Location, Location Theories, Location Models, Locational Economics, Plant Layout, Classification of Layout, Design of Product Layout, Design of Process Layout.	07
5	Forecasting Demand: Forecasting Objectives and Uses, Forecasting Decision Variables, Forecasting Methods, Exponential Smoothing, Regression and Correlation Methods, Applications and Control of Forecast.	07
6	Product Development and Design: Purpose of a Product Design, Product Analysis, A Framework for Process Design, Design for Manufacture (DFM), Design for Excellence. Materials Management: Scope or Functions of Materials Management, Material Planning and Control, Purchasing, Stores Management, Standardization and its advantages & disadvantages.	07
	Total	42

Text Books:

1. S. Anil Kumar & N. Suresh: "Operations Management" New Age International Pvt. Ltd
2. Jay Helzer and Barry Render.: "Operations Management" Pearson, Kindle Edition.

Reference Books:

1. William J. Stevenson: "Operations Management" (13th Edition), McGraw Hill
2. Christian Terwiesch: "Operations Management" (3rd Edition) Mc Graw Hill
3. Krajewski, Malhotra and Ritzman: "Operations Management Processes and supply chains" (11th Edition), Pearson.

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SEOE1B	OE-I-Marketing Management	03	00	00	03

Pre-requisites: Nil

Course Learning Objectives:

1. To impart the knowledge of Marketing management and the basic concepts of consumer behavior.
2. To impart the knowledge of basic concepts of Marketing Research, pricing and product decisions, and channels of distribution.
3. To impart the basic knowledge of Advertising and Sales promotion strategies and Sales personnel Management.
4. To impart the basic knowledge of International marketing, Services marketing and Online Marketing.

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

1. Understand the concepts of Marketing Management consumer behavior.
2. Demonstrate the knowledge of Marketing Research and Pricing decisions.
3. Understand the concepts of Product development and channels of distribution.
4. Demonstrate the knowledge Advertisement development & strategies.
5. Understand the concepts of Sales promotion strategies and Sales personnel Management.
6. Understand the concepts of international marketing, Services marketing and Online Marketing.

UNIT No.	Content: OE-I-Marketing Management	No. of Lectures Required
I	Marketing Management -Definition, Scope, and Objectives 4 P's of Marketing Mix for Products, Factors affecting consumer buying Behavior, Consumer Buying Decision Process, and Customer Relationship Management.	07

II	Marketing Research: Objectives and scope, Marketing research Procedure, Major techniques of Marketing Research. Pricing Decisions: Meaning, significance and objectives of Pricing, Types and strategies of Pricing. Pricing under different competitive situations	07
III	Product: Meaning, classes of Products, classification of consumer products, Product Life cycle (PLC) process, New Product Development strategy, Functions of packaging as a marketing tool Channel of distribution: Role and importance, channel selection, types of intermediaries, objectives of physical distribution	07
IV	Advertising: Definition, objectives, Advertising organization, Advertising Budget, Media planning, classes of advertising, Advertising & Ethics, Steps in making layouts, Advertising Campaign, Push and Pull strategy in advertising	07
V	Sales Promotion: Meaning, objectives, types of sales promotion schemes, Promotion Mix, Objectives of Marketing organization, types of marketing organization Sales Personnel: Role of sales manager, sales personnel recruitment, selection and training, motivation, Appraisal of performance. Expenses control	07
VI	International marketing: Environment, Marketing mix strategy for International marketing, Documents for International marketing, Payment procedure in international trade. Marketing of services: Meaning, characteristics, classification of services, elements of marketing mix in service marketing; 7 P's of marketing. Online marketing: Meaning, objectives, Understanding internet/ online consumers, Online Advertising, Advantages & Limitations of Online marketing	07
	Total	42

Text Books:

1. Principles of Marketing, Philip T.Kotler, Pearson.
2. Marketing Management, Biplab S. Bose, Himalaya Publishing house.
3. Marketing Management – Verma & Duggal - Oxford University Press.

References Books:

1. K.S Chandrasekar, Marketing Management text and cases, Tata McGraw-Hill publications.
2. Kumar, R.S Case studies in marketing management.
3. Fundamentals of Marketing, Stanton, Etzel & Walker McGraw Hill.

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SEOE1D	OE (ii): Introduction to Cyber Laws	03	00	00	03

Pre-requisites:

1. General concepts of conventional law and order.
2. Fundamentals of computer and internet.

Course Learning Objectives:

1. To introduce the fundamentals of computers, internet technologies, and the principles of cyber law, including the Information Technology Act, 2000.
2. To develop an understanding of e-Commerce and internet security issues in the digital era.
3. To understand the nature and classification of cybercrimes and explore legal and preventive measures.

Course Outcomes:

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

1. Understand fundamentals of computer, internet and cyber law.
2. Understand fundamentals of E-Commerce.
3. Demonstrate the knowledge of cybercrimes.
4. Classify the cybercrimes.
5. Understand the principles of Information Technology Act.
6. Demonstrate the knowledge of Internet security issues.

Unit No.	Content: OE (ii): Introduction to Cyber Laws	No. of Lectures Required
1	Fundamentals of Computer, Internet and Cyber Law: Functional Components of Computer, applications of computers, Internet architecture, world wide web, internet server and types, Need for Cyber Law, difference between Cyber Crimes and Conventional Crimes,	07
2	Introduction to E-Commerce: Electronic data interchange and legal issues, e-commerce models, e-banking, credit card, e-mail, e-governance and objective, models and types.	07
3	Concepts of Cyber Crime: Characteristics of Cyber Crime, Causes and Measures to combat Cyber Crimes, Cyber Crimes against Individuals, Institution and State.	07
4	Categories of Cyber Crimes: Classification of Cyber Crimes, Hacking, Cracking, Digital Forgery, Cyber Stalking/ Harassment, cyber terrorism, Cyber Pornography and Obscenity, Identity Theft, Cyber Defamation, Virus attacks, Computer Fraud, Social Networking Crimes.	07
5	Information Technology Act, 2000: Silent features of Information Technology Act, 2000, Definitions, Digital Signatures and Certificates, Security Procedures, Electronic Contracts, Penalties and Adjudication, Liabilities of Service Providers,	07
6	Internet Security: Internet Security, ethical issues of Information Technology- software piracy, firewall and types of firewall, biometrics and internet security products software.	07
	Total	42

Text Books:

1. Pavan Duggal - Cyber law
2. Pavan Duggal – Cyber Frauds, Cybercrimes and Law in India
3. Nilakshi Jain, Ramesh Menon – Cyber Security and Cyber Laws
4. Sharma Vakul - Information Technology Law and Practice
5. Nandan Kamath - Law Relating to Computer, Internet and E-commerce,
6. Cyber Laws – Sony Prakashan, Nagpur

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SE05	Fundamentals of Entrepreneurship	02	00	00	02

Pre-requisites: Nil

Course Learning Objectives:

1. To explain the fundamental concepts of entrepreneurship and the role of entrepreneurs in various business situations.
2. To develop the ability to analyze the scope, challenges, and economic aspects of entrepreneurial ventures.
3. To understand the process of entrepreneurial project development and explore emerging trends in entrepreneurship.

Course Outcomes:

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

1. Pick up about Foundation of Entrepreneurship Development and its Theories
2. Learn entrepreneurial decision processes
3. Identify the type of entrepreneur and the steps involved in an entrepreneurial venture
4. Understand various steps involved in starting a venture
5. Comprehend financial aspects of a venture
6. Learn the steps to launch a new venture

Unit No.	Content: Fundamentals of Entrepreneurship	No. of Lectures Required
1	Introduction to Entrepreneurship: Meaning and concept of entrepreneurship, the history of entrepreneurship development, role of entrepreneurship in economic development, agencies in entrepreneurship management and future of entrepreneurship	05
2	Entrepreneur Skills: Meaning of entrepreneur, the skills required to be an entrepreneur, the entrepreneurial decision process, and role models, mentors and support system.	05
3	Business Opportunity Identification: Business ideas, methods of generating ideas, and opportunity recognition	05
4	Preparing a Business Plan: Meaning and significance of a business plan, components of a business plan, and feasibility study.	05
5	Financing the New Venture: Importance of new venture financing, types of ownership securities, venture capital, types of debt securities, determining ideal debt-equity mix, and financial institutions and banks	05
6	Launching the New Venture: Choosing the legal form of new venture, protection of intellectual property, and marketing the new venture.	05
	Total	30

Text Books:

1. Dr Bhavesh M. Patel: ENTREPRENEURSHIP, VIKAS PUBLISHING HOUSE PVT. LTD. 2020

Reference Books:

1. Barringer, B. R. and Ireland, R. D. Entrepreneurship: Successfully Launching New Ventures. Pearson Education, New Delhi.
2. Roy, R. Entrepreneurship. Oxford University Press, New Delhi.
3. Blundel, R, and Lockett, N. Exploring Entrepreneurship: Practices and Perspectives. Oxford University Press, New Delhi.
4. Kuratko, D. F. and Rao, T. V. Entrepreneurship: A South-Asian Perspective. Cengage Learning, New Delhi.

Term Work: 50 Marks

Marking Scheme:

1. Business Idea Presentation – 20 Marks
2. Business Idea Proposal – 10 Marks
3. Innovation and Execution – 10 Marks
4. Attendance – 10 Marks

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course ode	Course Title	L	T	P	C
3SE06	Environmental Science	02	00	00	02

Pre-requisites: 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 ecosystem.
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.

UNIT	Subject: Environmental Science	No. of Lectures Required
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 lores, 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

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SE07	Electronic Devices & Circuits Lab	00	00	02	01

Pre-requisites:

1. Basic knowledge of Semiconductor Physics

Course Learning Objectives:

1. To understand the basic principle and characteristics of semiconductor devices.
2. To understand the operation of various transistor configurations.
3. To provide practical exposure to students on various electronic components, semiconductor devices and electronics instruments which facilitates to design basic electronic circuits.

Course Outcomes:

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

1. Use his/her understanding/knowledge of fundamental electronic component so as to design/conduct experimentation related to given aim/ objective.
2. Analyze various electronic circuits using hardware kits as well as on p-spice simulator and other concerned resources for the conduction of experiments.
3. Understand results, articulate findings, draw suitable conclusion and enabling the students to verify the theoretical concepts of electronic devices and circuits.

List of Experiments:

Minimum 08-10 experiments should be conducted based on 3SE02 Electronic Devices & Circuits syllabus.

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Course Code	Course Title	L	T	P	C
3SE08	Digital System Design Lab	00	00	02	01

Pre-requisites: Nil

Course Learning Objectives:

1. To study the fundamental concepts and techniques used in digital electronics & to illustrate reduction of logical expressions using Boolean algebra and K-map.
2. To inculcate the design procedure of combinational logic circuits& Sequential logic circuits.

Course Outcomes:

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

1. Apply Boolean algebra and number system to solve various logic functions & simplify Combinational logic circuit using K-Map.
2. Analyze and design MSI circuit using 74xx series IC & Apply the knowledge of flip-flops to design Sequential logic circuits.
3. Analyze and design synchronous state machines using flip-flops.

List of Experiments:

Minimum 8-10 Experiments should be conducted based on 3SE03 Digital System Design Syllabus

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SE09	Object Oriented Programming Lab	00	00	02	01

Pre-requisite:

1. 1SF04 Programming for Problem Solving

Course Learning Objectives:

1. Design, implement, test, and debug simple programs in an object-oriented programming language.
2. Design and test the implementation of C++ programming concepts.

Course Outcomes:

After successful completion of this course, students will be able to-

1. Use his/her understanding/knowledge of Object Oriented Programming so as to develop computer program related to the given aim/objective.
2. Use equipment's/other concerned resources for conduction of experiments.
3. Interpret results, formulate findings, draw suitable conclusion and respond to inquiries, related to given experiment.

List of Experiments:

Minimum 08-10 experiments should be conducted based on 1SF04 – Programming for Problem Solving Syllabus

B.Tech. Third Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
3SE10	Community Engagement Project / Field Project (CEP/FP)	00	00	04	02

Pre-requisites:

1. All courses / laboratories from I, II Semesters.

Course Learning Objectives:

Students shall UNDERTAKE and EXECUTE a Mini Project through a group of students to:

1. Understand the “Project Development Cycle”, through Community Project.
2. Inculcate hardware and software knowledge implementation skills.
3. Develop students’ abilities to transmit technical information clearly through Technical Report writing on the Mini Project work carried out.

Course Outcomes:

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

1. Acquired knowledge within the chosen area of technology for project development.
2. Identify, reproduce, improve and refine the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Work as an individual or in a team in development of technical projects and communicate and report effectively project related activities and findings.
4. Do the social survey, analyses it, identify problem and find probable solution for the benefit of society.

Minor Project Work:

1. Group Size:

Minimum 5 and maximum 10 students can form a group for the mini project.

2. Project Type:

The selected mini project should be based on any of the following:

- Design and development of a prototype electronics system / product.
- Design and development of laboratory equipment's.
- Industry needs based basic survey or Testing or Analysis etc.
- Investigate performance of govt schemes for society benefits.
- Parametric analysis of components / systems / devices.
- Investigation of optimum process / material for product development.
- Solution for society / industry problems.

3. General guidelines:

Project domain may be from the following, but not limited to:

- Solar Systems. / IOT / RFID
- Robotics Mechanisms / Digital systems
- Mini model / Hardware / Software
- Analysis of various apps
- Automation and Control Systems
- Microcontroller based Systems /Arduino
- Agriculture system.
- Smart systems using AI

4. Project Report:

A project report with following contents shall be prepared:

1. Title, Certificate and Index
 2. Objectives.
 3. Introduction,
 4. Literature survey
 5. Methodology-Experimental Method / Data collection and Analysis methods (using Google Form)/case study / survey Method / Research Method
 6. Analysis-Graphical representation / Simulation/experimentation / survey / testing etc.
 7. Problem Identification
 8. Probable solution
 9. Conclusion.
- References.

B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
4SE01	Analog Circuits	03	00	00	03

Pre-requisites:

1. Electronic Devices & Circuits.

Course Learning Objectives:

1. To understand the basics and internal structure of Op-Amp.
2. To analyze and design linear and non-linear applications of Op-Amp.
3. To understand concepts of voltage regulators, and design waveform generators using IC 555, PLL IC 565 and active filters.

Course Outcomes:

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

1. Comprehend the knowledge of basic concepts and performance parameters of Op-Amp.
2. Analyze and design electronic circuits for various linear applications.
3. Analyze and design electronic circuits for various non-linear applications.
4. Acquire and apply knowledge for design of voltage regulator circuits using ICs.
5. Design various waveform generator circuits using IC 555 & Data Converters.
6. Comprehend the knowledge of PLL, its applications and various types of active filters.

Unit No.	Content: Analog Circuits	No. of Lectures Required
1	Operational amplifier: Operational amplifier Block diagram of Op-Amp, differential amplifier configurations using BJT, constant current source, level shifting, transfer characteristics, study of ICuA741, Op-Amp parameters.	07
2	Linear applications of Op-Amp: Linear applications of Op-Amp: Inverting and non-inverting amplifiers, summing amplifiers, differential amplifier, integrator and differentiator, sinusoidal RC oscillators: RC-phase shift, Wein bridge oscillator using IC 741.	07
3	Non-Linear Applications of Op-Amp: Non-Linear Applications of Op-Amp: comparator, zero-crossing detector, Schmitt trigger, Astable Multivibrator, Monostable Multivibrator.	07
4	Design of Voltage regulators using IC 78xx, 79xx, and LM 317, dual tracking regulators using 78xx and 79xx series, instrumentation amplifier.	07
5	Introduction to IC 555, IC 555 based design of Astable, Monostable multivibrator and their applications, Introduction to A to D converters, and D to A converters.	07
6	Operation of phase lock loop system, lock range and capture range, study of PLL IC LM 565 and its applications as AM detector, FM detector, Design of Butterworth first and second order low pass, and high pass filter.	07
	Total	42

Text Books:

1. R.A. Gayakwad, "OP-AMP and Linear Integrated Circuits", Prentice Hall/ Pearson Education Publications.
2. Sergio Franco, "Design with Linear Integrated Circuits & Op-Amps", TMH Publications, Rai and Sons, New Delhi, 1999.

Reference Books:

1. Gray and Meyer, "Analysis and Design of Analog Integrated Circuits", Wiley Intl. Publication.
2. Paul Horowitz, W. Hill, "The art of Electronics", Cambridge Publications.

B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
4SE02	Analog and Digital Communication	03	00	00	03

Pre-requisites:

1. Applied Mathematics-III

Course Learning Objectives:

1. To understand and analyze various analog and digital modulation and demodulation techniques, including AM, FM, and pulse modulation systems.
2. To study the fundamental concepts of digital communication systems, including sampling, quantization, baseband transmission, and digital modulation techniques.
3. To explore the building blocks of digital communication systems and apply information theory to evaluate data transmission limits and performance.

Course Outcomes:

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

1. Understand the necessity of modulation and identify the various components of analog and Digital communication systems.
2. Understand different modulation and demodulation schemes in analog communication systems and to compare the strengths and weaknesses of various analog communication systems.
3. Analyze the performance of various pulse modulation schemes.
4. Understand basic building blocks of digital communication system and formatting of digital signal.
5. Understand concepts of information theory and analyze information transmission over communication channel.
6. Analyze the performance of different digital modulation techniques.

Unit No.	Content: Analog and Digital Communication	No. of Lectures Required
1	AM Transmitters and Receivers: Modulation, need of modulation, AM Modulation (Mathematical expression and related numerical), Principles of DSB-FC, DSBSC, SSB-SC modulation and their comparison, Details of DSB-FC Transmitter. Superheterodyne receiver, Need and types of AGC, Receiver Characteristics: Selectivity, Sensitivity & Fidelity.	07
2	FM Transmitters and Receivers: FM Modulation, Circuit & Analysis for direct FM generation using FET. Narrow Band and Wide Band FM, their comparison, Pre-emphasis and De-emphasis.	07

	FM Discriminator: FM Receiver block diagram, Single Slope, Balanced slope detector and Ratio detectors. Performance Comparison of AM & FM systems.	
3	Analog Pulse Modulation: Band limited & time limited signals, Narrowband signals and systems, Sampling Theorem in time domain, Nyquist criteria, Types of sampling- ideal, natural, flat top, Aliasing & Aperture effect, PAM, PWM & PPM.	07
4	Pulse Code Modulation: Digital representation of Analog signal, PCM Generation and Reconstruction, Quantization (basic working), Quantization Noise, Companding, Delta Modulation, Adaptive Delta Modulation.	07
5	Introduction to Digital Communication System: Functional Blocks of Digital Communication System, Line Coding: Need for Line coding, Properties of Line Coding, Types of Line Coding and its comparison. Information Theory: Measure of Information, Entropy and Information Rate, Introduction of Binary Symmetric Channel.	07
6	Digital Modulation: BPSK, BFSK and ASK generation and reception, QPSK and MSK Transmitter and Receiver, Comparison of Digital modulation systems (should include Probability of Error parameter) Equalization: Need and types of equalization, Clock and Carrier Synchronization.	07
	Total	42

Text Books:

1. Kennedy G. "Electronic Communication System" Tata Mc-Graw Hill Co., New Delhi (Third Ed).
2. Taub and Schilling D.L., "Principles of Communication Systems", Mc-Graw Hill Co., New Delhi (Second Ed.).
3. Shanmugam K.S., "Digital & Analog Communication Systems", John Wiley & Sons, New York, 1996.
4. Lathi B. P., "Modern Digital and Communication Systems", Holt Rinchart and Winston Inc., New York, 1993.
5. Simon Haykin, "Digital Communication", John Wiley and Sons, Pvt. Ltd., Singapore.

Reference Books:

1. Proakis J. K., "Digital Communication", Mc-Graw Hill Book Co., London (Second Edition).
2. Glover and Grant, "Digital Communication", Prentice Hall Publication
3. Collins Dennis, Collins John, "Electronic Communications" PHI.
4. Wayne Tomasi, "Electronic Communication Systems" Pearson Education, (Fifth Edition).
5. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering" John Wiley, 1965.
6. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication", Kluwer Academic Publishers, 2004

B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
4SE03	Network Theory	03	00	00	03

Pre-requisites:

1. Basics of Electrical Engineering.
2. Applied Mathematics.

Course Learning Objectives:

1. To understand fundamental concepts of Node and Mesh analysis for linear circuits & study different Network Theorems for the circuit analysis.
2. To Understand Two Port Network parameters & apply Laplace Transform Technique for analysis of linear circuits.
3. To study Network Functions & basic concepts of circuit simulation with PSpice.

Course Outcomes:

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

1. Analyze electrical circuits using Mesh and Node analysis.
2. Apply suitable Network Theorem to analyze electrical circuits.
3. To implement the concept of Laplace Transform for electrical circuit analysis.
4. To apply Two-Port network theory for electrical network analysis.
5. To evaluate different Network Functions.
6. Analyze and simulate the circuit using PSpice.

Unit No.	Content: Network Theory	No. of Lectures Required
1	Node and Mesh analysis: Circuit components, assumptions for circuit analysis, Sources of electrical energy, Kirchhoff's laws, Node and Mesh analysis, Matrix approach of network containing voltage and current sources and reactance, Network equations for RLC networks.	07
2	Network Theorems: Superposition theorem, Reciprocity theorem, Thevenin's theorem, Norton's theorem and Maximum power transfer theorem	07
3	Network Analysis using Laplace Transform: Laplace transforms and its properties: Partial fractions, analysis of RC, RL and RLC networks with and without initial conditions. Initial and Final value theorems, Duality.	07
4	Two port networks: Open circuit impedance parameters, Short circuit admittance parameters, Transmission parameters, Inverse transmission parameters, Hybrid and Inverse hybrid parameters, Condition for reciprocity and symmetry of a two port network.	07
5	Network functions: Ports and terminal pairs, Network functions, poles and zeros, Necessary conditions for driving point function, Necessary conditions for transfer function, Application of network analysis in deriving functions, driving point and transfer impedance functions of LC networks.	07
6	Introduction to PSpice: Types of Analysis, Limitations of PSpice, Element Values, Nodes, Circuit Elements, Sources, Output Variables, PSpice output commands, Format of circuit files, format of output files, Examples of SPICE Simulation.	07
	Total	42

Text Books:

1. D. Roy Choudhary, "Networks and Systems", New Age International.
2. Muhammad H. Rashid, "Introduction to PSpice Using OrCAD for Circuits and Electronics", PHI Learning Private Limited, Third Edition.

Reference Books:

1. M. E. Van Valkenburg, "Network Analysis", Prentice Hall, 3rd Edition.
2. Sudhakar A., Shyammohan S. P. "Circuits and Network"; Tata McGraw-Hill New Delhi, 1994.
3. W. H. Hayt, J. E. Kemmerly and S. M. Durbin, "Engineering Circuit Analysis", 7th Edition, Tata McGraw-Hill education private Limited, New Delhi.
4. Abhijit Chakrabarti, "Circuit theory, Analysis and Synthesis", Dhanpat Rai and Co. Pub.

B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
4SEOE2A	Aptitude for Engineers	03	00	00	03

Pre-requisites:

1. Basic knowledge of Mathematics.

Course Learning Objectives:

This course is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning during various examinations and campus interviews.

Course Outcomes:

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

1. Understand the basic concepts of quantitative ability
2. Understand the basic concepts of logical reasoning Skills
3. Acquire satisfactory competency in use of reasoning
4. Solve campus placements aptitude papers covering Quantitative Ability
5. Logical Reasoning Ability
6. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC

Unit No.	Content: Aptitude for Engineers	No. of Lectures Required
1	Number Systems, LCM and HCF, Decimal Fractions, Simplification, Square Roots, and Cube Roots	07
2	Problems on Ages, Surds & Indices, Percentages, Rate of interest	07
3	Basic concepts of Ratio and Proportion, Combination of Ratios, Introduction to Average	07
4	Series Completion: Types of Number Series, Alphabet Series, Alphanumeric Series, Continuous pattern series, Introduction to Coding – decoding, Letter coding, Direct letter coding, Number symbol coding, deciphering message word codes	07
5	Basic concepts of Blood Relation, relation puzzle, coded relation, Important fact of a Clock and Calendar, Directional sense	07
6	Data Interpretation: Introduction to Tabulation, Basic concepts of Bar Graph Fundamentals of Pie Chart	07
	Total	42

Text Books:

1. Quantitative Aptitude, Dr. R.S. Aggrawal, S. Chand & Company Ltd.
2. A Modern Approach to Verbal and Non Verbal Reasoning, Dr. R.S. Aggrawal, S. Chand & Company Ltd.

Reference Books:

1. A New Approach to Reasoning Verbal, Non Verbal and Analytical, BS Sijwali and Indu Sijwali, Arihant Publication Ltd
3. Complete Mathematics Part-1, Rishikesh Kumar, Lucent Publication Ltd.
4. Quantitative Aptitude, Abhijit Guha, McGraw Hill
5. Quantitative Aptitude for CAT, Trishna, Pearson Publication.

B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
4SEOE2B	OE-2 : Financial Planning	03	00	00	03

Pre-requisites: Nil.

Course Learning Objectives:

1. Basic concepts of finance and economic environment.
2. Financial Institutions and fundamentals of investment.
3. Money market & retirement planning.

Course Outcomes:

At the end of course, Learner will be able to

1. Learn the basics of financial planning.
2. Understand the Money and Economic Environment.
3. Learn the functions and working of financial institutes.
4. Understand basic concepts of Investment.
5. Understand the Money market.
6. Understand the concept of Retirement Planning.

Unit No.	Content: Financial Planning	No. of Lectures Required
1	Introduction to financial planning : Introduction to expenses & savings, Taxation : Taxes and Types of taxes, Utility of taxes, Income tax & it's computation	07
2	Money and Economic Environment : Inflation, Deflation, Kinds of money, Value of money, Economic liberalization, Privatization, Globalization	07
3	Investment: Meaning, Objectives and Significance & Mechanism of Investments, Issues and Dilemmas of Investments, Investment Options and Opportunities, Investment Return and Risk.	07
4	Financial Institutions: Functions of bank, Types of bank, Working, Functioning and Relevance of Reserve Bank of India, Commercial Banking, Non-Banking Finance Companies, Development Banking, Insurance.	07
5	Money Market : Stock Market Constitution, Functions. Performance of Indian Stock Market. Sensex and Nifty: Construction and Significance, Stock Market as the Leading Indicator of an Economy, Initial public offering. Financial Derivatives : Concept, Participants, Products, Uses, features, History of Derivatives Market, Myth about Derivatives & its regulation in India.	07
6	Introduction to Retirement Planning : Significance of Retirement Planning, Purpose and Need of Retirement Planning, Role of Financial Planner in Retirement Planning, Life expectancy vs Retirement age, Early retirements vs Delaying retirement, Post retirement activities and goals, Risk of living longer than expected.	07
	Total	42

Text Books:

1. Financial Planning : Theory and Practice by Sid Mittra, SAGE Texts

Reference Books:

1. Investment Science by David G. Luenberger, Oxford University Press.
2. Indian Financial System by M.Vora, Anmol Publication
3. Retirement Planning, R.K. Mohapatra, Blue Rose Publishers.

B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
4SE0E2C	OE-2 : Accounting & Costing	03	00	00	03

Pre-requisites: Nil

Course Learning Objectives:

1. To explain the fundamental concepts, branches, and objectives of accounting, and understand its role as an information system along with key accounting terms.
2. To develop the ability to prepare and interpret financial statements, understand depreciation methods, and analyze annual reports for informed financial decision-making.
3. To understand the principles and practices of cost accounting, including cost sheet preparation, unit and overhead costing, marginal costing, break-even analysis, and the importance of cost audits.

Course Outcomes:

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

1. Understand fundamental accounting concepts, branches, and objectives, showcasing comprehension of accounting as an information system.
2. Master financial statements, exhibiting proficiency in their preparation, interpretation, and analysis of annual reports.
3. Demonstrate expertise in depreciation concepts, causes, methods, and their practical implications in accounting scenarios.
4. Grasp the scope, objectives, and practical implications of cost accounting, connecting with both financial and management accounting.
5. Participate in discussions and demonstrate skills in preparing cost sheets, unit costing, and overhead costing, including tender price calculation.
6. Acquire and apply knowledge of Marginal Costing principles, conduct break-even.

Unit No.	Content: OE-2 : Accounting & Costing	No. of Lectures Required
1	Introduction of Accounting - Book Keeping & Accounting, Branches of Accounting, Objectives and Functions of Financial Accounting, accounting as an information system and its users, Accounting Terms.	07
2	Financial Statement - Meaning, Importance & Limitation of Financial Statement. Preparation of Trading Account and Profit And Loss Account, Balance Sheet. Understanding the annual report of companies.	07
3	Depreciation - Concept of depreciation; Causes of depreciation; Depreciation, depletion, amortization, and dilapidation; Depreciation accounting; Methods of recording depreciation.	07
4	Introduction of Cost Accounting - Definition, Scope, objectives and significance of cost accounting, relationship with financial accounting and management accounting. Practical implication of cost accounting.	07
5	Cost Sheet - Unit Costing, Preparation of Cost Sheet and Statement of Cost (Including calculation of tender price), Overhead costing, (Including calculation of machine hour rate.)	07
6	Costing Method – Marginal Costing- Profit – Volume Ratio, Break – Even Point, Margin of Safety, Application of Break-even Analysis. Cost Audit – Meaning, Importance and Techniques of Cost Audit, Cost Audit Programme.	07
	Total	42

Text Books:

1. Financial Accounting for Management by Ambrish Gupta.
2. Financial Accounting: An Indian Perspective by Paresh Shah and Sejal Shah.
3. Corporate Accounting by Naseem Ahamed.
4. Cost Accounting: Theory and Practice by Bhabatosh Banerjee.
5. Cost Accounting: Principles and Practice by Rajasekaran.
6. Cost Accounting: Text and Problems by M. N. Arora.

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Course Code	Course Title	L	T	P	C
4SE04	SIGNALS AND SYSTEMS	02	00	00	02

Course Pre-requisite:

1. (2SF01) Applied Mathematics-II
2. (3SE01) Engineering Mathematics-III

Course Learning Objectives:

1. To understand the fundamental characteristics of continuous signals and systems.
2. To analyse signals and systems in terms of the transform domains.
3. To analyse discrete time signals and systems in time and frequency domain.

Course Outcomes:

After successful completion of this course, students will be able to,

1. Describe signals mathematically and understand how to perform mathematical operations on signals.
2. Understand the continuous time systems, system classification.
3. Analyse the spectral characteristics of continuous-time periodic signal using Fourier analysis.
4. Analyse the spectral characteristics of continuous-time non-periodic signals using Fourier Transform.
5. Understand the classification of Discrete Time signal and systems along with the mathematical operations on signals.
6. Analyse the spectral characteristics of discrete-time signal using Discrete Time Fourier Transform (DTFT).

Unit	Course: Signals and Systems	No. of Lectures Required
Unit-1	Continuous time signals: Signal, Signal operations, Signal Classification: Periodic-Non periodic signal, Causal-Non causal signal, Energy-Power signal, Even-Odd signal.	05
Unit-2	Continuous time systems: System, System Classification: Linear-Nonlinear system, Time variant-time invariant system, Causal-Non causal system, Static-Dynamic system, Stable-Unstable system.	05
Unit-3	Signal Analysis using Fourier Series: Trigonometric Fourier Series, Existence and Convergence of Fourier Series, Magnitude and phase plots of Fourier coefficients.	05
Unit-4	Signal Analysis using Fourier Transform: The Fourier Transform, Properties of Fourier Transform, Inverse Fourier Transform.	05
Unit-5	Time-Domain Analysis of Discrete-Time Signals & Systems: Signal Operations, Classification of signals, Classification of Discrete-Time Systems.	05
Unit-6	Discrete Signal Analysis using DTFT: Introduction to Discrete time Fourier Transform (DTFT), properties of DTFT, inverse DTFT	05
	Total	30

Text Books:

1. Alan V. Oppenheim & Alan S. Willsky with S. Hamid Nawab, "Signals & Systems" PHI Publication, Second Edition.
2. Lathi B. P., "Principles of Linear Systems and Signals" Second Edition (International Version) Oxford University Press.

Reference Books:

1. Ambardar A., "Analog And Digital Signal Processing", Thomson Learning-2005.
2. Simon Haykin, Barry Van Veen, "Signals & Systems", IInd Edition, Wiley Pub.
3. Michael J. Roberts, "Signals and Systems Analysis Using Transform Methods and MATLAB", Mc Hill Publication.

B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
4SE05	Engineering Economics	02	00	00	02

Pre-requisites: Nil

Course Learning Objectives:

1. The course aims to introduce the fundamentals and scope of Engineering Economics, emphasizing core economic principles, production theory, and the functioning of the banking system.
2. It focuses on understanding the financial aspects of engineering decisions through concepts like time value of money, cash flow analysis, and methods of depreciation.
3. Students will learn to evaluate engineering alternatives by applying economic analysis techniques to identify cost-effective and financially viable solutions.

Course Outcomes:

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

1. Learn the concept of engineering economics with principles
2. Comprehend the laws of production and various cost curves
3. Understand the cash flow diagrams
4. Develop engineering alternatives
5. Learn and apply different depreciation analysis
6. Comprehend the banking system with special aid to commercial banks

Unit No.	Content: Engineering Economics	No. of Lectures Required
1	Definition and Scope of Engineering Economics: Subject Matter of Economics, Principles of Engineering Economics, Micro-economics Vs Macro-economics , Utility Analysis, Laws of diminishing utility analysis, law of Demand, Elasticity of demand	05
2	Theory of Production: Theory, Isoquants and its properties, Marginal rate of Technical substitution, Law of variable proportions, Returns to Scale, Cost of Production and Cost of Curves, The law of supply, Price determination	05
3	Time value of Money: Techniques for adjusting time value of money, Uniform Gradient series factor, annuity, annuity due, calculation of deferred annuity , Types and components of cash flow, cash flow diagrams, Uses, significance and limitation of Cash flow statement	05
4	Evaluation of Engineering alternatives: Present worth method, Future worth Method, Equivalent annual worth comparison, Rate of return method, Project evaluation and Cost benefit analysis	05
5	Depreciation Analysis: Causes of depreciation, Depreciable property, depreciation methods, Digit method, Break even analysis, determination of breakeven point, Breakeven point in terms of quantity, sales and as percentage of capacity, Break even chart, Breakeven analysis assumptions	05
6	Commercial Banking: Functions of Commercial Banks , Role of Commercial banks in developing economy, sound banking system for under-developed countries, types of banks, balance sheet of a bank, New developments in banking system	05
	Total	30

Text Books:

1. Engineering Economics and Costing , Second Edition, PHI, 2010 by Sasmita Mishra

Reference Books:

1. Engineering Economic Analysis, Volume 2, By Donald G. Newnan, Ted Eschenbach, Jerome P. Lavelle · 2004.
2. ENGINEERING ECONOMICS, PHI Learning, By R. PANNEERSELVAM · 2013

B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
4SE06	Analog Circuits Lab	00	00	02	01

Pre-requisites: Nil

Course Learning Objectives:

This lab will facilitate students:

1. To understand the basics and internal structure of Op-Amp & to analyze and design linear applications of Op-Amp.
2. To synthesize the waveform generators using IC 555, IC 565 & active filters.
3. To enhance technical writing skills.

Course Outcomes:

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

1. Comprehend the knowledge of basic concepts and performance parameters of Op-Amp. & Should be able to design electronic circuits for various linear & nonlinear applications.
2. Experiment the designed circuits using educational kits and other resources available in the laboratory.
3. Apprehend results, articulate findings, draw suitable conclusion and verify the theoretical concepts of experimented electronic circuits and express them in the journal.

List of Experiments:

Minimum 8-10 Experiments should be conducted based on 4SE01 Analog Circuits Syllabus

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Course Code	Course Title	L	T	P	C
4SE07	Analog and Digital Communication Lab	00	00	02	01

Pre-requisites: Nil

Course Learning Objectives:

This laboratory work will enrich students:

1. To demonstrate the importance of modulation in both analog and digital communication through practical examples.
2. To perform experiments based on analog and digital modulation.
3. To realize and implement various digital modulation techniques and express through technical writing.

Course Outcomes:

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

1. Understand the concepts of analog and digital communication so as to design/conduct experimentation related to given aim/ objective.
2. Use equipment's/other concerned resources for the conduction of experiments.
3. Understand results, articulate findings, draw suitable conclusion and respond to queries, related to present experiment through journals.

List of Experiments:

Minimum 08-10 experiments should be conducted based on 4SE02- Analog and digital communication syllabus.

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Course Code	Course Title	L	T	P	C
4SE08	Network Theory Lab	00	00	02	01

Pre-requisites: Nil

Course Learning Objectives:

This Laboratory will enable students to:

1. To apply knowledge of Mesh analysis (KVL + Ohm's Law) and Node analysis (KCL + Ohm's Law) and network theorems for a given network.
2. Perform experimentation on Network analysis.
3. To enhance his technical writing skills through analysis of experimental results.

Course Outcomes:

After successful completion of the lab course the students will be able to:

1. Use knowledge of Network Theory so as to design / conduct experimentation related to the given objective / aim.
2. Use equipment's / other concerned resources for conduction of experiments.
3. Interpret results, formulate findings, draw suitable conclusion and respond to inquiries, related to given experiment.

List of Experiments:

Minimum 08-10 experiments should be conducted based on 4SE03 Network Theory syllabus.

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Course Code	Course Title	L	T	P	C
4SE09	Signal & System Lab	00	00	02	01

Pre-requisites: Nil

Course Learning Objectives:

This Laboratory will enable students:

1. To demonstrate basic concepts of Signals and System.
2. To validate the theory through experimentation.
3. To analyse experimental results through journal writing.

Course Outcome:

After successful completion of this course, students will be able to:

1. Use his/her understand the classification of various Signal and Systems.
2. Implements methodologies for signal operations, signal parameters, system response using Octave tool.
3. Analyse and express the outcomes of Signal & System in journal and viva-Voce.

List of Experiments:

Minimum 08 experiments should to be conducted based on 4SE04 Signal and System syllabus.

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Course Code	Course Title	L	T	P	C
4SEH	Electrical Drives & Machines	2	0	0	2

Course Prerequisites:

1. (2SF03) Basic Electrical Engineering

Course Objectives:

1. To study the working of electrical drives and their components.
2. To comprehend the working of Induction motor and design of transducer.
3. To understand industrial application of electrical drives.

Course Outcomes:

After successful completion the course, students will be able to-

- CO1: Explain the working of electrical drives and their components.
- CO2: Discuss the basic of DC motor and their characteristics.
- CO3: Describe the working of AC, Induction motor and concept of braking.
- CO4: Elaborate the different control method of AC and DC motors.
- CO5: Design of transducer and their application.
- CO6: Discribe the industrial application of electrical drives.

Units	Course : Electrical Drives & Machines	L
Unit-1	Concept of general electric drives, classification and comparison of electrical drive system, Cooling and heating of electric motors. Introduction to mechatronics.	4
Unit-2	Basic characteristics of D.C. motor, Torque equation, Starting and braking of D.C. motors, comparison of mechanical and electrical braking methods.	4
Unit-3	Classification of A.C. motors, construction, types, principle of working and characteristics of 3 phase Induction motors, applications. Starting and braking of 3 phase induction motors. working principle & construction of Single phase induction motor	6
Unit-4	Conventional methods of speed control of A.C. motor and D.C. motor. Thyristorized stator voltage control of 3 phase induction motor. (v/f) control method, slip-power recovery scheme.	4
Unit-5	Basic principle, construction & applications of sensors and transducers, contact - non- contact type, optical proximity sensors Hall effect-sensors A.C./D.C. Tachogenerator.	4
Unit-6	Industrial applications - classes of duty selection of an electric drive for particular applications such as steel mill, paper mill etc. Induction heating, surface hardening & Dielectric heating. Introduction to electrical vehicles.	6
Total		28

Text Books:

1. S. K. Pillai, "A First Course on Electrical Drives", New Age International.
2. B.L. Theraja, "Basic Electrical Technology", S. Chand Publishing.

Reference Books:

1. W. Bolton, "Mechatronics", Addison Wesley, Longman Ltd., 1997.
2. A.K. Sawhney, "A Course in Electrical, Electronics Measurement and Instrumentation", Dhanpat Rai & Sons, 2006.
3. G. K. Dubey, "Fundamentals of Electrical Drives", Narosa, 2001.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SE01	Microcontroller & Applications	03	00	00	03

Pre-Requisite:

1. (3SE03) Digital System Design
2. (3SE02) Electronic Devices & Circuits.

Course Objectives:

1. To understand the architectural details of Microprocessor and Microcontroller.
2. To enrich students with C Language Programming concepts of Microprocessor & Microcontroller.
3. To interface different peripheral devices with Microprocessor and Microcontroller.

Course Outcomes:

After successful completion of the course, students will be able to-

CO1: Describe basic architecture and operation of Microprocessor & Microcontroller.

CO2: Elaborate the concept interfacing and programming of 8255 PPI with 8085 Microprocessor.

CO3: Discuss the fundamentals of microcontroller systems.

CO4: Apply the concept of the C language programming for microcontrollers.

CO5: Analyze the interfacing of different types of peripheral devices with Microcontroller.

CO6: Elaborate the basics of RISC Architecture.

UNIT	Course: Microcontroller & Applications	L
Unit-1	Introduction to Microprocessor: 8085: Pin Diagram and Architecture, Addressing Modes and Instruction Set, Timing Diagram For Data Transfer instructions, Interrupt system.	08
Unit-2	I/O Interfacing & Programming of 8085: Introduction to 8255, interfacing with 8085 and related programming, Address space partitioning schemes. Comparison of Microprocessor & Microcontroller.	08
Unit-3	Introduction to 8051 Microcontroller: Architecture, Signal description, Register set, Timer structure and their modes.	06
Unit-4	8051 programming in C: Data types and time delay in 8051, IO programming, Logic operations, and Data conversion programs in 8051.	06
Unit-5	Interfacing and programming of 8051 using C: Interfacing and programming of 8051 with ADC 0809, DAC 0808, Relays and Opto-isolators, Stepper Motor & DC motor.	08
Unit-6	Introduction to RISC Processors: Difference between CISC and RISC, Study of ARM NXP LPC2148 Microcontrollers with ARM 7 architecture.	06
Total		42

Text Books:

1. Gaonkar R.S, "Microprocessor Architecture Programming and Applications with the 8085", Penram International Pub.
2. B. Ram , "Fundamental of Microprocessor & Microcontrollers", Dhanpat Rai Publications.

Reference Books:

1. M. A. Mazidi, J. G. Mazidi and R. D. McKinley : "The 8051 Microcontroller and Embedded Systems using Assembly and C", Pearson Education (2nd Ed.)
2. K. J. Ayala : "The 8051 Microcontroller", Penram Int. Pubs., 1996 4. Furber: "ARM System on Chip Architecture", 2nd Edition, Person India 5. Phillips NXP LPC 2148 User Manual.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SE02	Power Electronics	03	00	00	03

Pre-Requisite:

1. (2SF03) Basics of Electrical Engineering.
2. (3SE02) Electronic Devices & Circuits.

Course Objectives:

1. To introduce power electronic devices such as SCR, TRIAC, IGBT, MOSFET and their characteristics.
2. To study various converter topologies based on power devices.
3. To comprehend the knowledge of power devices in analyzing various applications.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1: Describe basic operation of SCR & firing techniques.

CO2: Explain the characteristics of various power electronics devices.

CO3: Elaborate the concept of controlled rectifiers and dual converters.

CO4: Analyze different types of inverter circuits.

CO5: Analyze basic chopper and cyclo-converter circuits.

CO6: Explore various applications of power electronics

UNIT	Course: Power Electronics	L
Unit-1	SCR & firing techniques: SCR -construction, characteristics, two transistor analogy for turning ON-OFF a SCR, different methods of turning ON of a SCR, turn OFF mechanism, Thyristor firing circuit using UJT, Protection of SCR (snubber circuit).	07
Unit-2	Characteristics of power electronic devices: Triac, Diac-construction, characteristics. power transistor, power MOSFET, IGBT - their construction & characteristics, Introduction to GTO, Classification of circuit for forced commutation.	07
Unit-3	Rectifiers and dual converters: Principle of phase control, single phase half wave controlled rectifier, half controlled bridge & fully controlled bridge rectifier for resistive and RL load, derivation for output voltage and current, effect of freewheeling diode, single phase dual converters.	07
Unit-4	Inverter circuits: Series inverter, improved series inverter, parallel inverter, principle of operation for single phase transistorized bridge inverter, and three phase bridge inverters in 120 deg. and 180 deg. mode.	07
Unit-5	Chopper circuits: Basic principles of chopper, time ratio control and current limit control techniques, voltage commutated chopper circuit, Jones chopper, step-up chopper, AC chopper.	07
Unit-6	Applications of power electronics: Single phase to single phase cycloconverter, speed control of DC series motor using chopper, speed control of DC shunt motor using phase-controlled rectifier, UPS, Speed control of single phase AC motor.	07
Total		42

Text Books:

1. M. D. Singh, K. B. Khanchandani, "Power Electronics", Tata McGraw-Hill.
2. Muhammad H. Rashid, "Power electronics", Prentice Hall of India.

Reference Books:

1. P.C. Sen., "Modern Power Electronics", Edition II, Chand & Co.
2. V. R. Moorthi, "Power Electronics", Oxford University Press.
3. Cyril W., Lander," Power Electronics", edition III, McGraw Hill.
4. SCR manual from General Electric.

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Course Code	Course Title	L	T	P	C
5SE03	Digital Signal Processing	03	00	00	03

Pre-requisites:

1. (3ETC01) Engineering Mathematics-III
2. (4ETC04) Signals and Systems

Course Learning Objectives:

1. To understand discrete signal and system fundamentals.
2. To analyze the discrete-time signals in the frequency domain, using Z-transform and DFT.
3. To design FIR and IIR filters and to understand the architecture of DSP processor, filter bank and some applications of multi-rate DSP.

Course Outcomes:

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

- CO1: Apply signal operations on discrete time signals.
- CO2: Compute the Z-transform of a sequence, identify its region of convergence and compute the inverse Z-transform.
- CO3: Evaluate the Fourier transform of a signal.
- CO4: Design FIR filters.
- CO5: Design and Implement IIR filters.
- CO6: Explain the concepts of Multi-rate Digital Signal Processing, need of Filter banks and the application of Digital Signal Processing.

Unit	Course: Digital Signal Processing	L
Unit-1	Discrete Time Signals and systems: Sampling of analog signal, representation of discrete time Signals, Basic Operations on signals, Linear Convolution.	06
Unit-2	Z-Transform: Definition and Properties of Z-Transform, Concept of Region of Convergence [ROC], Inverse Z- transform using long division, Power Factor Expansion and residue method.	06
Unit-3	Discrete and Fast Fourier Transform: Discrete Fourier Transform (DFT), Definition and Properties of DFT and IDFT, Circular convolution. Fast Fourier Transforms (FFT), Radix-2 decimation in time and decimation in frequency FFT algorithms.	08
Unit-4	Finite Impulse Response (FIR) filters: Specifications, FIR filter design by Rectangular, hanning and hamming window, FIR filter realization.	08
Unit-5	Infinite Impulse Response (IIR) filters: IIR Filter Design by Mapping of S-plane to Z-plane: Impulse Invariance method, Bilinear Transformation method, Realization of IIR filter structures: Direct form-I, Direct Form-II, Cascade and Parallel form.	08
Unit-6	Multi-rate Digital Signal Processing: Sampling, Sampling rate conversion, multi-level filter bank. Overview and architecture of DSP processor TMS320C54XX. Applications of DSP: Block diagram of Speech Signal, RADAR & SONAR.	06
	Total	42

Text Books:

1. Proakis & Manolakis D. G., "Digital Signal Processing", PHI.
2. Nagoorkani, "Digital Signal Processing", Tata McGraw-Hill Education, Second Edition.
3. S. Salivahanan, A. Vallavaraj, "Digital Signal Processing", Tata McGraw-Hill Education, 2001.

Reference Books:

1. Oppenheim & Schafer, "Discrete time processing", PHI.
2. Mitra S. K., "Digital Signal Processing", TMH.
3. Roman Kuc, "Digital Signal Processing", MGH.
4. Ifeachor E. C., Jervis B. W., "Digital Signal Processing", Addison Wesley.
5. P. P. Vaidyanathan, "DSP and MultiMate Systems", PHI.

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Course Code	Course Title	L	T	P	C
5SE04PE1A	PEC I- Control System	02	00	00	02

Pre-requisites:

1. (1SF01) Applied Mathematics
2. (4SE03) Signals and Systems

Course Objectives:

1. To understand the fundamental concepts of Control systems and mathematical modeling of the physical systems.
2. To analyze time domain and frequency domain response of the LTI system
3. To analyze State Variables of the system.

Course Outcomes:

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

- CO 1: Elaborate mathematical models of Physical systems.
- CO 2: Determine transfer function from block diagrams and signal flow graph.
- CO 3: Evaluate transient response and steady state response parameters.
- CO 4: Analyze stability of the LTI system using Routh criterion and root locus
- CO 5: Analyze stability of the LTI system using Bode plot and Polar Plot.
- CO 6: Create state model and Evaluate response of system using state variable method.

Unit	Course: Control System	L
Unit-1	Fundamentals of Control system: Types of control systems, Classification of control system, Physical Systems, Electrical Analogous Systems, Force-voltage analogy, force-Current analogy.	04
Unit-2	Control system Representation: Block diagram reduction technique & Rules, Signal flow graphs, Estimation of Transfer Function using Mason's gain formula.	04
Unit-3	Time Response Analysis: Standard test signals, Time domain response of first and second order system, impulse response function, Transient domain specifications. Steady state analysis: Types of steady state error and constants, dynamic error coefficients.	05
Unit-4	Stability of Control System: Necessary conditions for stability, Routh stability criterion. Root locus Techniques: Introduction, Construction of root locus, construction rules, Stability analysis of systems using root locus.	05
Unit-5	Frequency- Domain analysis using Bode plot: General procedure for construction, Gain margin and phase margin, Stability analysis of systems using Bode plots, Basic concepts of Polar plot.	05
Unit-6	State space Analysis: Space model representation of LTI systems, Relationship between state variable model and transfer function. Concept of Controllability and Observability.	05
Total		28

Text Books:

1. Nagrath I. J. and M. Gopal, "Control Systems Engineering", 5th Ed. New Age International.
2. K. Ogata, "Modern Control Engineering", Fourth Edition (PHI).

Reference Books:

1. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", 11th Ed., Pearson Education.
2. M. Gopal, "Control System–Principles and Design", Tata McGraw Hill, 4th Edition, 2012.
3. Norman S. Nise, "Control System Engineering", 5th Edition, Wiley.
4. Bhattacharya, "Control System Engineering", 2nd Edition (Pearson Education).
5. Benjamin C. Kuo, "Automatic Control System", JOHN WILEY & SONS, INC. 9th Edition.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SE04PE1B	PEC-1: Speech and audio processing	02	00	00	02

Pre-requisite:

1. (4SE04) Signals and Systems.
2. (4SE02) Analog and Digital Communication

Course Objectives:

1. To relate human physiology and anatomy with signal processing paradigms.
2. To acquire the knowledge of speech generation and speech recognition models.
3. To understand methods/techniques used in speech signal estimation & detection

Course Outcomes:

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

CO1: Illustrate how the speech production is modelled

CO2: Analyse the techniques involved in collecting the features from the speech signal in time and frequency domain.

CO3: Elaborate the various speech coding techniques.

CO4: Describe the process of Speech Synthesis.

CO5: Apply techniques/methods used for speech enhancement.

CO6: Analyse techniques/methods used for speech recognition

Unit	Course: Speech and audio processing	L
Unit-1	Speech Production and Acoustic Phonetics: Process of speech production, Articulatory phonetics, Acoustic Phonetics, Acoustic theory of speech production, Co- articulation, Prosody, Digital models of speech signals.	05
Unit-2	Speech Analysis: Time and frequency domain methods for analysis of speech: Methods for extracting energy, average magnitude, zero crossing rate, silence discrimination using ZCR and energy.	05
Unit-3	Coding of Speech Signals: Introduction, Quantization, Speech redundancies, Time domain waveform coding, Linear predictive coding: Linear Delta Modulation ,Adaptive Delta Modulation	05
Unit-4	Speech Synthesis: Principles of speech synthesis, Articulatory synthesis, Formant synthesis and LPC synthesis	05
Unit-5	Speech Enhancement: Introduction, Nature of interfering sounds, speech enhancement techniques: spectral subtraction and filtering, harmonic filtering, Spectral subtraction, Adaptive noise cancellation	04
Unit-6	Speech Recognition: Introduction, Baye's rule, Segmental feature extraction, MFCC, DTW, HMM approaches for speech recognition	04
	Total	28

Text Books:

1. Douglas O'Shaughnessy, "Speech Communications: Human & Machine", Universities Press.
2. Rabiner and Schafer, "Digital Processing of Speech Signals", Prentice Hall, 1978.

Reference Books:

1. Thomas F. Quatieri, "Discrete-Time Speech Signal Processing: Principles and Practice", Publisher: Prentice Hall.
2. Nelson Morgan and Ben Gold, "Speech and Audio Signal Processing: Processing and Perception of Speech and Music", John Wiley & Sons.
3. J. L. Flanagan, "Speech Analysis Synthesis and Perception", Second edition, Springer-Verlag(1972).
4. Gold & Morgan, "Speech and Audio Signal Processing", Wiley and Sons, 1999.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SE04PE1C	PEC-1: Fiber Optic Communication	02	00	00	02

Pre-Requisite:

1. (3SE04) Electromagnetics waves
2. (4SE02) Analog & Digital Communication

Course Objectives:

1. To understand the fundamentals of optical fibers and its transmission characteristics.
2. To explore the different aspects of optical sources, their quantum efficiencies and other parameters.
3. To learn the concepts of optical receivers, parameters and optical communication systems.

Course Outcomes:

After successful completion of the course, students will be able to:

- CO1: Describe the principles of fiber-optic communication, modes and types of optical fibers.
- CO2: Explain the transmission characteristics of optical fiber.
- CO3: Elaborate different aspects of Optical sources.
- CO4: Describe principle of operation of Optical detectors and related parameters.
- CO5: Illustrate the aspects of optical fiber coupler and switches.
- CO6: Elaborate concepts of WDM and DWDM systems.

UNIT	Course: Fiber Optic Communication	L
Unit-1	Optical Fiber Communication System: Basic optical laws and definitions, Optical fiber modes and configurations, Numerical Aperture; Step index, Graded index, Single mode and Multi-mode fibers, Cutoff wavelength, Block Diagram of fiber optic communication.	05
Unit-2	Losses and Dispersion in fibers: Attenuation: Absorption, Scattering losses, Radiation losses, Bending losses, Intra & intermodal dispersion.	05
Unit-3	Optical Sources: Material for Optical sources, Light Emitting Diodes – Structure, Power and Efficiency, Laser Diodes: Basic concepts, threshold conditions, Types of LASER.	05
Unit-4	Optical Detectors: Principles of photodiode, Quantum Efficiency, Responsivity, and types – P-N Photodiode, PiN Photodiode, APD Photodiode.	05
Unit-5	Optical Couplers and Amplifiers: Introduction to Fiber Couplers: Three & four port coupler, Star coupler, Optical amplifiers – Erbium Doped Fiber Amplifier, Raman amplifier.	04
Unit-6	Wavelength Division Multiplexing: Need of WDM, Principles of WDM networks, Nonlinear effects in fiber optic links, Concept of self-phase modulation, Introduction to DWDM.	04
Total		28

Text Books:

1. Gerd Keiser, “Optical Fiber Communication”, 5th Edition, Mc Graw Hill Education (India) Pvt Ltd, 2015.
2. John M Senior, “Optical Fiber Communications”, Principles and Practice, 3rd Edition, Pearson Education, 2010,

Reference Books:

1. Seniors J. M., “Optical Fibre Communication and Applications”, Prentice Hall of India Pvt.Ltd., New Delhi.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SE05PE2A	PEC-2 SENSORS AND TRANSDUCERS	02	00	00	02

Prerequisites:

1. (2SF03) Basic of Electrical Engineering.
2. (2SET01)Electrical Measurement & Measuring Instruments.

Course Learning Objective:

1. To make students aware of Types of transducers, their characteristics and Instrumentation system.
2. To impart knowledge of different types of transducers to students.
3. To enrich students with knowledge of sensors and applications.

Course Outcomes:

After successful completion of the course, students will be able to:

1. Describe the role of sensors and transducers in instrumentation systems.
2. Comprehend the characteristics of instrumentation system & Transducers.
3. Discuss the operation of different types of Temperature & Radiation Transducers.
4. Elaborate Transducers for measurement of displacement, Flow & level.
5. Explain the working and operation of different type of Humidity & Pressure Transducers.
6. Discuss of strain measurement & working of smart sensors.

UNIT	Course: SENSORS AND TRANSDUCERS	L
Unit-1	Sensor & Transducers: Definition-basic principle- characteristics- types of Sensors & Transducers. Selection of sensors, Need of sensor, Difference between Sensors & Transducers, Classification of Transducer. Introduction to Generalized Instrumentation system with example.	05
Unit-2	Characteristic, parameters and Errors: Static characteristics of instruments and Statistical Parameters with numerical. Error and its Types: Gross error, Systematic Error, Random Error.	05
Unit-3	Thermal sensors: Resistance type: Resistance thermometer (RTD), Thermistor. Thermo EMF Sensor: Thermocouples. Radiation Sensor: Total radiation Pyrometers. IC LM 35.	04
Unit-4	Transduction Sensor (Displacement Measurement): Resistive: Potentiometric Type. Inductive: Linear Variable Differential Transformer. (LVDT). Capacitive: Variable Distance-Parallel plate, Variable area, Measurement of Flow: Hot wire anemometer. Measurement of Level: Resistive method, Ultrasonic level detector.	05
Unit-5	Humidity Measurement: Definition, Resistive, Capacitive and Piezoelectric. Measurement of Pressure: Capacitive, Piezo- electric and its material. Low Pressure (Vacuum): Pirani gauge	04
Unit-6	Strain Measurement: Introduction, types of strain gauge, gauge factor, materials for strain gauge, resistance strain gauge bridges, and temperature compensation and applications of strain gauges. Introduction to Smart Sensors: Components of Smart Sensor, general architecture of Smart Sensor, Industrial application of Smart Sensor.	05
Total		28

Text Books:

1. Shawhney A. K. "A Course In Electrical and Electronics Measurements and Instrumentation", Dhanpat Rai& Sons, 11th Ed., 1999.
2. Kalsi H. S. "Electronic Instrumentation", Tata McGraw-Hill Education.

Reference Books:

1. D. Patranabis ,“Sensor & transducers”, 2nd edition, PHI.
2. J B Gupta , "A Course In Electrical and Electronics Measurements and Instrumentation”.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SE05PE2B	PEC-2: Introduction to Java	02	00	00	02

Pre-requisites:

(3SE09) Object Oriented Programming Lab

Course Learning Objectives:

1. To learn basics of Java programming.
2. To understand the principals of Object-Oriented Programming.
3. To study the exception and file handling of Java programming language.

Course Outcomes:

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

- CO1: Understand fundamentals of Object-Oriented Programming and can build & run a basic application at their own.
- CO2: Discuss the basic building blocks of Java Programming Language.
- CO3: Apply the knowledge of selection & repetition statements in Java Program.
- CO4: Create methods and use classes and objects to solve real world problems.
- CO5: Elaborate and apply the concept of inheritance in Java programming language.
- CO6: Demonstrate the exception handling and create user defined exception and also apply file handling in Java.

Unit	Course: Introduction to Java	L
Unit-1	Java Basics: History of Java, Characteristics of Java, Types of Java Program, an introduction to Classes & Objects, Messages & methods, introduction to Inheritance, Software Engineering & Software Life Cycle.	05
Unit-2	Java Building Elements: Identifiers, Variables, Constants, Data types, Arithmetic Expressions, Standard Input & Output, Programming Style & Documentation.	04
Unit-3	Control Structure: Selection Statements: if, if...else, Nested if, switch. Repetition Statements: for loop, while loop & do loop, using break & continue.	04
Unit-4	Object Oriented Programing: Objects & classes, Passing Objects to methods, Instance Variables & class Variables, Instance Methods & Class Methods, Scope of Variables, Introduction to Packages, the Math Class.	05
Unit-5	Inheritance: Super classes and Subclasses, the super keyword, <i>this</i> keyword, the Object class, the final and abstract modifiers, the concept of Wrapper Classes, Introduction to Interfaces.	05
Unit-6	Exception Handling: Exception as objects, Exception hierarchy, Try catch finally, throw, throws. File Handling: File & J File Chooser Objects, Low-Level File I/O, High Level File I/O.	05
	Total	28

Text Books:

1. Y. Daniel Liang, “An Introduction to Java Programming”, Eastern Economy Edition, PHI.
2. C. Thomas Wu, “An Introduction to Object-Oriented Programming JAVA”, Fourth Edition, Tata McGraw Hill.

Reference Books:

1. Kathy Sierra & Bert Bates, “Head First Java”, O'REILLY.
2. E Balagurusamy, “Programming with JAVA, A Primer”, Third Edition, Tata McGraw Hill.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SE05PE2C	PEC-2: Cryptography & Network Security	02	00	00	02

Pre-Requisite:

1. (3SE01) Applied Mathematics – III

Course Objectives:

1. To explain the objectives of information security, confidentiality, integrity, authentication and availability.
2. To impart the knowledge of various cryptographic algorithms.
3. To enrich students with the knowledge of basic categories of threats to computers and networks.

Course Outcomes:

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

CO1: Understand the basic cryptographic algorithms.

CO2: Discuss the message and web authentication and security issues.

CO3: Identify and implement information system requirements.

CO4: Comprehend the current legal issues towards information security.

CO5: Explain the fundamentals of public-key cryptography.

CO6: Elaborate E-Mail Security and architecture.

UNIT	Course : Cryptography & Network Security	L
Unit-1	Security Concepts: Introduction, The need for security, Security approaches, Principles of security, Types of Security attacks, Security services, Security mechanisms, A model for Network Security. Cryptography Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, Basic aspects of steganography.	05
Unit-2	Symmetric key Ciphers: Block Cipher principles, DES, AES, Blowfish, Block cipher operation, Stream ciphers, RC4.	05
Unit-3	Asymmetric key Ciphers: Principles of public key cryptosystems, RSA algorithm, Elgamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.	05
Unit-4	Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures, Message Digest code.	05
Unit-5	Transport-level Security: Web security considerations, HTTPS, Secure Shell (SSH). Wireless Network Security: Wireless Security, Mobile Device Security, Introduction to IEEE 802.11 Wireless LAN and IEEE 802.11i Wireless LAN Security.	04
Unit-6	E-Mail Security: Pretty Good Privacy, S/MIME IP Security: IP Security overview, IP Security architecture, Authentication Header, Internet Key Exchange.	04
Total		28

Text Books:

1. William Stallings, "Cryptography and Network Security - Principles and Practice", 6th Edition, Pearson Education.
2. Atul Kahate, "Cryptography and Network Security", 3rd Edition, Mc Graw Hill.

Reference Books:

1. C K Shyamala, N Harini, Dr T R Padmanabhan, "Cryptography and Network Security", 1st Edition, Wiley India.
2. Forouzan Mukhopadhyay, "Cryptography and Network Security", 3rd Edition Mc Graw Hill.
3. Mark Stamp, "Information Security, Principles, and Practice", Wiley India.
4. WM Arthur Conklin, Greg White, "Principles of Computer Security", TMH.
5. Introduction to Network Security: Neal Krawetz, CENGAGE Learning
6. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

B.Tech. Electronics and Telecommunication, Semester V

Course Code	Course Title	L	T	P	C
5SE06	Microcontroller & Applications Lab	00	00	02	01

Pre-Requisite: (3SE03) Digital System Design
(3SE02) Electronic Devices & Circuits.

Course Objectives:

1. Implement a basic program on a microprocessor-based development board (e.g., Dynalog 8085) and a microcontroller-based development board (e.g., NVIS 8051 kit) that demonstrates a fundamental difference in their operation
2. Develop and debug C language programs to control at least five different on-board peripherals (e.g., GPIOs, Timers, UART, ADC, DAC, LCD, Keyboard) on a chosen microcontroller development board (e.g., NVIS, 8051 DVK), achieving a specified functionality for each.
3. Develop and validate a C program that reads data from a digital sensor and controls an actuator (e.g., an LED or a small motor) through an appropriate interface, demonstrating real-time interaction and error handling.

Course Learning Objectives:

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

1. Successfully program a basic task (e.g., LED blink) on both a microprocessor and a microcontroller.
2. Interface and program an 8255 PPI to control I/O (e.g., turn on/off LEDs, read switches) with an 8085 microprocessor.
3. Identify the function of key components in a given microcontroller datasheet.
4. Develop and debug C programs to control at least three different peripherals (e.g., GPIO, UART, Timer) on a microcontroller.
5. Control an actuator (e.g., motor, relay) using a microcontroller and appropriate interfacing.

List of Experiment:

Performance of Minimum 8-10 practicals based on 5SE01 Microcontroller & Application theory syllabus.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SE07	Power Electronics Lab	03	00	02	03

Pre-Requisite:

3. (2SF03) Basics of Electrical Engineering.
4. (3SE02) Electronic Devices & Circuits.

Course Learning Objectives:

4. To introduce power electronic devices such as SCR, TRIAC, IGBT, MOSFET and their characteristics.
5. To study various converter topologies based on power devices.
6. To comprehend the knowledge of power devices in analyzing various applications.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1: Describe basic operation of SCR its firing techniques and explain the Characteristics of various power electronic devices

CO2: Elaborate the concept of controlled rectifiers and dual converters and analyze different types of inverter circuits.

CO3: Analyze basic chopper and cyclo-converter circuits.

Practical's: Performance of Minimum 8-10 practical's based on 5SE07 Power Electronics.

B.Tech. Fourth Semester (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SE08	Digital Signal Processing Lab	00	00	02	01

Pre-requisite: Digital Signal Processing (5SE03)

Course Objectives:

This Laboratory will enable students:

1. To demonstrate basic concepts of digital signals and systems.
2. To validate the theory through experimentation.
3. To analyse experimental results through journal writing.

Course Outcome:

After successful completion of this course, students will be able to:

1. Understand the classification of various digital signals and its processing.
2. Implements methodologies for signal operations, signal parameters, system response using Octave tool.
3. Analyse and express the outcomes of Digital Signal Processing in journal and viva-Voce.

List of Experiments:

Performance of Minimum 8-10 practicals based on 5SE03 Digital Signal Processing syllabus.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SEOE3C	OE-III : Human Resource Management	03	00	00	03

Course Pre-requisite: 1. 1SF05 Professional Communication Skills

2. 2SF05 Universal Human Values

Course Learning Objectives:

1. To understand the fundamentals of Human Resource Management (HRM).
2. To explore HRM functions like recruitment, selection, training, and performance management.
3. To analyse HR policies, labour laws, and ethical practices in HR

Course Outcomes:

1. Explain the key principles, functions, and importance of Human Resource Management in an organization.
2. Analyse the processes of human resource planning, job analysis, recruitment, and selection, with a focus on IT and IoT-based companies.
3. Evaluate different training methods and employee development strategies, emphasizing their importance in fast-evolving tech environments.
4. Examine performance appraisal methods, compensation structures, and employee motivation techniques relevant to IT and IoT industries.
5. Interpret various labour laws, workplace ethics, and employee relations policies, ensuring compliance with organizational and legal standards.
6. Assess the impact of digital transformation, AI-driven HR tools, and remote work trends on modern HR practices in tech industries.

UNIT	Course: Human Resource Management	L
Unit-1	Introduction to Human Resource Management: Definition, Scope, and Evolution of HRM, Functions and Objectives of HRM, HRM vs. Personnel Management, Role of HR in IT and IoT Industries, Strategic HRM and its Importance.	07
Unit-2	HR Planning and Recruitment: Human Resource Planning (HRP) Process, Job Analysis, Job Description, and Job Specification, Recruitment: Sources and Methods, Selection Process: Tests, Interviews, and Selection Criteria, Onboarding and Induction Programs.	07
Unit-3	Employee Training and Development: Need for Training in the IT Industry, Training Methods: Online vs. Offline, On-the-Job vs. Off-the-Job, Employee Development and Career Planning, Importance of Continuous Learning in IoT & AI Fields, Evaluating Training Effectiveness	07
Unit-4	Performance Management and Compensation: Performance Appraisal: Purpose, Methods, and Challenges, Key Performance Indicators (KPIs) in Tech Companies, Compensation and Benefits in IT and IoT Sectors, Incentives and Reward Systems, Employee Motivation and Engagement Strategies	07
Unit-5	Employee Relations and Legal Aspects: Employer-Employee Relationship in Tech Firms, HR Policies and Workplace Ethics, Labor Laws and Employment Regulations in India, Grievance Handling and Conflict Resolution, Workplace Safety, Diversity, and Inclusion	07
Unit-6	HRM in the Digital Age: Role of HR Analytics and Data-Driven Decision Making, Artificial Intelligence in HRM (HR Chatbots, Resume Screening), Remote Work and Virtual Team Management.	07
Total		42

Textbooks:

1. "Human Resource Management" by Gary Dessler
2. "Human Resource Management: People, Data, and Analytics" by Talya Bauer, Berrin Erdogan, David Caughlin, and Donald Truxillo

Reference Books:

1. "HRM, Artificial Intelligence and the Future of Work", by Tony Dundon and Adrian Wilkinson
2. "Human Resource Management" by Sangeetha N.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SEH	Electronic Circuit design	02	00	00	02

Pre-requisites:

1. (4SE03) Analog circuits
2. (3SE02) Electronics Devices & Circuits
3. (3SE03) Digital system Design

Course Learning Objectives:

1. To understand principles of electronic circuit design.
2. To comprehend the procedures for designing and analyzing electronic circuits.
3. To learn the concepts of digital circuit design using VHDL.

Course Outcomes:

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

- CO1: Understand the design specifications, components and electronic system design.
- CO2: Formulate, analyze and design fundamental analog circuits.
- CO3: Demonstrate the design of instrumentation amplifier, Temperature controller and indicator.
- CO4: Discuss the basic Concepts of VHDL.
- CO5: Develop VHDL code for various Combinational Circuits.
- CO6: Design synchronous and asynchronous of sequential circuits.

Unit	Content: Electronic Circuit design	L
Unit-1	Design of regulated power supply using transistor, design of DC amplifier, comparator, window detectors using IC 741 /IC 324.	06
Unit-2	Design of waveform generator using IC 741, IC 8038, IC 566. Design of sweep generator, voltage controlled oscillator.	06
Unit-3	Design of instrumentation amplifier, Temperature controller / indicator using thermocouple, resistance thermal detector, thermo sensors AD590, LM35.	06
Unit-4	VHDL : Design flow, EDA tools, code structures, data types, operators and attributes. Signals & Variables, packages and components, configuration.	06
Unit-5	Design of combinational blocks such as multi-bit adders, ALU, MUX, DEMUX, encoders, decoders.	04
Unit-6	Design of sequential circuits, asynchronous and synchronous design, state machine modeling (Moore and Mealy machines).	04
	Total	28

Textbooks:

1. R.A. Gayakwad : “OP-AMP and Linear Integrated Circuits”,4th Edition, PHI
2. Brown & Vranesic, “Digital Logic Design using VHDL”, TMH.
3. J. Bhaskar, “VHDL Primer”,Pearson Education.

Reference Books:

1. Sergio Franco, ”Design with Linear Integrated Circuits & Opamps”.
2. Douglas L. Perry,” VHDL” , 3rd Edition , McGraw Hill.
3. Paul Horowitz-W.Hill, ”The art ofElectronics”,Cambridge publication.
4. Volnei Pedroni, “ Circuit Design with VHDL”, PHI , 2005 edition.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SEOE3A	OE-III: Waste to Energy	03	00	00	03

Pre-requisites: NA

Course Learning Objectives:

- 1: To understand the principles of waste management and its significance in environmental sustainability.
- 2: To analyse various sources of waste, their classification, and their impact on the environment.
- 3: To explore methods of energy generation through bio-chemical and thermo-chemical conversions, and their role in waste-to-energy processes.

Course Outcomes:

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

CO1: Familiarized with the concept of Waste Management.

CO2: Explain waste sources and its classification.

CO3: Understand the concept of energy generation by Bio-chemical conversion.

CO4: Understand the concept of energy generation Thermo-chemical conversion.

CO5: Understand the need of Energy from Plastic Wastes.

CO6: Discuss about Biofuels.

UNIT	Course : OE-III: Waste to Energy	No. of Lectures Required
Unit-1	Introduction: The Principles of Waste Management and Waste Utilization. Waste Management Hierarchy and 3R Principle of Reduce, Reuse and Recycle. Waste as a Resource and Alternate Energy source.	06
Unit-2	Waste Sources & Characterization: Waste production in different sectors such as domestic, industrial, agriculture, postconsumer, waste etc. Classification of waste – agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous). Characterization of waste for energy utilization. Waste Selection criteria.	07
Unit-3	Biochemical Conversion – Energy production from organic waste through anaerobic digestion and fermentation.	06
Unit-4	Thermo-chemical Conversion – Combustion, Incineration and heat recovery, Pyrolysis, Gasification; Plasma Arc Technology and other newer technologies.	06

Unit-5	WASTE TO ENERGY OPTIONS: Landfill gas, collection and recovery. Energy from Plastic Wastes – Non-recyclable plastic wastes for energy recovery. Energy Recovery from wastes and optimization of its use, benchmarking and standardization. E-waste: E-waste in the global context, Growth of Electrical and Electronics Industry in India, Environmental concerns, health hazards and Recycling.	07
Unit-6	Introduction to biofuels: Definition of fuels and biofuels; Emission factors, Comparative analysis of the chemical composition of the raw biomass materials; Evolution of the production of biofuels – (from I generation to IV generation). Process of Bioethanol Production from Biomass.	07
	Total	39– Lectures

Text Book (s):

1. P. Aarne Vesilind, William A. Worrell and Debra R. Reinhart. “Solid Waste Engineering”, Second edition, Cengage learning India Pvt. Limited, 2016
2. Nicholas P. Cheremisinoff, “Handbook of Solid Waste Management and Waste Minimization Technologies”, An Imprint of Elsevier, New Delhi, 2003
3. Zander Ellis, “Industrial Waste Management”, Larsen and Keller Education, 2017

Reference Books(s) / Web links:

1. The Biofuels Handbook By Natasha Ramroop Singh.
2. C Parker and T Roberts (Ed), “Energy from Waste – An Evaluation of Conversion Technologies”, Elsevier Applied Science, London, 1985
3. Sofer, Samir S, Oskar R. Zaborsky, “Biomass Conversion Processes for Energy and Fuels”, Springer, 2012
4. Hagerty, D. Joseph; Pavoni, Joseph L; Heer, John E., “Solid Waste Management”, New York, Van Nostrand, 1973
5. Amalendu Bagchi. “Design of Landfills and Integrated Solid Waste Management”. 3rd edition, John Wiley and Sons. New York, 2004
6. C. S. Rao. “Environmental Pollution Control Engineering”, Wiley Eastern Ltd. New Delhi (1995)
7. “E-waste in India: Research unit, Rajya Sabha Secretariat, New Delhi, June 2011”
8. KL Shah, “Basics of Solid and Hazardous Waste Management Technology”, Prentice Hall, 2003
9. M Datta, “Waste Disposal in Engineered Landfills”, Narosa Publishing House, 1997

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
5SEOE3B	Intellectual Property Rights (IPR)	03	00	00	03

Pre-Requisite: NIL

Course Learning Objectives:

4. Impart awareness on Intellectual Property Rights (IPR) and various regulatory issues related to IPR.
5. Familiarize students with the shades of Intellectual Property Rights (IPR).
6. Awareness on intellectual property rights and various regulatory issues related to IPR.

Course Outcomes:

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

1. Understand the concept of intellectual property and list its various forms.
2. Explain the process of obtaining a patent, including eligibility criteria and rights associated with patents.
3. Apply copyright laws to determine eligibility for protection and understand procedures for registration.
4. Analyze trademark classification and evaluate criteria for registration.
5. Synthesize understanding to develop strategies for registration and protection of industrial designs.
6. Evaluate the significance of trade secrets in business operations and analyze precautionary measures for protection.

UNIT	Course: Intellectual Property Rights	L
Unit-1	Introduction to Intellectual Property Rights: Role of IP in the Economic and Cultural Development of the Society, IP Governance. IP as a Global Indicator of Innovation, Origin of IP, History of IP in India. Patents, Copyrights and Related Rights, Trademarks, Trade Secrets.	07
Unit-2	Patents: Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention, Rights Associated with Patents, Enforcement of Patent Rights, and Inventions Eligible for Patenting, Non-Patentable Matters, Patent Infringements, Process of Patenting.	07

Unit-3	Copyrights: Classes of Copyrights, Criteria for Copyright, Ownership of Copyright, Copyrights of the Author, Copyright Infringements, Liability of Owner of an Auditorium/Hall, Fair Use Doctrine, Non-Copyright Work, Copyright Registration, Judicial Powers of the Registrar of Copyrights, Fee Structure, Copyright Symbol, Validity of Copyright.	07
Unit-4	Trademarks: Eligibility Criteria, Who Can Apply for a Trademark, Acts and Laws, Designation of Trademark Symbols, Classification of Trademarks, Registration of a Trademark is Not Compulsory, Validity of Trademark, and Types of Trademarks Registered in India, Trademark Registry, and Process for Trademarks Registration. Famous Case Law: Coca-Cola Company vs. Bisleri International Pvt. Ltd.	07
Unit-5	Industrial Design: Eligibility Criteria, Acts and Laws to Govern Industrial Designs, Design Rights, Enforcement of Design Rights, Non-Protectable Industrial Designs India, Protection Term, Procedure for Registration of Industrial Designs, Importance of Design Registration, Cancellation of the Registered Design, Application Forms, Famous Case Law: Apple Inc. vs. Samsung Electronics Co.	07
Unit-6	Trade Secret: Criteria for Trade Secret, Registration and Protection Time of Trade Secrets, Rights Associated with Trade Secrets, Enforcement of Trade Secrets, When to Apply for Trade Secret Protection, Precautionary Measures to be Taken by Enterprises/Organizations, Disparity Between Trade Secrets and Patents, Renowned Trade Secrets.	07
Total		42

Text Books:

1. Prof. Rupinder Tewari and Ms. Mamta Bhardwaj, "Intellectual Property: A Primer for Academia" by, Publication Bureau, Panjab University, Chandigarh, 2021.
2. K. V. Nithyananda, "Intellectual Property Rights: Protection and Management", by Cengage Learning India Private Limited, 2019.

Reference Books:.

1. Deborah E. Bouchoux, "Intellectual Property for Paralegals – The Law of Trademarks, Copyrights, Patents & Trade Secrets", 4th Edition, Cengage Learning, 2012.
2. N. S. Gopalakrishnan and T. G. Agitha, "Principles of Intellectual Property", Eastern Book Company, Lucknow, 2009.
3. M. M. S. Karki, "Intellectual Property Rights: Basic Concepts", Atlantic Publishers, 2009.
4. Ganguli Prabuddha, "Intellectual Property Rights--Unleashing the Knowledge Economy", Tata McGraw Hill, 2001.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE01	Microwave Theory & Techniques	03	00	00	03

Pre-requisites: (3SE04) Electromagnetic Waves.

Course Learning Objectives:

1. To understand Basic concepts of Microwave active and passive devices.
2. To acquire the knowledge of Transmission characteristic of microwave through waveguide and Parallel strip line.
3. To comprehend Concepts of Microwave resonators and Microwave components and formulation of scattering matrix.
4. To understand the techniques of Measurement of microwave parameters.

Course Outcomes:

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

CO1: Understand the principles of operation of microwave tubes.

CO2: Analyze the operational characteristics of microwave solid-state devices.

CO3: Analyze microwave propagation through waveguides and parallel strip lines.

CO4: Illustrate various types of microwave resonators.

CO5: Formulate Scattering matrix for microwave components.

CO6: Apply appropriate measurement techniques to measure and evaluate parameters of microwave systems.

Units	Course: Microwave Theory & Techniques	L
Unit-1	Microwave Tubes: Introduction to microwave Engg. and applications, advantages, frequency bands, Limitation of Conventional devices at high frequency, Microwave Tubes: Two cavity, reflex klystron, Cylindrical Cavity Magnetron, TWT.	07
Unit-2	Semiconductor Microwave Devices: Gunn diode: RWH theory, Gunn domain, modes of Gunn oscillation, Negative resistance amplifier (principle), Parametric amplifiers: operation & types, Principle of operation of IMPATT, TRAPATT diodes, & MASER.	07

Unit-3	Waveguide system and Parallel Strip lines: Waveguides: Rectangular Wave guide: TEM wave in Rectangular Waveguide, Field Expressions and parameters, Circular Waveguide: Field Expressions and parameters. Introduction to Parallel strip lines.	08
Unit-4	Microwave Resonator: Basics concepts of Resonant circuits, Series and parallel resonant circuits (RLC), transmission line resonators – Half wavelength and quarter wavelength long open circuited and short circuited line, Cavity resonators: rectangular and circular cavities, resonant frequency, and quality factor of resonators.	07
Unit-5	Microwave passive components & Scattering matrix: Introduction to scattering matrix and properties, formulation of Scattering Matrix for Two hole directional coupler, E-plane tee, H-plane tee, Magic tee and Circulators. Microwave propagation in ferrites, devices employing Faraday rotation: Gyrator, Isolator.	07
Unit-6	Microwave Measurements: Frequency Measurements, Power Measurements, Attenuation Measurements, VSWR Measurements, Impedance Measurements, insertion Loss Measurements, Dielectric constant Measurements.	06
	Total	42

Text Books:

1. Liao, Samuel Y., “Microwave Devices & Circuits”, Tata Mc-Graw Hill Co. Ltd., New Delhi.
2. David M Pozar, “Microwave Engineering” Wiely 3 rd Edition.
3. Collin, Robert E., “Foundations for Microwave Engineering”, Mc- Graw Hill, New York.

Reference Books:

1. Kennedy G., “Electronics Communication Systems”, Tata Mc-Graw Hill Book Co., New Delhi.
2. K.C. Gupta, “Microwave Engineering”, New Age.
3. Reich, Scolnik, Ordnung, Krangs, “Microwave Principles”, PHI.
4. M.L. Sisodiya and G.S. Raghuwanshi, “Microwave Circuits and Passive devices”, John Wiley & Sons Ltd.
5. Mathew M. Radmanesh, “RF and Microwave Electronics – Illustrated”, Prentice Hall.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE02	Digital Image Processing	3	00	00	3

Pre-Requisite:

1. (3SE01) Mathematics-III
2. (5SE03) Digital Signal Processing

Course Objectives:

1. To understand fundamentals of digital image processing.
2. To analyze Digital image filtering techniques in spatial and transform domain.
3. To comprehend the knowledge of segmentation, morphological concepts and image processing operations.
4. To understand image compression techniques and color image processing.

Course Outcomes:

After successful completion of the course, students will be able to:

CO1: Describe the fundamentals of digital image processing.

CO2: Analyze different image enhancement methods in the spatial domain.

CO3: Analyze different image enhancement methods in the transform domain.

CO4: Elaborate image segmentation and morphological processes.

CO5: Explain the image degradation model and various image compression techniques.

CO6: Elaborate concepts of colour image processing.

UNIT	Course: Digital Image Processing	L
Unit-1	Introduction and Digital Image Fundamentals: Human Visual System, Image as a 2-D signal, image sampling and quantization, image types-Binary, Gray, RGB and Multi-spectral; Pixel neighbourhood, adjacency, connectivity and distance measures.	07
Unit-2	Image Enhancement in the Spatial Domain: Enhancement: Image negation, Brightness, contrast modification, Histogram, Histogram Equalization, Bit plane slicing; Linear, Order-Statistic (Nonlinear) Filters, Laplacian filter using the Second Derivative.	07
Unit-3	Image Enhancement in the Frequency Domain: Properties of 2D DFT: Transactional and Periodicity; Low pass & High Pass Filters - Ideal, Butterworth and Gaussian; Homomorphic Filter.	07
Unit-4	Image Segmentation and Morphology: Segmentation Fundamentals, Line detection, Edge detection using Prewitt, Sobel and canny Kernal; Region Growing, Region splitting and merging; Erosion and Dilation, Opening and Closing	07
Unit-5	Image restoration and Compression techniques: Wiener filtering Types of Redundancy, Loss less compression (Huffman coding), Lossy compression-predictive and transform coding; JPEG, JPEG-2000, PNG Image compression standards	07
Unit-6	Color Image Processing: Color Models: RGB, CMY and CMYK; Pseudo color Image processing, Image Smoothing and Sharpening, Image segmentation in RGB vector space.	07
Total		42

Text Books:

1. Gonzaleze and Woods, “Digital Image Processing”, 3rd edition, Pearson Publication.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, “Digital Image Processing”, 2nd edition, McGraw Hill publication.

Reference Books:

1. Anil Kumar Jain, “Fundamentals of Digital Image Processing”, 2nd edition, Prentice Hall of India, 2004.
2. Arthur R. Weeks, “Fundamentals of Electronic Image Processing”, Wiley–Blackwell.
3. William Pratt,” Digital Image Processing: PIKS Inside”, 4th Edition, A WISP.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE03	Embedded systems	03	00	00	03

Pre-Requisite:

1. (3SE03) Digital System Design.
2. (3SE09) Object Oriented Programming Lab
3. (5SE01) Microcontroller & Applications

Course Objectives:

1. To understand the concept of Embedded Systems.
2. To study architecture and inbuilt peripherals of AVR Microcontroller.
3. To learn and apply RTOS to embedded systems.

Course Outcomes:

After successful completion of the course, students will be able to-

- CO1: Describe the concept of Embedded Systems.
- CO2: Explain the quality attributes of Embedded System.
- CO3: Articulate the architecture and inbuilt peripherals of AVR Microcontroller.
- CO4: Evaluate the programming of AVR Microcontroller in C and C++.
- CO5: Compare task, process & threads in Real Time Embedded System.
- CO6: Evaluate validation and debugging of Embedded System.

Units	Course: Embedded Systems	L
Unit-1	Introduction to Embedded systems: History of Embedded system, Embedded systems vs. General computing systems, Classification of Embedded systems, Major application areas of Embedded systems, Purpose of Embedded systems.	08
Unit-2	Building blocks of Embedded systems: Core of the Embedded system, Memory Devices, Sensors and Actuators, Communication Interface, Embedded Firmware, Other System components, Characteristics of Embedded systems, Quality attributes of Embedded System.	07
Unit-3	Introduction to AVR Microcontroller: AVR microcontroller, History, Features and AVR family and its inbuilt Peripherals, Architecture of ATmega 32: signal description, registers of AVR, Data Memory, data formats.	07
Unit-4	AVR Application and Programming in C: Data types, I/O programming, I2C, Timer Structure, Watch dog timer, UART, Interrupt Structure, Analog to Digital convertors.	07
Unit-5	RTOS based Embedded System Design: Operating System basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Processes and Scheduling.	07
Unit-6	Embedded System Architecture: Architecture Styles, implementation Aspects, validation & debugging of embedded systems, hardware – software co-design in an embedded system.	06
Total		42

Text Books:

1. Shibu K. V., “Introduction to Embedded System”, McGraw Hill Education
2. S.V. Iyer & Pankaj Gupta, “Embedded Real-time Systems Programming”, McGraw Hill Education.
3. Muhammad Ali Mazidi, Sarmad Naimi and Sephers Naimi, “AVR Microcontroller and Embedded systems using assembly and C”, Pearson Education, Inc. publishing as Prentice Hall 2013.

Reference Books:

1. Rajkamal, “Embedded Systems”, 2nd Edition, Tata McGraw Hill
2. Cottet, Delacroix & Mammeri, “Scheduling in Real Time Systems”, John Wiley & Sons.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE04PE3A	PEC-3: Internet of Things	03	00	00	03

Pre-Requisite:

1. (1SET01)Electrical Measurements & Measuring Instruments
2. (5SE05PE2A)Sensors and transducers
3. (5SE01)Microcontroller and Applications

Course Learning Objectives:

1. To understand the concepts of terminologies and architecture of IoT systems, Use sensors and actuators for design of IoT.
2. To impart the knowledge of various protocols for design of IoT systems.
3. To explore associated IOT Technologies and various applications of IoT.

Course Outcomes:

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

CO1: Describe the various concepts, terminologies and architecture of IoT systems.

CO2: Apply the knowledge of sensors and actuators for design of IoT.

CO3: Apply various protocols for design of IoT systems.

CO4: Explain visualization, Cloud model and other associated IOT Technologies.

CO5: Comprehend various applications of IoT.

CO6: Analyze IoT with Case Studies.

UNIT	Course: Internet of Things	L
Unit-1	Introduction to IoT: Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, IoT Challenges, IoT Networking Components.	07
Unit-2	IoT Sensing and Actuation: Types of Sensors, Sensor Characteristics, Sensorial Deviations, Types of Actuators, Actuator Characteristics, Examples and Working.	07
Unit-3	Basics of Networking: Introduction, Network Types, Layered network models, Basics of Networking, Communication Protocols, Machine-to-Machine Communications, Difference between IoT and M2M, IoT Communication Protocol (MQTT).	07
Unit-4	Associated IoT Technologies: Cloud Computing: Introduction, Virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Cloud Implementation, Sensor-Cloud: Sensors-as-a-Service.	07
Unit-5	Applications of IoT: Overview, Block Diagram and Working of real world IoT applications : Smart Home automation, Agricultural System and Smart Parking, Health and Lifestyle, Industrial IoT	07
Unit-6	IoT Case Studies and Future Trends: Vehicular IoT: Introduction, Healthcare IoT: Introduction, Case Studies, IoT Analytics: Introduction.	07
Total		42

Text Books:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, “Introduction to IoT”, Cambridge University Press 2021.
2. Hakima Chaouchi, “The Internet of Things Connecting Objects to the Web” ISBN : 978-1- 84821-140-7, Wiley Publications.

Reference Books:

1. S. Misra, C. Roy, and A. Mukherjee., “Introduction to Industrial Internet of Things and Industry 4.0” 2020..
2. Raj Kamal, “Internet of Things architecture and Design Principles” ,McGrawhill Education private limited, 2017.
3. Olivier Hersent, David Boswarthick, and Omar Elloumi, “The Internet of Things: Key Applications and Protocols”, WileyPublications.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE04PE3B	PEC-3: BIO-MEDICAL ELECTRONICS	03	00	00	03

Course Requisite:

1. (6SE04PE3B) Electronic Devices and Circuits
2. (5SE05PE2A) Sensors and Transducers

Course Learning Objectives:

1. To understand the role of engineers in medical field and studying various electrical signals generated in human body.
2. To study various transducers, electrodes, recorders, problems for recording biomedical signals and different medical imaging systems.
3. To analyze patient care, safety and various therapeutic lifesaving instruments.

Course Outcomes:

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

- CO1: Understand fundamentals of Medical Instrumentation, Biomedical Signals and Electrode.
- CO2: Identify and classify various Biomedical Transducers.
- CO3: Illustrate the significance of human signals and recording techniques.
- CO4: Familiarize with Modern medical imaging systems.
- CO5: Conceptualize requirements and importance of Patient Care and Monitoring and Safety.
- CO6: Describe the function and necessity of Physiological and electrotherapy equipment's.

UNIT	Course: BIO-MEDICAL ELECTRONICS	L
Unit-1	Introduction: Sources of bioelectric potentials, Different bioelectric signals like ECG, EMG and EEG, Bio potential Electrode theory, Basic electrode, Electrodes for EEG, ECG, EMG. Skin contact Theory, motion artifacts, Nernst Equation.	07
Unit-2	Biomedical transducers: Classification of Transducers-Pressure, force, acceleration, flow, respiration sensor, Smart sensors, pulse sensor, temperature, potential, dissolved ions and gases.	07
Unit-3	Biomedical Recorders and Measurement: Biomedical recorders for EEG, ECG, EMG, Measurement of Blood Pressure: Direct method, Indirect methods- The Rheographic method, Ultrasonic Doppler shift method, Blood flow meter - square wave electromagnetic, Measurement of Heart rate, Measurement of pulse rate.	07
Unit-4	Medical Imaging System: Instrumentation for diagnostics X-rays, X-rays basics properties, X-ray machine, Special imaging techniques: Computerized Axial Tomography (CAT), Ultrasonic imaging system: Physics of Ultrasound, Biological effect of ultrasound. Ultrasonics: A-scan, M-scan, B-scan.	07
Unit-5	Patient Care and Monitoring and Safety: System concepts, Bedside patient monitors, central monitors, Intensive care monitoring. Biotelemetry: Single channel and Multichannel bio-telemetry, PATIENT SAFETY: Electric shock hazards, leakage current. Types of Leakage current, measurement of leakage current, methods of reducing leakage current, precautions to minimize electric shock hazards.	07
Unit-6	Therapeutic Equipment's & Ventilators: Need of Physiological and electrotherapy equipment's. Cardiac pacemakers, Cardiac Defibrillators, Nerve and Muscle stimulators. Diathermy Machines: Short wave, Microwave, Ultrasonic. Ventilators: Mechanics of respiration, Artificial Ventilators, Microprocessor controlled Ventilators.	07
	Total	42

Text Books:

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata Mc-Graw Hill, New Delhi.
2. Cromwell L. & Wiebell. F. J., "Biomedical Instrumentation", PHI Publications.

Reference Books:

1. Webster J.G., "Medical Instrumentation", Third ed. John Wiley & Sons.
2. Carr & Brown, "Introduction to Biomedical Equipment Technology", Prentice Hall.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE04PE3C	PEC-3 Database Management System	03	00	00	03

Pre-requisites: None

Course Learning Objectives:

1. To introduce with the basic knowledge of file structure, Data Base, Entity Relation Diagram, data modelling and SQL query and structure.
2. To apply the process of building normalization and Transaction for the database system.
3. To understand the storage mechanism for data base management system.

Course Outcomes:

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

CO1: Understand knowledge of fundamentals of DBMS, database design, Entity Relation Diagram and data modelling.

CO2: Elaborate the basic principal of relational model.

CO3: Apply the basics of SQL for retrieval and management of data.

CO4: Describe the basics of transaction processing and concurrency control.

CO5: Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database

CO6: Comprehend the database storage structures and access techniques.

UNIT	Course: Database Management System	L
Unit-1	Introduction to Database Design: Data Independence, Structure of a DBMS Database Design and ER Diagrams, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design With the ER Model.	07
Unit-2	Introduction to the Relational Model: Integrity constraint over relations, enforcing integrity constraints, querying relational data, logical database design, introduction to views, destroying/altering tables and views. Relational Algebra, Tuple relational Calculus, Domain relational calculus.	07
Unit-3	SQL Structure: SQL: Basic Structure, Set Operations, Aggregate Functions, Null Values, Nested Sub queries, Views. Integrity and Security, Domain Constraints, Referential Integrity, Assertions, Triggers, Security and Authorization, Authorization in SQL.	07
Unit-4	Normalization: Purpose of Normalization, Data Redundancy and Anomalies, Non-Loss decomposition and Functional Dependencies, First, Second and Third Normal Forms, Boyce/Codd Normal Form (BCNF).	07
Unit-5	Transaction Processing: The Concept of Transaction, States of Transaction, Concurrent Execution of Multiple Transactions, Serializability - Conflict and View Serializability.	07
Unit-6	Storage: Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree based Indexing, Comparison of File Organizations, B+ Trees: A Dynamic Index Structure.	07
	Total	42

Text Books:

1. Silberschatz, Korth, and Sudarshan, "Database System Concept", 4th Edition, Mc Graw Hill.
2. Raghu Ramkrishnan, Johannes Gehrke, "Database Management System", 3rd Edition, Mc Graw Hill.

Reference Books:

1. C. J. Date, "An Introduction to Database System", 8th edition, Pearson Education.
2. Connolly & Begg, Database System, 6th edition, Pearson Education.
3. Peter Rob & Carlos Coronel, "Database System Design, Implementation and Management", 7th Edition, Thomson Course Technology.

B.Tech. Semester V (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE05PE4A	PEC-4 Adaptive Signal Processing	03	00	00	03

Course Pre-requisite:

1. (3SE01) Applied Mathematics-III
2. (4SE04) Signals and Systems
3. (5SE03) Digital Signal Processing

Course Learning Objectives:

1. To introduce with adaptive signal processing and adaptive systems.
2. To be acquainted with desired response, mean square error performance and Wiener Filters.
3. To make familiar with gradient search algorithms, LMS, LLS, RLS algorithms.

Course Outcomes:

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

1. Comprehend adaptive system and functions.
2. Evaluate the performance of various methods for designing adaptive filters through estimation of different parameters.
3. Understand the concepts of gradient and mean square error performance in adaptive systems.
4. Analyse convergence and stability issues associated with adaptive filter design and come up with optimum solutions.
5. Apply an adaptive filter algorithm that recursively finds the coefficients that minimize a weighted linear least squares cost function.
6. Implement applications of adaptive signal processing.

Unit	Course: Adaptive Signal Processing	L
Unit-1	Adaptive Systems: Adaptive Systems: Definition and characteristics, General Properties, Applications and examples of an adaptive system. Review of probability, random variables and random processes	07
Unit-2	Wiener Filters: Input signal and weight vectors, desired response and error, Mean Square Error (MSE), Principle of Orthogonally, FIR Wiener Filters, Wiener Hopf equation.	07
Unit-3	Steepest Descent Algorithms: Searching the performance surface Methods & Ideas of Gradient Search methods, Gradient Searching Algorithm & its Solution, Stability & Rate of convergence, Method of Steepest Descent	07
Unit-4	Least Mean Square (LMS) Algorithms: Derivation of LMS algorithm, Convergence, Stability and performance analysis of LMS Algorithm, Normalized Least-Mean-Square Algorithm.	07
Unit-5	Recursive Least Square Algorithms: Linear Least Square Estimation Problem, Introduction to Recursive Least-Squares Adaptive filters, Matrix Inversion Lemma, RLS Algorithm	07
Unit-6	Applications of Adaptive filtering: System identification, Adaptive Equalization, noise cancellation, linear prediction, Echo Cancellation, Lattice Filters	07
	Total	42

Text Books:

1. Simon Haykin, "Adaptive Filter Theory", 3rd Ed, Prentice Hall Inc, 2002.
2. Bernard Widrow & Samuel. D. Stearns, "Adaptive Signal Processing", Pearson Edu, 2001.

Reference Books:

1. Alexander D.Poulanikas & Zayed M Ramadan, "Adaptive Filtering Primer with MATLAB", Taylor & Francis Series, CRS Press.
2. Bernard Widrow, "Adaptive Signal Processing", Prentice-Hall Signal Processing Series.
3. Sen M. Kuo, Bob H. Lee and Wenshun Tian, "Real Time Digital Signal Processing: Implementation and Applications", 2nd Ed, John Wiley & Sons, 2006.
4. Maurice G Bellanger, "Adaptive Digital Filters", 2nd Edition,
5. Marcel Dekkar Inc. T Ogunfummi, "Adaptive Nonlinear System Identification", Springer

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE05PE4B	PEC-04: Renewable Energy Sources	03	00	00	03

Pre-requisites:

1. (2SF03) Basics of Electrical Engineering.

Course Learning Objectives:

1. To understand the different types of conventional and non-conventional energy sources
2. To learn the different renewable energy sources
3. To comprehend the need and importance of electric vehicle and battery systems.

Course Outcomes:

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

- CO1: Understand the environmental aspect of renewable energy resources in comparison with various conventional energy systems.
- CO2: Describe the use of Solar Energy and Various Components use in energy production.
- CO3: Discuss the conversion principles of wind energy.
- CO4: Elaborate the conversion process of biomass energy and working of hydropower plant.
- CO5: Explain the knowledge about other renewable energy sources.
- CO6: Illustrate the Basic Knowledge of electric Vehicles.

Units	Course: Renewable Energy Sources	L
Unit-1	Renewable Energy (RE) Sources: Conventional Energy Sources, Non-Conventional Energy Sources, Importance of Renewable Energy, Types of Renewable Energy Sources, Limitation of Renewable Energy Sources.	07
Unit-2	Solar Energy : Solar Photovoltaic System, Basic Principle of SPV Conversation, Types of Solar Cells, Photovoltaic Cell Concept- Cell, Module , Array, I-V Characteristics of P-V Module, Efficiency and Quality of The Cell, Series and Parallel Connection, Maximum PowerPoint Tracking , Applications.	07
Unit-3	Wind Energy : Power in the wind, Types of Wind Power Plants (WPPs), Component of WPPs, Working of WPPs, Grid Integration Issues of WPPs,	07
Unit-4	Biomass and Hydro Energy: Introduction to Biomass Resources, Energy From Biomas, Conversation Process of Biomass, Mini /Micro Hydropower Plant Classification of Hydro Power Schemes, Essential Component of Hydroelectric System.	07
Unit-5	Other Energy Sources: Tidal Energy System, Wave Energy System, Geothermal Energy, Energy Storage System	07
Unit-6	Electric vehicles: Benefits of Using EVs, Types of Electric Vehicles, EV Motor Drive Technology, EV Energy Sources Technologies, Introduction to Battery Parameters, Lithium Ion Battery, Battery Pack Development, Battery pack Design.	07
	Total	42

Text Books:

1. G D Rai ,”Non- Conventional Energy Sources”, Fourth Edition, Khanna Publication.
2. S.Rao and Dr. B.B Parulekar ,”Energy Technology”, Khanna Publication.
3. Subhas p Sukhatme ,”Solar energy”, 2nd Edition ,TataMc Graw hill,1996.

Reference Books:

1. A.W.Culp Jr ,”Principles of Energy Conversion”, McGraw Hill, 1996.
2. Shobh Nath Singh ,”Non- Conventional Energy Resource” , Person, 2018.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE05PE4C	PEC4-Antenna & Wave Propagation	3	00	00	3

Prerequisites:

1. (3SE04) Electromagnetic Waves
2. (4SE03) Analog and Digital Communications

Course Learning Objectives:

1. To understand basic terminology and concepts of Antennas.
2. To learn the basic antenna operation, antenna array as well as their usage in real time.
3. To understand the principle of smart antennas and to study the propagation of the waves in free space.

Course Outcomes:

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

- CO1: Discuss the fundamental aspects of antenna.
- CO2: Explain the antenna array system its excitation and field patterns.
- CO3: Elaborate concepts of Aperture antennas and its application.
- CO4: Describe the concepts and applications of broadband and microstrip antennas.
- CO5: Explain the concept and benefit of smart antennas
- CO6: Apply the means of propagation of electromagnetic waves.

UNIT	Course: Antenna & Wave Propagation	L
Unit-1	Antenna Fundamentals: Transmission lines & equivalent Circuits, Concept of radiation, Radiation pattern, near and far fields, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation.	07
Unit-2	Antenna Arrays: Radiation from wires and loops- Infinitesimal dipole, finite-length dipole, small circular loop, antenna array, analysis of uniformly spaced array with uniform and non-uniform excitation amplitudes, extension to planer arrays.	08
Unit-3	Aperture antennas: Huygen's principle, radiation from rectangular and circular apertures, design consideration, Babinet's principle, Radiation from sectorial and pyramidal horns, design concepts, parabolic reflector and Cassegrain antennas.	07
Unit-4	Broadband Antennas: Broadband Antennas: Log periodic and yagi-uda antenna, frequency independent antennas. Microstrip antenna: Basic characteristics of microstrip antenna, feeding methods, Introduction of rectangular and circular patch antenna.	07
Unit-5	Smart Antennas: Smart Antennas: Concept and benefit of Smart Antennas, fixed weight beam forming basics, Adaptive beam forming.	06
Unit-6	Wave Propagation: Modes of Propagation: Ground, sky and space wave propagation, structure of Atmosphere, Fading, Ionospheric Absorption, Multi hop propagation and super refraction.	07
	Total	42

Text Book:

1. C.A. Balanis, "Antenna Theory and design", 3rd ed. John wiley and sons,2005.
2. John D. Kraus, "Antennas", 2nd Ed. McGraw-Hill, 1988.

References:

1. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd ed., PHI, 2000.
2. K.D. Prasad, Satya Prakashan, "Antennas and Wave Propagation", Tech India Publications, New Delhi, 2001.
3. Harish A.R., "Antenna and wave propagation", Oxford university press.2010

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE06	MICROWAVE THEORY & TECHNIQUES LAB	03	00	02	05

Pre-requisites:

1. (3SE04) Electromagnetic Waves

Course Learning Objectives:

1. Makes student aware of basic concepts of Microwave active and passive devices.
2. To enrich with knowledge of transmission characteristic of microwave through waveguide and parallel strip line.
3. To impart the Concepts of Microwave resonators and Microwave components.
4. To explain various techniques for measurement microwave parameters.

Course Outcomes:

After successfully completion of the course, the students will be able to

CO1. Understand the Fundamentals of Microwave Devices

CO2. Analyze Microwave Transmission Techniques

CO3. Measure and Evaluate Microwave System Performance.

List of Experiments:

Performance of Minimum Eight Practicals based on 6SE01 Microwave Theory and Techniques syllabus.

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Course Code	Course Title	L	T	P	C
6SE07	Digital Image Processing Lab	03	00	02	03

Pre-Requisite:

4. (4ETC04) Signals and Systems
5. (5ETC03) Digital Signal Processing
6. Mathematics (Matrices & Transform Methods).

Course Learning Objectives:

1. To understand the fundamentals of digital image processing and enhancement in spatial and frequency domain
2. To apprehend the knowledge of image transform and analyse the various image compression techniques used in digital image processing.
3. To understand the fundamentals of video processing and segmentation.

Course Outcomes:

After successful completion of the course, students will be able to-

- CO1: Able to understand and perform on the basic concepts of digital image & video processing in practical Lab.
- CO2: Able to develop logic & write to a code to process images using OCTAVE/MATLAB Software.
- CO3: Able to express inference, finding and outcomes of experiment in journal and viva-Voce.

Practical's:

Performance of Minimum Eight Practicals based on 6SE02 Digital Image Processing Syllabus.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE08	Embedded Systems Lab	03	00	02	03

Pre-Requisite:

7. (3SE03) Digital System Design.
8. (3SE09) Object Oriented Programming Lab
9. (5SE01) Microcontroller & Applications

Course Learning Objectives:

4. To understand the concept of Embedded Systems.
5. To study architecture and inbuilt peripherals of AVR Microcontroller.
6. To learn and apply RTOS to embedded systems.

Course Outcomes:

After successful completion of the course, students will be able to-

- CO1: Understand the concept of Embedded Systems.
- CO2: Design embedded applications using embedded C.
- CO3: Develop the interfacing between various applications of Embedded Systems.

Practical's:

Performance of Minimum Eight Practicals based on 6SE03 Embedded Systems Syllabus.

B.Tech. Semester VI (Electronics and Telecommunication Engineering)

Course Code	Course Title	L	T	P	C
6SE0	MINI PROJECT Lab	03	00	02	05

Pre-requisites:

1. Basic knowledge of Electronics and Telecommunication.

Course Learning Objectives:

1. To let the students apply the knowledge of theoretical concepts of the undergraduate courses to real time problems or situations
2. To provide valuable hands-on experience in building and testing electronic circuits or systems.
3. To spark innovation and encourage students to think about applying theoretical knowledge, developing practical skills, and fostering essential engineering competencies
4. To communicate their findings effectively through presentation and documentation.

Course Outcomes:

After successfully completion of the course, the students will be able to

CO1. Understand the Fundamentals problems in the field of Electronics and Telecommunication to define the problem and formulate the objectives

CO2. Implement a Methodology/ Experimental Procedure in order to develop a Prototype / working model etc.

CO3. Ability to work and communicate effectively as an individual and in a team in preparing the presentation, documentation.

Guidelines:

The mini project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design. The mini project may be a complete hardware or a combination of hardware and software. Mini Project should cater to a small system required in laboratory or real life. It should encompass components, devices, analog or digital ICs, micro controllers with which functional familiarity is introduced. Based on comprehensive literature survey/ Industry requirements analysis, the student shall identify the title and define the aim and objectives of the mini project.

B.Tech. Semester VI (Electronics and Telecommunication Engineering) A.Y. 2025-26

Course Code	Course Title	L	T	P	C
6SEH	PLC & Automation	03	00	00	03

Pre-requisites:

1. Instrumentation
2. Digital System Design

Course Objectives:

1. To understand Basic Architecture of PLC.
2. To study Different input/ output peripherals and communication standards used with PLC.
3. To develop skills to write basic PLC programs.
4. To learn SCADA and its application in industrial automation.

Course Outcomes:

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

- CO 1: Explain the fundamental concepts and components of Programmable Logic Controllers.
- CO2: Identify and explain the working principles and applications of various input devices used in automation systems.
- CO3: Describe different output devices types of DC motors along with understanding the advantages and limitations of industrial automation.
- CO4: Implement various PLC functions using ladder logic symbols and standards.
- CO5: Develop PLC programs for electronic and control applications using appropriate programming languages.
- CO6: Discuss the architecture, functions, and communication methods of SCADA systems.

Unit No.	Course: PLC & Automation	L
Unit-1	PLC Basic: Introduction to PLC, Need of PLC, Types of PLC, Block diagram, processor section, solid state memory, Input modules & output module (Analog, Digital, Discrete).	07
Unit-2	Input Devices Mechanical switches, proximity switches, encoders, Transducer and Sensor- RTD, Thermistors, Thermocouple, Displacement, position, motion sensor, pressure, liquid level detector, fluid flow measurement, optical sensors.	07
Unit-3	Output Devices: Relays, Solenoid, directional control valve, Various types of DC motors, stepper motors. Advantages and limitations of Automation	07
Unit-4	PLC Functions: Symbols of ladder diagram, Symbols of I/O Devices, PLC Timer functions, PLC Counter functions, Comparison functions, data handling functions, Bit functions, data move functions, skip & bypass IO functions.	07
Unit-5	PLC Programming for Electronic Application: Types of programming language, Development of ladder diagrams: Various types for ladder programming, flowchart, ladder programming for logic gates, flip-flop (JK, RS, D, T),	07
Unit-6	SCADA: Introduction to supervisory control: Introduction, Block diagram, what is real time, scan interval, Communications in SCADA- types & methods used, Remote Terminal Unit (RTU), and Industrial Application of SCADA system.	07
Total		42

Text Books:

1. John W. Webb, "Programmable logic controller principle and application", PHI publication.
2. Curtis Johnson, "Process Control Instrumentation Technology", PHI publication.
3. Stuart A. Boyer, "SCADA supervisory control and data acquisition", ISA Publication.

Reference Books

1. Rajesh Mehra & Vikrant Vijay, "PLCs & SCADA: Theory and Practice", Laxmi Publications.
2. John R Hackworth, "Programmable Logic Controllers", Pearson education.
3. Gary A Dunning, "Introduction to programmable logic controllers", Delmar Thomson Learning, 2001.
4. John Ridley, "Mitsubishi FX programmable logic controllers Application and programming", Wiley Publishing, Inc.