D Y PATIL
DEEMED TO BE
UNIVERSITY

SCHOOL *of* ENGINEERING
& MANAGEMENT
KOLHAPUR

F.Y. B. Tech.
Electronics & Telecommunication Engineering
Structure and Curriculum

Department of First Year Engineering

w. e. f. A.Y.: 2024-25

F.Y. B. Tech Electronics & Telecommunication Engineering Structure 2024-25

SEMESTER – I											
			Teaching Scheme				Theory			Practical		Total Marks
Course Category	Course Type	Course Name	Credits	Contact Hrs.			ISE	MSE	ESE	INT	OE/ PoE	
				L	P	T						
Basic Sciences	BSC	Linear Algebra & Calculus	4	3	-	1	20	30	50	25	-	125
	BSC	Applied Physics	4	3	2	-	20	30	50	25	-	125
Engineering Science	ESC	Problem Solving through Programming	4	3	2	-	20	30	50	25	-	125
	ESC	Digital Logic Design	4	3	2	-	20	30	50	25	-	125
Vocational Skills Enhancement Course	VSEC	Design Thinking Through Innovation	2	1	2	-	25	-	-	25	-	50
Indian Knowledge System	IKS	The Outreach of Indian Knowledge System	2	2	-	-	20	30	-	-	-	50
Co-Curricular Activities	CCA	Liberal Learning	2	-	4	-	-	-	-	50	-	50
Mandatory Course	MC	Finishing School Training I	-	3	-	-	50	-	-	-	-	Grade
		Rural/Social Internship	-	-	-	-	-		-	50	-	Grade
		Total	**22**	**15**	**12**	**1**	**175**	**150**	**200**	**225**	-	**650**
SEMESTER – II												
Basic Sciences	BSC	Differential Equations & Numerical Techniques	4	3	-	1	20	30	50	25	-	125
	BSC	Applied Chemistry	4	3	2	-	20	30	50	25	-	125
Engineering Science	ESC	Generative AI	4	3	2	-	20	30	50	25	-	125
Ability Enhancement Course	AEC	Professional Communication	2	1	2	-	25	-	-	25	-	50
Co-Curricular Activities	CCA	Liberal Learning	2	-	4	-	50	-	-	-	-	50
Program Core Courses	PCC	Basics of Analog Electronics	2	2	-	-	-	-	50	-	-	50
Vocational Skills Enhancement Cours	VSEC	Python Programming	2	1	2	-	25	-	-	25	-	50
Mandatory Course	MC	Capstone Project	-	-	-	-	-	-	-	50	-	Grade
		Finishing School Training - II	-	3	-	-	50	-	-	-	-	Grade
		Total	**20**	**13**	**12**	**1**	**210**	**90**	**200**	**175**	-	**575**

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F. Y. B. Tech. Scheme of Teaching and Examination w. e. f. A. Y. 2024-2025

Semester -I

Sr. No	Course Code	Course Type	Name of the Course	Teaching Scheme Per Week			Credits	Total Marks	Evaluation Scheme			
				L	P	T			Type	Max. Marks	Minimum Marks For Passing	
Students Induction Program as Per AICTE Guidelines												
1	241ETCBSCL101	BSC	Linear Algebra & Calculus	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
2	241ETCBSCL107	BSC	Applied Chemistry	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
3	241ETCESCL101	ESC	Problem Solving through Programming	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
4	241ETCIKSL101	IKS	Historical Places in and Around Kolhapur District	02	--	--	02	50	ISE MSE	20 30	20	
5	241ETCVSECL103	VSEC	Python Programming	01	--	--	01	25	ISE	25	10	
6	241ETCAECL102	AEC	Professional Communication	01	--	--	01	25	ISE	25	10	
7	241ETCBSCP102	BSC	Linear Algebra & Calculus Tutorial	--	--	01	01	25	ISE	25	10	
8	241ETCBSCP108	BSC	Applied Chemistry Laboratory	--	02	--	01	25	ISE	25	10	
9	241ETCESCP102	ESC	Problem Solving through Programming Laboratory	--	02	--	01	25	ISE	25	10	
10	241ETCVSECP104	VSEC	Python Programming Laboratory	--	02	--	01	25	ISE	25	10	
11	241ETCAECP103	AEC	Professional Communication Laboratory	--	02	--	01	25	ISE	25	10	
12	241ETCCCAP101	CCA	Liberal Learning - I	--	04	--	2	50	ISE	50	20	
Total				**14**	**14**	**01**	**20**	**575**	--	--	--	--
Mandatory Courses												
1	241ETCMC102	MC	Rural/Social Internship	--	--	--	--	50	ISE	Grade	--	--
2.	241ETCMC101	MC	Finishing School Training - I	03	--	--	--	50	ISE	Grade	--	--

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F. Y. B. Tech. Scheme of Teaching and Examination w. e. f. A. Y. 2024-2025
Semester -II

Sr. No	Course Code	Course Type	Name of the Course	Teaching Scheme Per Week			Credits	Total Marks	Evaluation Scheme			
				L	P	T			Type	Max. Marks	Minimum Marks for Passing	
1	241ETCBCSL103	BSC	Differential Equations & Numerical Techniques	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
2	241ETCBSCL105	BSC	Applied Physics	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
3	241ETCESCL105	ESC	Generative AI	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
4	241ETCESCL103	ESC	Digital Logic Design	03	--	--	03	100	ISE MSE ESE	20 30 50	40	
5	241ETCPCCL101	PCC	Basics of Analog Electronics	02	--	--	02	50	ESE	50	20	
6	241ETCVSECL101	VSEC	Design Thinking Through Innovation	01	--	--	01	25	ISE	25	10	
7	241ETCBSCP104	BSC	Differential Equations & Numerical Techniques Tutorial	--	--	01	01	25	ISE	25	10	
8	241ETCBSCP106	BSC	Applied Physics Laboratory	--	02	--	01	25	ISE	25	10	
9	241ETCESCP106	ESC	Generative AI Laboratory	--	02	--	01	25	ISE	25	10	
10	241ETCESCP104	ESC	Digital Logic Design Laboratory	--	02	--	01	25	ISE	25	10	
11	241ETCVSECP102	VSEC	Design Thinking ThroughInnovation Laboratory	--	02	--	01	25	ISE	25	10	
12	241ETCCCAP102	CCA	Liberal Learning - II	--	04	--	02	50	ISE	50	20	
			Total	**14**	**10**	**1**	**22**	**650**	--	--	--	--
Mandatory Courses												
1	241ETCMC104	MC	Capstone Project	--	--	--	--	50	ISE	Grade	--	--
2.	241ETCMC103	MC	Finishing School Training - II	03	--	--	--	50	ISE	Grade	--	--

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Course Title: Linear Algebra & Calculus	
Course Code: 241ETCBSCL101	**Semester:** I
Teaching Scheme: L-T-P: 3-1-0	**Credits:** 3
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Matrices, Derivatives

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance the logical thinking power of students.
3.	To provide students with skills in Linear Algebra and Calculus.
4.	To imbibe graduates with mathematical knowledge, computational skills, and the ability to deploy these skills effectively in solution of engineering problems.

Curriculum Details

Course Contents	Duration
Unit 1: Unit-I Linear Algebra –I • Introduction to matrices, types of matrices. • Rank of matrix by normal form and echelon form. • Solution of simultaneous linear non-homogenous equations. • Solution of simultaneous linear homogenous equations. • Numerical Solutions of Linear Equations by Gauss-Elimination method	**07 Hrs**
Unit 2: Linear Algebra –II • Definition of linear combination of vectors. • Dependence and independence of vectors. • Eigen values and its properties. • Eigen vectors and its properties. • Cayley-Hamilton Theorem	**07 Hrs**
Unit 3: Partial Differentiation • Introduction. • Partial derivatives. • Total derivatives. • Euler's theorem on homogeneous functions. • Jacobian and its properties	**07 Hrs**
Unit 4: Partial Differential Equations • Definition of partial differential equation. • Standard method to solve first order non-linear partial differential equations of the Form I f(p, q)=0 • Standard method to solve first order non-linear partial differential equations of the Form II f(z,p,q)=0 • Standard method to solve first order non-linear partial differential equations of the Form III f(x, p)=g(y, q) • Lagrange's method to solve first order linear partial differential equations	**07 Hrs**

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Unit 5: Vector Calculus • Introduction. • Gradient of scalar point function. • Divergence of vector point function. • Curl of a vector point function. • Irrotational, Solenoidal vector field	**07 Hrs**
Unit 6: Integral Calculus • Introduction of improper integral. • Gamma function and its properties. • Beta function and its properties. • Error Function and its properties	**07 Hrs**

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
101.1	**Reduce** matrices to echelon form and **apply** the concept of rank of matrices to solve system of linear equations
101.2	**Identify** Eigen values & make use of it for finding Eigen vectors
101.3	**Apply** the knowledge of partial differentiation
101.4	**Solve** partial differential equations with different methods.
101.5	**Apply** knowledge of vector differentiation to find curl and divergence of vector fields.
101.6	**Use** special functions and their properties during their higher learning

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	2,3	3	2	--	--	1	---	--	--	--	--	--	1
101.2	2,3	3	2	--	--	1	--	--	--	--	--	--	1
101.3	3	3	2	--	--	--	--	--	--	--	--	--	1
101.4	3	2	2	--	--	--	--	--	--	--	--	--	1
101.5	3	2	2	--	--	1	--	--	--	--	--	--	1
101.6	3	2	2	--	--	--	--	--	--	--	--	--	1

Text Books:

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Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Higher engineering Mathematics	36th	B. S. Grewal	Khanna publishers	2001
2	A Text Book of Applied Mathematics	7th	P. N. Wartikar, J. N. Wartikar	Vidyarthi Griha Prakashan, Pune.	2006
3	Advanced Engineering Mathematics	1st	H. K. Dass	S. Chand Publications, New Delhi	2011
4	Advanced Engineering Mathematics	7th	Peter V.O'Neil	Cengage learning	2012
5	Linear Algebra		Jin Ho Kwak and Sungpyo Hong	Springer	2004
6	Numerical Methods in Engineering and Science		B.S. Grewal	Khanna Publishers	

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	5th	Erwin Kreyszig	India Pvt, Ltd.	2014
2	Higher Engineering Mathematics	6th	B. V. Ramana	Tata M/c Graw Hill Publication	2010
3	Calculus	8th	James Stewart	Cengage Learning	2016
4	A Textbook of Engineering Mathematics	6th	N.P.Bali, Iyengar	Laxmi Publication	2004
5	Elementary Linear Algebra	5th	Stephen Andrilli and David Hecker	Academic Press	2016

Useful Link /Web Resources:

1. DELNET- http://www.delnet.in
2. NDL-http://ndl.iitkgp.ac.in
3. N-LIST- http://www.nlist.inflib.ac.in
4. https://www.youtube.com/results?search_query=Dr+Navneet+Sangle

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Course Title: Linear Algebra & Calculus Tutorial	
Course Code: 241ETCBSCP102	**Semester:** I
Teaching Scheme: L-T-P: 0-1-0	**Credits:** 1
Evaluation Scheme ISE: 25	**ESE Marks:** --

Prior Knowledge of:	Matrices, Derivatives

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance the logical thinking power of students.
3.	To provide students with skills in Linear Algebra and Calculus.
4.	To imbibe graduates with mathematical knowledge, computational skills, and the ability to deploy these skills effectively in solution of engineering problems.

List of Tutorials

Tut. No.	Title of Tutorials	Duration
01	**Linear Algebra –I:** Rank of Matrix, Solutions of Non-homogeneous simultaneous linear equations	01Hr
02	**Linear Algebra –I:** Solutions of simultaneous linear homogeneous equations	01Hr
03	**Linear Algebra –II:** Dependence and Independence of vectors	01Hr
04	**Linear Algebra –II:** Eigen values and Eigen vectors of Matrix, Cayley-Hamilton Theorem	01Hr
05	**Partial Differentiation – I:** Euler's theorem on homogeneous functions.	01Hr
06	**Partial Differentiation –II:** Partial derivatives, Jacobian and its properties	01Hr
07	**Partial Differential Equations-I:** Form I f(p, q)=0, Form II f(z,p,q)=0	01Hr
08	**Partial Differential Equations-II:** Form III f(x, p)=g(y, q), Lagrange's method to solve first order linear partial differential equations.	01Hr
09	**Integral Calculus-I:** Gamma function and its properties	01Hr
10	**Integral Calculus-II:** Beta function and its properties, Error function and its properties	01Hr
11	Linear Algebra-I using SCILAB/MATLAB	01Hr
12	Linear Algebra-II using SCILAB/MATLAB	01Hr

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Course Title: Applied Physics	
Course Code: 241ETCBSCL105	**Semester: I & II**
Teaching Scheme: L-T-P:3-0-0	**Credits: 03**
Evaluation Scheme ISE-I/MSE/ISE-II: 10/30/10	**ESE Marks: 50**

Prior Knowledge of:	Fundamentals of optics, semiconductors, nature of radiation, quantum mechanics, electrochemistry.

Course Objectives:

1.	To provide basic concept of modern optics
2.	To make the students grasp the working principles of LASER and its applications
3.	To perceive the fundamentals of quantum mechanics and its applications
4.	To explain electronic properties of semiconductors materials from quantum mechanical point of view
5.	To elucidate the thermodynamic and kinetic properties of cell reactions in rechargeable batteries

Curriculum Details

Course Contents	Duration
Unit 1: Wave Optics • Introduction: interference, diffraction, review of geometric and optical path • Theory of plane diffraction grating and grating equation • Resolving power of plane diffraction grating • Newton's ring: Experimental arrangement • Diameter of bright and dark ring • Determination of wavelength of monochromatic light using Newton's ring	**07 Hrs**
Unit 2: LASER • Concept of LASER, • Principle and working of LASER: Absorption, Spontaneous emission, Stimulated emission, Population inversion • Einstein's coefficient • Properties of LASER • Types of LASERS - Ruby LASER, He-Ne LASER • Applications of LASER: Industrial, Medical	**07 Hrs**
Unit 3: Quantum Mechanics	**07 Hrs**

• Introduction to quantum physics • de Broglie wavelength of matter waves and its different forms • Heisenberg's uncertainty principle • Wave function and probability interpretation • Schrödinger's time independent & dependent wave equation (1-D) • Energy of particle in 1-D potential well using Schrödinger equation • Numerical	
Unit 4: Semiconductor Physics • Fermi Dirac distribution • Formation of bands in solids • Fermi energy and Fermi level in intrinsic and extrinsic semiconductors • Dependence of Fermi energy on temperature • Hall effect: equation for Hall voltage and Hall coefficient and relation between them • Numerical	**07 Hrs**
Unit 5: Semiconductor Devices and Digital Electronics • Properties of a P-N junction • Diode equation and I-V characteristic • Construction, working and I-V characteristics of BJT, JFET and MOSFET • Introductory digital concepts: Logic levels, Digital waveform and characteristic. Time clock and timing diagram • Logic functions and logic gates: AND, OR, NOT, NAND, NOR, X-OR, and X-NOR • Numerical	**07 Hrs**
Unit 6: Supercapacitor and Battery • Introduction: Electrolytic and galvanic cells, • Electrochemical energy storage: Supercapacitors and Batteries • Types of supercapacitors and batteries • Cell reactions in rechargeable batteries • Thermodynamic and Kinetic parameters of cell reactions • Courses of the cell reactions in different rechargeable batteries • Heat effects and Battery parameters	**07 Hrs**

Self-learning topics: Fire Temperature sensor (TIR-based), NDT of materials, Optical fiber as sensors, CO_2 LASER

Course Outcomes (COs): After completion of the course, students will be able to:

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CO	Statements
105.1	**Apply** the principle of interference and **relate** concepts in various engineering applications
105.2	**Summarize** the working mechanism and applications of LASER
105.3	**Examine** 1-D potential well problems using principles of quantum mechanical phenomenon
105.4	**Interpret** the electronic properties of semiconductors
105.5	**Express** the output characteristics of P-N junction-based semiconductor devices
105.6	**Determine** the equilibrium cell voltage using thermodynamic parameters of rechargeable batteries

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
105.1	3	3	2	-	-	-	-	-	-	-	-	-	1
105.2	2	3	2	-	-	-	-	-	-	-	-	-	1
105.3	3	3	2	-	-	-	-	-	-	-	-	-	1
105.4	2	3	2	-	-	-	-	-	-	-	-	-	1
105.5	2	3	2	-	-	-	-	-	-	1	-	-	1
105.6	3	3	2	-	-	-	-	-	-	1	-	-	1

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Engineering Physics	1st	H. K. Malik	Tata McGraw Hill Education	2019
2	A Text Book of Engineering Physics	Revised	M. N. Avadhanulu, P. G. Kshirasagar	S. Chand Publications	2018
3	Engineering Physics	Revised	L.N. Singh	Synergy Knowledge Ware	2016
4	Engineering Physics	Revised	V. Rajendran	Tata McGraw Hill Education	2010
5	Engineering Physics	1st	R.K. Gaur, S.L. Gupta	Dhanpat Rai Publications	1993

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Fundamentals of Physics	Revised	J. Walker, D. Halliday, R. Resnick	Wiley Publications	2018
2	Engineering Physics	1st	B.K. Pandey and Chaturvedi	Cengage learning Publications	2017
3	Battery Technology Handbook	2nd	H. A. Kiehne	Marcel Dekker, Inc., New York	2003
4	Introduction to Solid State Physics	8th	Charles Kittel	John Willey and Sons Inc.	2009
5	Solid State Physics	6th	S.O.Pillai	New edge Internationals	2009
6	Digital Fundamentals	8th	T. L. Floyd	Pearson Education Inc., New Delhi	2003

Useful Link /Web Resources:

1. http://hyperphysics.phy-astr.gsu.edu/hbase/index.html
2. https://en.wikipedia.org/wiki/Wave_interference
3. https://en.wikipedia.org/wiki/Introduction_to_quantum_mechanics

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Course Title: Applied Physics Laboratory	
Course Code: 241ETCBSCP106	**Semester:** I/II
Teaching Scheme: L-T-P: 0-0-2	**Credits: 01**
Evaluation Scheme: ISE: 25	**ESE Marks:**

Prior Knowledge of:	Optics, magnetic materials, semiconductor basics, graph plotting, slope calculation

Course Objectives:

1	To make the students understand the concept of physics for the effective application in the field of engineering and technology.
2	To use the knowledge of electron transport in semiconductors.
3	To summarize the factors affecting the capacitance of the supercapacitors.

List of Experiments-

Exp. No	Title of Experiments	Duration
01	To compute diameter of cylindrical obstacle using mono chromatic Source	02 Hrs
02	To calculate radius of curvature of Plano convex lens using Newton's ring	02 Hrs
03	To determine the velocity of the ultrasonic wave in water using ultrasonic Interferometer	02 Hrs
04	To determine wavelength of LASER using diffraction grating	02 Hrs
05	To decide band gap energy of P-N junction diode	02 Hrs
06	To determine divergence of LASER beam	02 Hrs
07	To determine resolving power of diffraction grating	02 Hrs
08	To recognize carrier concentration of semiconductor using Hall effect	02 Hrs
09	To Determine wavelength of light using plane diffraction grating	02 Hrs
10	To study physical significance of wave function quantum mechanics	02 Hrs
11	To calculate the resolving power of telescope	02 Hrs
12	To prove De Morgan's theorem	
13	To calculate the performance parameters of a given supercapacitor device using the data recorded on an electrochemical work-station	02 Hrs

Minimum 10 Experiments should be conducted from above list.

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Course Outcomes (COs): After successful completion of the course, students will be able to

CO	Statements
106.1	**Implement** knowledge related to optics to use for suitable purposes in applied physics
106.2	**Examine** the properties of LASER for suitable applications in applied physics
106.3	**Apply** the theory of semiconductors to estimate band gap energy and carrier concentration
106.4	**Determine** the performance parameters of a supercapacitor device using a modern electrochemical workstation

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
106.1	3	3	-	-	-	-	-	-	-	-	-	-	1
106.2	3	3	-	-	-	-	-	-	-	-	-	-	1
106.3	3	3	-	-	-	-	-	-	-	-	-	-	1
106.4	3	3	-	-	-	1	-	-	-	-	-	-	1

Suggested Learning Resources: Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Engineering Physics	1st	H.K. Malik	Tata McGraw Hill Education	2019
2	A Text Book of EngineeringPhysics	Revised	M. N. Avadhanulu, P. G. Kshirasagar	S. Chand Publications	2018
3	Engineering Physics	Revised	L. N. Singh	Synergy Knowledge Ware	2016
4	Engineering Physics	Revised	V. Rajendran	Tata McGraw Hill Education	2010
5	Engineering Physics	1st	R.K. Gaur, S.L. Gupta	Dhanpat Rai Publications	1993

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Fundamentals of Physics	Revised	J.Walker, D.Halliday, R.Resnick	Wiley Publication	2018
2	Engineering Physics	1st	B.K. Pandey and Chaturvedi	Cengage Learning Publications	2017
3	Battery Technology Handbook	2nd	H. A. Kiehne	Marcel Dekker, Inc., New York	2003
4	Introduction to Solid State Physics	8th	C.Kittel	John Willey and Sons Inc.	2009
5	Solid State Physics	6th	S.O.Pillai	New edge Internationals,	2009
6	Digital Fundamentals	8th	T. L. Floyd	Pearson Education Inc., New Delhi	2003

Useful Link /Web Resources:

1. https://vlab.amrita.edu/?sub=1
2. http://vlabs.iitb.ac.in/vlab/labsps.html

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Course Title: Problem-Solving Through Programming	
Course Code: 241ETCESCL101	**Semester:** I
Teaching Scheme: L-T-P: 3 – 0 – 0	**Credits:** 03
Evaluation Scheme ISE-I, MSE, ISE-II:10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Basic knowledge of computers.

Course Objectives:

1.	Acquire basic principles of problem-solving using computers.
2.	Learn and use the syntax of C programming language to solve basic science and engineeringproblems.
3.	Select appropriate programming constructs, data structures, and functions to build solutionsto a variety of problems.

Curriculum Details:

Course Contents	Duration
Unit 1: Introduction to C programming: Fundamentals of algorithms, flowcharts. **Getting started with C**- Basic structure of C program, features of C language,Character set, C tokens, Keywords and Identifiers, Data types and Format Specifier. Managing Input and Output operations. **Variable**s-Local and Global variables, rules for defining a variable name, variable initialization-Run time and compile time, variable declaration. **Constants**-Defining Constant by using preprocessor directive and keyword const. **Operators:** Arithmetic operators, Relational operators, Logical Operators, Assignment operators, Increment and Decrement operators, Conditional operators, Bit-wiseoperators, Special operators. Operator precedence and Associativity.	**07Hrs**
Unit 2: Programming Constructs: **Need of Decision-making statements**- 'if' statement, Simple 'if' statement, the 'if…else' statement, nesting of 'if…else' statements, The 'else if' ladder, The 'switch' statement, break statement, The 'go to' statement. **Need of looping statements**: The 'for',' while', and' do-while statements with examples.	**08 Hrs**
Unit 3: Arrays& Strings: **Arrays**-Types of arrays, Declaration arrays, initializing dimensional arrays (One-Dimensional and Two-Dimensional Array)-Run time Initialization and Compile time Initialization with examples. **Character Arrays and Strings**: Declaration and Initialization- Run time Initialization and Compile time Initialization with examples, reading string from the terminal and writing strings to screen, String handling Functions - strcpy(), strcmp(), strlen(), strcat().	**07Hrs**

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Unit 4: Structures and Unions: **Structures**-Elements of Structure –Structure definition, declaring structure variables, Structure initialization. Accessing structure members by using '.' Operator, Arrays of structure, Arrays within structures. **Unions**: Elements of Union–Union definition, declaring union variables, Union initialization, Comparison of Structure and Unions.	**07Hrs**
Unit 5: Functions: Need for Functions, Types of functions (User Defined and Built–In). **User-defined Function**-Elements of UDF-Function Definition, Function declaration, Function call. Actual Parameters, Formal Parameters. **Categories of functions**- With Argument and with the return value, No Argument and with a return value, With Argument and No return value, No Argument, and No return value. Storage classes (Automatic, Static, Extern, and Register). Passing arrays to function, Structures, and Functions. **Recursion.**	**07Hrs**
Unit 6: Pointers: Introduction to Pointers, accessing a value of variable by using Pointers-Declaration of Pointer variable, Initialization of pointer variables, Dereference operator. Pointers as function arguments-Call by value and call by reference. Pointers Expression, Pointers and Arrays, Pointers and Strings, Pointers to Functions, Pointers and Structures.	**06Hrs**

Self-learning topics: Recent trends in IT.

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
101.1	Describe the basic structure of C program and use of different data type.
101.2	Develop conditional and Loop statements to write C programs.
101.3	Explain the concept of arrays and strings to store homogeneous data.
101.4	Use functions to break programs into small module.
101.5	Explain the concept of structures and unions.
101.6	Use pointers to access memory location.

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Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	2	3	3	2	-	-	-	-	-	-	-	-	1
101.2	2	3	3	2	-	-	-	-	-	-	-	-	1
101.3	2	3	3	2	-	-	-	-	-	-	-	-	1
101.4	2	3	3	2	-	-	-	-	-	-	-	-	1
101.5	2	3	3	2	-	-	-	-	-	-	-	-	1
101.6	2	2	2	2	-	-	-	-	-	-	-	-	1

Text Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	Programming in ANSI C	8th	E. Balagurusamy	McGraw Hill Education	2019
2	Let Us C	16th	Yashwant Kanetkar	BPB Publication	2017

Reference Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1	Programming with ANSI And Turbo C	-	Ashok Kamthane	Pearson Education	2002
2	Programming in C	2nd	J.B Dixit	Firewal Media	2011
3	The Complete Reference Edition	4th	Herbert Schildt	McGraw-Hill Education	2017

Useful Link /Web Resources:

https://nptel.ac.in/courses/1061041282.

https://www.udemy.com/courses

https://www.coursera.org

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Course Title: Problem-Solving Through Programming Laboratory	
Course Code: 241ETCESCP102	**Semester:** I
Teaching Scheme: L-T-P: 0 – 0 – 2	**Credits:** 01
Evaluation Scheme ISE:25	**ESE Marks:** 25

Prior Knowledge of:	Basic understanding of computer operations and familiarity with mathematical concepts

Course Objectives:

1.	Acquire basic principles of problem-solving using computers.
2.	Learn and use the syntax of C programming language to solve basic science and engineeringproblems.
3.	Select appropriate programming constructs, data structures and functions to build solutions to variety of problems.

Details:

Exp. No	Title of Experiments	Duration
01	To Study basic Linux commands and different IDEs used for programming.	02 Hrs
02	Basic C Programming	02 Hrs
03	C Programs based on Data Types and Operators	02 Hrs
04	C Programs based on Control Structures-conditional statements	02 Hrs
05	C Programs based on Control Structures-loops	02 Hrs
06	C Programs based on Functions	02 Hrs
07	C Programs based on array and string manipulation.	02 Hrs
08	C Programs based on Structures	02 Hrs
09	C Programs based on Pointers	02 Hrs
10	C Programs based on File Handling	02 Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
102.1	Develop problem-solving strategies and computational thinking.
102.2	Design and implement algorithms using the C programming language.
102.3	Write, test, and debug C programs effectively.
102.4	Apply problem-solving techniques to a variety of programming challenges.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
102.1	2	1				1							2
102.2	2		2					1		1			2
102.3	2	1	2		3			1		1			2
102.4	2	2	2		3	1		1		1	1	1	2

Text Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1.	Let Us C	16th Edition	Yashavant Kanetkar	BPB Publication.	2017
2.	Computer Fundamentals	4th Edition	P. K. Sinha,	BPB Publications.	2011
3.	How to Solve it by Computer		R.G. Dromey	Pearson Education India	
4.	The Complete	4th Edition	Herbert Schildt	McGraw-Hill Education	

Reference Books:

Sr.No	Title	Edition	Author(s)	Publisher	Year
1.	The C Programming Language	2nd Edition	Brian W. Kernighan, Dennis Ritchie	Pearson Education India	2019
2.	C How to Program	7th Edition	Deitel	Pearson Education India	2017

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Course Title: Digital Logic Design	
Course Code:241ETCESCL103	**Semester:** I
Teaching Scheme: L-T-P:3-0-0	**Credits:**3
Evaluation Scheme ISE-I, MSE, ISE-II:10/30/10	**ESE Marks:**50

Course Prerequisites:	Basic algebra and understanding of logic

Course Objectives:

1.	To understand the basic concepts of digital systems, including binary number systems, Boolean algebra, and logic gates.
2.	To apply and simplify Boolean expressions and logic circuits using Karnaugh maps and Boolean algebra.
3.	To construct digital circuits using basic components like multiplexers, decoders, encoders, and flip-flops.
4.	To artculate the concepts of Processing unit and memory subsystem.

Course Description:

Digital Logic Design focuses on essential concepts in digital systems, including Boolean algebra, logic gates, and both combinational and sequential circuits. The course emphasizes hands-on learning of Sequential and Combinational Circuit designs through hands-on practical's using simulators. By the end, students are equipped to apply digital logic design concepts in computer engineering and related fields.

Curriculum Details:

Course Contents	Duration
Unit 1: Introduction to Digital System and Number System Digital Systems, Number System, Number system conversions, Logic Gates, minimization: Representation of truth-table, SOP form, POS form, Simplification of logical functions, Minimization of SOP and POS forms, don't care conditions Reduction techniques: K-Maps up to 4 variables.	**05Hrs**
Unit 2: Combinational Logic Design BCD, Excess-3, Gray code, Binary Code. Half- Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexers (MUX), Demultiplexers (DEMUX)	**07 Hrs**
Unit 3: Sequential Logic Design & Synchronous and Asynchronous Circuits Latches and Flip-Flops, Flip-Flop: SR, J-K, D, T; Preset & Clear, Truth Tables, and Excitation tables, Conversion of Flop- Flop, Registers: SISO, SIPO, PISO, PIPO, Asynchronous Counter, Synchronous Counter, BCD Counter	**08Hrs**

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Unit 4: Introduction to Computer Organization Function and structure of a computer Functional components, interconnection of components, Bus Structures. Processing Unit: Organization of a processor - Registers, ALU and Control unit, Instruction cycle	**07Hrs**
Unit 5: Input/output Subsystem Access of I/O devices, I/O ports, I/O interfaces - Serial port, Parallel port, PCI bus, I/O peripherals - Input devices, Output devices, Secondary storage devices.	**07Hrs**
Unit 6: Memory Subsystem Memory Hierarchy, RAM (Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory.	**08 Hrs**

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
103.1	Describe the working of basic digital components.
103.2	Solve Boolean expressions for designing digital circuits using K-Maps.
103.3	Design Combinational digital circuits & Sequential circuits.
103.4	Demonstrate basics of Computer organization and Memory

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
103.1	2	1	-	-	-	-	-	-	-	-	-	-	-
103.2	2	1	1	-	-	2	-	-	-	-	-	-	-
103.3	2	2	2	2	2	3	-	-	-	1	2	-	-
103.4	2	1	-	-	1		-	-	-	-	-	-	-

Text Books:

1. R.P.Jain, "Modern Digital Electronics", Tata McGraw-Hill, 4th Edition,2010 ISBN 978-0-07-06691-16
2. Moris Mano, "Digital Logic and Computer Design", 2017, Pearson, ISBN 978-93-325-4252-5
3. W. Stallings, "Computer Organization & Architecture: Designing for performance", 10th Edition, 2016, Pearson Education/ Prentice Hall of India, ISBN-10: 0-13-410161-8 | ISBN-13: 978-0-13-410161-3

Reference Books:

1. John Yarbrough, "Digital Logic applications and Design", Cengage Learning, 2006, ISBN 13:978-81-315-0058-3
2. Norman B & Bradley, "Digital Logic and Design Principles", Wiley India Ltd, 2000, ISBN 978-81-265-1258-4.

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Course Title: Digital Logic Design Lab	
Course Code: 241ETCESCP104	**Semester:** I / II
Teaching Scheme: L-T-P: 0-0-2	**Credit:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:**

Course Description:
Digital Logic Design This subject covers practical details of the subject Digital Logic Design and Memory organization in computers.

Course Objectives	
1	To provide hands on experience on construction of basic digital logic circuits
2	To get practical experience on Demorgan's theorem, SOP and POS forms.
3	To demonstrate verification of Full Adders, Subtractors, Gray to binary converters and vice versa
4	To verify working of Flip-flops, Counters and Shift registers

Sr. No	**Experiment**
1	Realization of functions using basic and universal gates (SOP and POS forms).
2	Study of Boolean algebra & De Morgan's theorem.(Verification of Theorem with truth table)
3	Realization of 4/5 variable K-maps.
4	Design and Realization of half /full adder and subtractor using basic gates and universal gates.
5	Design and Realization of Multiplexers and Demultiplexers.
6	Study of Flip-Flops: J-K, D, T, S-R.
7	Study of Registers and Counters.
8	Study of Bus Structure and Instruction Cycle.
9	Interfacing counter circuit with seven segment display.
10	Hand- on -constructin of various combinational circuits using CircuitVerse Simulator.

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
104.1	Construct the truth table of various Logic Gates and combination circuits using logic gates.
104.2	Design, test, and evaluate various combinational circuits such as adders, subtractors, multiplexers, demultiplexers, decoders, etc.
104.3	construct flip-flops, counters, and shift registers
104.4	Simulate various combinational circuits using Circuit Verse Simulator.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes(POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
104.1	2	1								2			
104.2	2	1	1			2				2			
104.3	2	2	2			3				2	2		1
104.4	2	1			1					2			

Text Books:

1. R.P.Jain, "Modern Digital Electronics", Tata McGraw-Hill, 4th Edition,2010 ISBN 978-0-07-06691-16
2. Moris Mano, "Digital Logic and Computer Design", 2017, Pearson, ISBN 978-93-325-4252-5
3. W. Stallings, "Computer Organization & Architecture: Designing for performance", 10th Edition, 2016, Pearson Education/ Prentice Hall of India, ISBN-10: 0-13-410161-8 | ISBN-13: 978-0-13-410161-3

Reference Books:

1. John Yarbrough, "Digital Logic applications and Design", Cengage Learning, 2006, ISBN 13:978-81-315-0058-3
2. Norman B & Bradley, "Digital Logic and Design Principles", Wiley India Ltd, 2000, ISBN 978-81-265-1258-4.

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Course Title: Design Thinking Through Innovation	
Course Code: 241ETCVSECL101	**Semester:** I/II
Teaching Scheme: L-T-P: 1-0-0	**Credits:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:**

Prerequisites: Understanding, User-Centric Mindset, Collaboration and Teamwork, Curiosity and Open-Mindedness, Effective Communication Skills, Learning Orientation, and Risk Tolerance.

Course Description:

The Design Thinking & Innovations subject aims to provide students with the tools and exposure to address problems using the design thinking process. The curriculum for "Design Thinking through Innovations" structured in such a way students learn to acquire both knowledge of design and practice of skills required to develop an attitude towards design. Being of the exemplary kinds, it focuses more on hands-on knowledge, learned by doing and acting upon challenges discovered within the community and surroundings.

Course Objectives:

1.	To Familiarize with Engineering Design Process and The basics of Design Thinking
2.	To Bring Awareness on Idea Generation to Solve the Problems
3.	To Familiarize with the various types of prototype and the techniques used for prototyping.

Course Outcomes (COs): At the end of the course, the students should be able to:

CO	Statements	BTL
101.1	**Learn the** Structured Approach of Engineering Design and the Relevance of Design and Design Thinking in Engineering & **Understand** Idea Generation Techniques to find solutions to Problems.	**1**
101.2	**Understand** the various types of prototypes and **Inculcate** the techniques used for prototyping.	**2**

Course Content:

Content	Duration
Unit I: Engineering Design, Design Thinking and Idea Generation • Introduction, Key Concepts of Design, A Simplified Process of Engineering Design • What is Design Thinking? - Its Importance, Socio-Economical Relevance, Principles, Origin, Process of Design Thinking, Relevance of Design and Design Thinking in Engineering • Introduction to Idea Generation, Idea Generation Techniques, Processes, Define the Problem, Needs v/s Wants, Identify Philosophy, Problem Solving Tools, Case Studies • Critical thinking: Fundamentals, Characteristics, Critical v/s Ordinary Thinking. • Critical thinking skills- linking ideas, structuring arguments, five pillars of critical thinking.	**07 Hrs**

Unit II: Prototyping and Tools for Design - Innovation • Prototyping: Introduction, Need, Process, Types, Fidelity for prototypes, Minimum Usable Prototype [MUP] – Concept, challenges, etc. • Prototyping for Digital & Physical products: Concept, What is unique in Digital and Physical Prototypes? • Digital & Physical prototypes: Preparation; testing prototypes with users. • Introduction to Different tools used for design and Innovation, such as Hand Saw (Wood, PVC, CPVC and Steel), Component cutter, Spanners, Allen key & Wrench (Flat, Ring, Adjustable), Solder Gun, Component cutter, Tweezer, Multi meter, Glue Gun, Hex saw, Cutter, Wire Stripper.	**07 Hrs**

Text Books:

Sr. No	Title	Author(s)	Publisher	Year
1.	Introduction to Design Thinking	S.Salivahanan, S.Suresh Kumar, D.Praveen Sam	Tata Mc Graw Hill, First Edition	2019
2.	The Design Thinking Playbook	Michael Lewrick	Wiley	2019
3.	Prototyping for Designers: Developing the best Digital and Physical Products	Kathryn McElroy	O'Reilly	2017

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1.	Design Thinking – New Product Essentials from PDMA	1st	Michael G. Luchs, Scott Swan , Abbie Griffin	Wiley	2015
2.	101 Design Methods: A Structured Approach for Driving Innovation in Your Organization	1st	Vijay Kumar	Wiley	2012

Online Resources:

Sr. No.	Online Resource Link	Source
1	Introduction to Design Thinking - Course (swayam2.ac.in) Design Thinking Full Course | Design Thinking Process | Design Thinking For Beginners | Simplilearn - YouTube	Swayam (NPTEL) &YouTube
2	Thinking at IDEO - Insight, innovation, & a healthy dose of play	IDEO
3	INTRO (youtube.com)	YouTube
4	The Power of an Entrepreneurial Mindset | Bill Roche | TEDxLangleyED (youtube.com)	YouTube
5	https://www.ideou.com/pages/design-thinking	IDEO U
6	https://dschool.stanford.edu/	Stanford D school
7	https://www.designthinkersacademy.com/usa/	Design Thinking Institute
8	https://www.ibm.com/design/thinking/page/toolkit	Design thinking ToolKit
9	https://hbr.org/2018/09/design-thinking-is-fundamentally-conservative-and-preserves-the-status-quo	

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Course Title: Design Thinking Through Innovation Lab	
Course Code: 241ETCVSECP102	**Semester:** I / II
Teaching Scheme: L-T-P: 0-0-1	**Credit:** 01
Evaluation Scheme: ISE: 25	**ESE Marks:**

Prerequisites: Understanding, User-Centric Mindset, Collaboration and Teamwork, Curiosity and Open-Mindedness, Effective Communication Skills, Learning Orientation, and Risk Tolerance.

Course Description:

The Design Thinking & Innovations subject aim at providing students with the tools and exposure to be able to address problems using the design thinking process. Design Thinking & Innovations is designed in such a way students learn to acquire both knowledge of design and practice of skills required to develop an attitude towards design. Being of the exemplary kinds, it focuses more on hands-on knowledge, learned by doing and acting upon challenges discovered within the community and surroundings.

Course Objectives:

1.	To Discuss Various Techniques of Idea Generation.
2.	To Explain the Various Tools Used for Innovation.
3.	To Discuss the Methods of Implementing Design Thinking in The Real World.
4.	To Discuss the Implementation of Creativity and Innovation.

Course Outcomes (COs):

At the end of the course, the student should be able to:

CO	Statements	BTL
105.1	**Learn the** Structured Approach of Engineering Design and the Relevance of Design and Design Thinking in Engineering & **Understand** Idea Generation Techniques to find out solutions to Problems.	**1**
105.2	**Understand** the various types of prototypes and **Incorporate** the techniques used for prototyping.	**2**

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Course Content

Sr. No.	Title of Experiments/Assignment List	Duration
01	Overview of Design Thinking: Ethical Design and Critiques, Generation of "IDEA", Problem Identification and Exercises.	02 Hrs
02	Brainstorming Sessions to Find out Solution for Identified Problems	02 Hrs
03	Prototyping and Modelling Challenge, Various Tools and Methodology Used for the Prototyping.	02 Hrs
04	Hands-On Demonstration of Different Tools used for Design & Innovation.	02 Hrs
05	Hands-On Demonstration of Soldering Machine, Function and Purpose of Soldering Machine.	02 Hrs
06	Explanation and Usage of Joining & Insulation Tools and Technics.	04 Hrs
07	Assembly and Disassembly of Two Wheel Drive Robot Based Vehicle.	02 Hrs
08	Micro Project: Group Formation and Idea Generation.	02 Hrs
09	Creation of Prototype and Innovative Solution.	02 Hrs
10	Test and Evaluation of Prototype.	02 Hrs
11	Report Drafting - Instructions & Practices.	02 Hrs
12	Presentation & Exhibition.	02 Hrs

Suggested Learning Resources: --

Reference Books:

Sr. no.	Name of Book	Author	Year
1.	Design Thinking: Understand-Improve-Apply	S. G. Blank	2007
2.	Design Thinking for Innovation Research and Practice	Walter Brenner, Falk Uebernickel, Springer	2016
3.	Business Design Thinking and Doing: Frameworks, Strategies and Techniques for Sustainable Innovation	Angele M. Beausoleil	2022

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Course Title: Historical Places in and Around Kolhapur District	
Course Code:241ETCIKSL101	**Semester:** I/II
Teaching Scheme L-T-P :2-0-0	**Credits:**02
Evaluation Scheme ISE-I, MSE, ISE-II:10/30/10	**ESE Marks:**

Curriculum Contents	Duration
Unit 01: Chhatrapati Shahu Maharaj: A King for Society • Introduction • Life History • Contribution of Rajarshi Shahu Maharaj in various fields as a modern Social Reformer as Women Empowerment in the 19th Century • Development in Education • Social Reservation and equality • Agriculture • Industry • Initiation for Radhanagari Village and Dam	07 Hrs
Unit 02: A Study of Khidrapur- Kopeshwar • Life History of Khidrapur Kopeshwar Temple • The Wonder of Khidrapur Kopeshwar Temple • Swarga Mandap in Kopeshwar Temple • Sabha Mandap, Antaral Kaksha of Kopeshwar Temple • Beauty of Exterior Architecture of Kopeshwar Temple • Mystery of Black stone • Measures Suggested to Development of Khidrapur	07 Hrs
Unit 03: A Study of Panhala Fort and Pawankhind • History of Panhala Fort • Major Features: Andhar Bawadi • Major Features: Kalavanticha Mahal, Ambarkhana • Major Features: Dharma Koti, Sajja Koti • Teen Darwaja, Raj Darwaja • Rajdindi Bastion • Journey from Panhalgad to Pawankhind by Chhatrapati Shivaji Raje	07 Hrs
Unit 04: A Study of Mahalaxmi Temple • History and construction of Temple • The Main Shrines Doorway • Darshan and Kurma Mandap • Ganapati Chowk, Garud Mandap • Boundary wall, Entrances and complex • Mahalaxmi Temple Timings • Kiranostav Celebrations	07 Hrs

References:

1. Social Movements in India: A Review of Literature – Ghanshy am ShahISBN 0761995145 New Delhi ; Thousand Oaks : Sage Publications, 2004
2. Rajarshi Shahu Maharaj – Jeevan Vakarya, editor – Ramesh Patnage.
3. Shahu Chhatrapati - Royal Revolutionary – DhananjayKeer
4. Samajik SanshodhanPadnativaTantre – Dr. Pradeep Aaglave.
5. Kalasekar. T. L : Khidrapur: Khojurao of Maharashtra.
6. Chothe R.G : Temples of Khidrapur, A heritage of India.
7. Kulkarni A. B : Kopeshwar temple of Khidrapur.
8. Gazetteer of Kolhapur District.
9. Eaton, Richard Maxwell (2005). The New Cambridge History of India
10. "Translations of Panhala inscriptions". Government of Maharashtra. Retrieved 19 March 2009.
11. "Mahalakshmi Temple - Jewel Among Kolhapur Temples
12. "Inside Temples". mahalaxmikolhapur.com.

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Course Title: Differential Equations Numerical Technique	
Course Code: 241ETCBSCL103	**Semester: II**
Teaching Scheme: L-T-P: 3-0-0	**Credits:** 3
Evaluation Scheme ISE-I/MSE/ISE-II:10/30/10	**ESE Marks:** 50

Prior Knowledge of:	Formulae of Derivatives and Integration, Differential Equation, Statistics.

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance logical thinking power of students.
3.	To provide students with skills in differential equations and numerical techniques.
4.	To imbibe graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in solution of engineering problems.

Curriculum Details

Course Contents	Duration
Unit 1: Ordinary Differential Equations of First Order and First Degree • Definition of differential equation, order and degree of differential equation • Exact differential equations • Non - exact differential equations • Linear differential equations • Bernoulli's differential equations	**07 Hrs**
Unit 2: Applications of Ordinary Differential Equations • Introduction of variable separable form. • Orthogonal trajectories. (Cartesian form) • Applications to simple electrical circuits • Newton's law of cooling • Rate of decay and growth	**07 Hrs**
Unit 3 Numerical methods to solve Ordinary Differential Equations • Introduction • Picard's method • Taylor's series method • Euler's method • Runge - Kutta's method (Fourth order)	**07 Hrs**

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Unit 4: Laplace Transform • Laplace transforms of elementary functions • Properties of Laplace transforms (First Shifting ,Change of scale property , Multiplication & Division by t) • Inverse Laplace transforms by partial fraction	**07 Hrs**
Unit 5: Fourier Series and Fourier Transforms • Definition: Fourier Series, Euler's formulae, and examples • Introduction: Fourier transforms • Fourier Sine transform • Fourier Cosine transforms	**07 Hrs**
Unit 6: Z Transform • Definition: Z transform • Properties of Z transform • Z transform of basic sequences • Z transform of some standard discrete function • Inverse Z transform	**07 Hrs**

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
1	**Solve** ordinary differential equations of first order and first degree
2	**Apply** the knowledge of ordinary differential equation of first order and first degree
3	**Use** the numerical methods to solve ordinary differential equations
4	**Understand** definition of Laplace transforms and its properties
5	**Calculate** Fourier transforms of given functions
6	**Calculate** Z transforms of given functions

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
1	2,3	3	2	--	--	1	---	--	--	--	--	--	1
2	3	3	2	--	--	--	--	--	--	--	--	--	1
3	2,3	3	2	--	--	1	--	--	--	--	--	--	1
4	2	2	2	--	--	1	--	--	--	--	--	--	1
5	3	2	2	--	--	--	--	--	--	--	--	--	1
6	3	2	2	--	--	--	--	--	--	--	--	--	1

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Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	7th	Peter V.O'Neil	Cengage Learning	2012
2	Advanced Engineering Mathematics	1st	H.K. Dass	S. Chand Publications, New Delhi	2011
3	A Text Book of Applied Mathematics	7th	P.N.Wartikar, J.N.Wartikar	Vidyarthi Griha Prakashan, Pune.	2006
4	Higher Engineering Mathematics	36th	B.S. Grewal	Khanna Publishers	2001

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	5th	Erwin Kreyszig	India Pvt, Ltd.	2014
2	Higher Engineering Mathematics	6th	B.V.Ramana	Tata M/c Graw-Hill Publication	2010
3	Numerical Methods for Scientific and Engineering Computation	5th	M.K.Jain	New Age International Pvt. Ltd New Delhi	2007
4	A Textbook of Engineering Mathematics	6th	N.P.Bali, Iyengar	Laxmi Publication	2004

Useful Link /Web Resources:

1. DELNET- http://www.delnet.in
2. NDL-http://ndl.iitkgp.ac.in
3. N-LIST- http://www.nlist.inflib.ac.in
4. https://www.youtube.com/results?search_query=Dr+Navneet+Sangle

D. Y. Patil Education Society
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Course Title: Differential Equations Numerical Technique Tutorial	
Course Code: 241ETCBSCP104	**Semester: II**
Teaching Scheme: L-T-P: 0-0-1	**Credits:** 1
Evaluation Scheme ISE: 25	**ESE Marks:** 50

Prior Knowledge of:	Formulae of Derivatives and Integration, Differential Equation, Statistics.

Course Objectives:

1.	To teach mathematical methodology.
2.	To develop mathematical skills and enhance logical thinking power of students.
3.	To provide students with skills in differential equations and numerical techniques.
4.	To imbibe graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in solution of engineering problems.

List of Tutorials

Tut. No	Title of Tutorial	Duration
01	**Ordinary Differential Equations:** Exact and non-exact differential equations.	01Hr
02	**Ordinary Differential Equations:** Linear and non-linear differential equations.	01Hr
03	**Applications of Ordinary Differential Equations:** Orthogonal Trajectories. (Cartesian curves), Applications to Simple Electrical Circuits.	01Hr
04	**Applications of Ordinary Differential Equations:** Newton's law of cooling, Rate of Decay and growth.	01Hr
05	**Numerical Solution of Ordinary Differential Equations of First Order and First Degree:** Picard's method, Taylor's series method.	01Hr
06	**Numerical Solution of Ordinary Differential Equations of First Order and First Degree:** Euler's method, Runge-Kutta's method.	01Hr
07	**Laplace Transform:** First Shifting, change of scale property, Multiplication & Division by t	01Hr
08	**Laplace Transform:** Inverse Laplace transforms by partial fraction	
09	**Fourier Transform:** Fourier Sine Transform, Fourier Cosine Transforms	01Hr
10	**Z Transform:** Z transforms of basic sequence, Z transform of some standard discrete function, Inverse Z transform	01Hr
11	Numerical Techniques-I using SCILAB/MATLAB	01Hr
12	Numerical Techniques-II using SCILAB/MATLAB	01Hr

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Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	7th	Peter V.O'Neil	Cengage Learning	2012
2	Advanced Engineering Mathematics	1st	H.K. Dass	S. Chand Publications, New Delhi	2011
3	A Text Book of Applied Mathematics	7th	P.N.Wartikar, J.N.Wartikar	Vidyarthi Griha Prakashan, Pune.	2006
4	Higher Engineering Mathematics	36th	B.S. Grewal	Khanna Publishers	2001

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Advanced Engineering Mathematics	5th	Erwin Kreyszig	India Pvt, Ltd.	2014
2	Higher Engineering Mathematics	6th	B.V.Ramana	Tata M/c Graw-Hill Publication	2010
3	Numerical Methods for Scientific and Engineering Computation	5th	M.K.Jain	New Age International Pvt. Ltd New Delhi	2007
4	A Textbook of Engineering Mathematics	6th	N.P.Bali, Iyengar	Laxmi Publication	2004

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Course Title: Applied Chemistry	
Course Code: 241ETCBSCL107	**Semesters:** I and II
Teaching Scheme: L-T-P: 3 – 0 - 0	**Credits: 3**
Evaluation Scheme ISE-I/MSE/ISE-II: 50	**ESE Marks: 50**

Prior Knowledge of:	Periodic properties of elements, Basics of organic, inorganic, physical, and analytical chemistry

Course Objectives:

1.	**Understand** the principles and applications of sensors.
2.	**Discuss** the Basic concepts of electronic memory and display Systems
3.	**Illustrate** general synthesis and mechanisms of some advanced polymeric Materials and nanomaterials
4.	**Evaluate** the electrochemical energy storage systems such as lithium batteries and design for usage in electrical and electronic applications
5.	**Interpret** of extraction of metal from e-waste.
6.	**Apply** the theoretical aspects for understanding the water chemistry

Curriculum Details

Course Contents	Duration
Unit 1: Water Chemistry • Introduction, Types of impurities in natural water. • Water quality parameters total solids, acidity, alkalinity, chlorides, COD and BOD. (definition, causes, significance) • Hardness of water, types of hardness, units of hardness, numerical on hardness. • Ill effects of hard water in steam generation in boilers (scale & sludge formation, caustic embrittlement and boiler corrosion) • Treatment of hard water (Ion exchange and reverse osmosis process) • Biosensors for glucose detection.	**07 Hrs**
Unit 2: Sensors • Introduction, working, principle and applications of conductometric sensors, electrochemical sensors, thermometric sensors (Flame photometry) and optical sensors (colorimetry). • Hydrated gel sensor (P^H meter). • Sensors for the measurement of dissolved oxygen (DO). • Electrochemical gas sensors for SOx and NOx. • Disposable sensors (DS): Introduction, principle, characteristics of disposable sensors, Advantages of DS over Classical sensors.	**07 Hrs**

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Unit 3: Materials for Memory and Display Systems **Memory Devices**: • Introduction, basic concepts of electronic memory, Classification of electronic memory devices (organic, polymeric and hybrid material). • Manufacturing of semiconducting chips. • Green computing: Bio-composite based memory devices **Display Systems**: • Nanomaterials and organic materials for display technology (Light absorbing and emitting materials) used in optoelectronic devices. • Liquid crystals display (LC's) –Introduction, classification, properties and application in Liquid Crystal Displays (LCD's). • Properties and application of Organic Light Emitting Diodes (OLED's) and light-emitting electrochemical cells	**07 Hrs**
Unit 4: Energy System and Battery Technology • Introduction, Classification of batteries (primary and secondary batteries). • Construction, working, advantages, and applications of the carbon-zinc cell, Ni-Cd, and Li-ion battery as an electrochemical cell. • Principle, Properties, and applications of Quantum dots sensitized solar cells (QDSSC's). • Fuel cells: Concept, types of fuel cells and merits. • Construction, working and applications of phosphoric acid fuel cells and Hydrogen-oxygen fuel cell	**07 Hrs**
Unit 5: Sustainable Chemistry and E-waste management: • Introduction, sources of e-waste, Composition, Characteristics, and Need of e-waste management. • Toxic materials used in manufacturing electronic and electrical products, health hazards due to exposure to e-waste. • Recycling and Recovery: Different approaches of recycling (separation, thermal treatments, hydrometallurgical extraction, direct recycling). • Extraction of Metal from E-waste. Role of stakeholders in environmental management of e-waste (producers, consumers, recyclers, and statutory bodies).	**07 Hrs**
Unit 6: Engineering Advanced materials and Green Chemistry • Introduction, and classifications of polymer. • Introduction, synthesis, properties & applications of Bakelite and Urea-formaldehyde resin. • Conducting Polymers: Introduction, Synthesis & Mechanism of conduction in polyaniline. • Biodegradable polymers: Introduction and their requirements. Synthesis, properties and applications of Polylactic acid. **Green Chemistry:** • Introduction, Aims, goals and applications. • Twelve principle of green chemistry. • Green Fuels: Introduction, construction and working of solar photovoltaic cell, advantages, and disadvantages.	**07 Hrs**

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
107.1	**Understand** the principles and applications of sensors.
107.2	**Discuss and assess** the Basic concepts of electronic memory and display Systems
107.3	**Illustrate** general synthesis and mechanisms of some advanced polymeric Materials and nanomaterials
107.4	**Evaluate** the electrochemical energy storage systems such as lithium batteries and design for usage in electrical and electronic applications
107.5	**Interpret** the extraction of metal from e-waste and the role of stakeholders in the environmental management of e-waste.
107.6	**Apply** the theoretical aspects for understanding water chemistry

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
107.1	3	3	-	-	-	-	-	-	-	-	-	-	1
107.2	2	3	-	-	-	-	-	-	-	-	-	-	1
107.3	2	3	-	-	-	-	-	-	-	-	-	-	1
107.4	2	3	-	-	-	-	-	-	-	-	-	-	1
107.5	3	3	-	-	-	-	-	-	-	-	-	-	1
107.6	3	3	-	-	-	-	-	-	-	-	-	-	1

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Functional and smart materials,	--	Chander Prakash, Sunpreet Singh, J. Paulo Davim	CRC Press, ISBN: 978-036-727-510	2020,
2	A Textbook of Engineering Chemistry	12th	S. S. Dara, S. S. Umare	S. Chand & Company Ltd., New Delhi.	2011
3	A Text Book of Engineering Chemistry	--	Shashi Chawla	Dhanpat Rai & Co.	2017
4	A textbook of Engineering Chemistry	--	Jain and Jain,	Dhanpatrai Publication.	2015

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Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Energy storage and conversion devices: Supercapacitors, batteries, and hydroelectric cells,	1st edition, I	Anurag Gaur, A. L. Sharma, Anil Arya.	CRC Press, SBN: 978-1-003-14176-1	2021
2	E-waste recycling and management: present scenarios and environmental issues	Vol. 33.	Khan, Anish, and Abdullah M. Asiri.	Springer, ISBN: 978-3-030-14186-8.	2019
3	Functional and smart materials,	--	Chander Prakash, Sunpreet Singh, J. Paulo Davim	CRC Press, ISBN: 978-036-727-510	2020,
4	A Textbook of Engineering Chemistry	12th	S. S. Dara, S. S. Umare	S. Chand & Company Ltd., New Delhi.	2011

Useful Link /Web Resources:

1. https://ndl.iitkgp.ac.in/
2. https://www.youtube.com/watch?v=faESCxAWR9k

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Course Title: Applied Chemistry Laboratory	
Course Code:241ETCBSCP108	**Semesters:** I & II
Teaching Scheme: L-T-P: 0-0-2	**Credit:** 1
Evaluation Scheme: ISE: 25	**ESE Marks:**

Prior Knowledge of:	Experiments based on titration, Handling of Glassware & Chemicals, and Preparation of Solutions.

Course Objectives:

1.	To test water quality parameters using various titration analysis methods
2.	To synthesize simple advanced materials and estimate concentration of elements in material's
3.	To know handling of glassware's and simple equipment's for chemical analysis.

List of Experiments-

Exp. No	Title of Experiments	Duration
01	Determination of total hardness of water sample by EDTA method (Complex metric Titration).	02Hrs
02	To determine the normality of given strong acid by titrating against strong alkali solution by conduct meter	02Hrs
03	To determine the normality of given weak acid by titrating against strong alkali solution by conductometer.	02Hrs
04	Determination pH of given solutions by pH meter.	02Hrs
05	Estimation of Iron from a solution by calorimetry.	02Hrs
06	Estimation of Nickel from a solution by calorimetry	02Hrs
07	To determine the approximate analysis of coal.	02Hrs
08	To study the Construction and working of Galvanic cell	02Hrs
09	To estimate amount of calcium from waste chalk.	02Hrs
10	Estimation of zinc metal from brass solution.	02Hrs
11	Preparation of urea-formaldehyde resin.	02Hrs
12	Preparation of phenol formaldehyde resin.	02Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
108.1	**Analyse** hardness, acidity, alkalinity, and chloride content of water and percentage of elements in some alloys.
108.2	**Produce** various advanced materials and analyse aqueous solutions using instruments.
108.3	**Perform** various experiments by following written instructions.
108.4	**Express** involvement by understanding concepts in applied chemistry.

Course Articulation Matrix: Mapping of Course Outcomes (Cos) with Program Outcomes (PO's)

PO's / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
108.1	3	3	-	-	-	-	-	-	-	-	-	-	1
108.2	3	3	-	-	-	-	-	-	-	-	-	-	1
108.3	3	3	-	-	-	-	-	-	-	-	-	-	1
108.4	3	3	-	-	-	-	-	-	-	-	-	-	1

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Laboratory manual on engineering chemistry	1st	S. K. Bashin, Dr.Sudha Rani	Dhanpat Rai Publishingcompany Ltd.,New Delhi	2012
2	Engineering Chemistry	15th	P. C. Jain,	Dhanpat Rai Publishing Company Ltd., New Delhi	2014

Useful Link /Web Resources:

1. https://www.vlab.co.in/broad-area-chemical-science

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Course Title: Generative AI	
Course Code: 241ETCESCL105	**Semester:** Ii
Teaching Scheme: L-T-P: 3 – 0 - 0	**Credits:** 3
Evaluation Scheme: ISE-MSE Marks: 50	**ESE Marks:** 50

Course Description: Students will explore the basic principles of machine learning and neural networks, gaining insights into how AI systems learn from data to generate novel outputs. The course covers key areas of AI application, including natural language processing and computer vision, providing students with a broad perspective on the field's capabilities and potential.

Course Objectives:

1. To Explain the basic principles of Machine Learning.
2. To Describe the core concepts of neural networks and deep learning
3. To Distinguish between different generative models (e.g., GANs, VAEs)

Course Outcomes (COs):

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

C105.1	Understand and explain the fundamentals of AI and generative AI
C105.2	Develop proficiency in prompt engineering and apply effective techniques for text generation
C105.3	Analyze and compare different types of generative models, including their capabilities.
C105.4	Evaluate the ethical implications, societal impact, and future potential of generative AI

Content	Hours
Unit 1: Introduction to AI and Generative AI Definitions of AI and generative AI. Brief history and types of AI.	5
Unit 2: Fundamentals of Generative AI "Neural networks, machine learning, deep learning. How generative AI ""learns""?"	7
Unit 3: Prompt Engineering and Text Generation "What is prompt engineering? Importance of prompts in generative AI. Techniques for effective prompt writing. How do text generation models work? Applications in writing, chatbots, and education."	7
Unit 4: Introduction to Generative Models What are generative models? Overview of different types (GANs, VAEs, etc.) Simple examples of content generation Generating simple images or melodies	7

Unit 5: Image and Art Generation Image generation techniques. Role of prompts in image generation	6
Unit 6: Ethical Considerations and Future of Generative AI Potential applications and impact on society Ethical considerations (bias, misinformation, etc.) Privacy and security concerns Discussing the future of AI	8

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	Pos											
	1	2	3	4	5	6	7	8	9	10	11	12
C205.1	1				1							1
C205.2	1		2		1							
C205.3	1	2		1	1							
C205.4						3	2	3				1

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Course Title: Generative AI Laboratory	
Course Code: 241ETCESCP106	**Semester:** II
Teaching Scheme: L-T-P: 0 – 0 - 2	**Credits:** 1
Evaluation Scheme: ISE Marks: 25	**ESE-**

Course Description: This course provides an introduction to generative artificial intelligence (AI), covering fundamental concepts, Models, AI tools and applications. Students will learn about various generative models and tools used in creating content such as images, text, music, prompt engineering concepts and ethics.

Course Objectives:

1. To study basic principles of generative AI.
2. To study different types of generative models and their applications.
3. To give hands-on experiences with existing generative models and tools.
4. To explore ethical considerations and societal implifications of generative AI technologies.

Course Outcomes (COs):

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

C205.1	Understand and explain the fundamentals of AI and generative AI
C205.2	Develop proficiency in prompt engineering and apply effective techniques for text generation
C205.3	Analyze and compare different types of generative models, including their capabilities.
C205.4	Evaluate the ethical implications, societal impact, and future potential of generative AI

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	Pos											
	1	2	3	4	5	6	7	8	9	10	11	12
C205.1	1				1							1
C205.2	1		2		1							
C205.3	1	2		1	1							
C205.4						3	2	3				1

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List of Assignments		
Ass. No.	**Name of Assignment**	**Hours**
1	Use AIweirdness.com to explore simple text generation. (https://www.aiweirdness.com/)	2
2	Use Teachable Machine by Google to create a simple image classifier. (https://teachablemachine.withgoogle.com)	2
3	Use Neural Network playground to visualize how neural networks make decisions. (https://playground.tensorflow.org/)	2
4	Use GPT-3 playground or a similar tool to generate text. (https://studio.ai21.com/)	2
5	Create a simple chatbot using Dialogflow or Botpress.	2
6	Use DALL-E mini or Midjourney to create AI-generated art	2
7	Experiment with DeepArt.io to apply artistic styles to photos	2
8	Use Mubert to generate AI music .	2
9	Experiment with Google's Magenta studio for music creation	2
10	Use the What-If Tool by Google to explore machine learning models and dataset bias	2

Online Resources:

1. https://www.deeplearning.ai/courses/generative-ai-for-everyone/
2. https://www.coursera.org/learn/introduction-to-generative-ai
3. https://www.w3schools.com/gen_ai/gen_ai_prompt_intro.php
4. https://www.tutorialspoint.com/prompt_engineering/prompt_engineering_introduction.htm
5. https://www.youtube.com/@AI.Overpowered

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Course Title: Professional Communication	
Course Code: 241ETCACEL102	**Semester:** I/II
Teaching Scheme L-T-P: 1-0-0	**Credits:** 01
Evaluation Scheme: - ISE: 25	**ESE:** --

Prior knowledge of:	Basic English grammar, Basics of communication

Course Objectives:

1.	To **make** students learn important communicative situations, the basics of communication, and its significance in the corporate sector
2.	To **sharpen** listening, speaking, reading, and writing skills
3.	To **facilitate** them to draft office documents effectively
4.	To **enhance** career skills to make students industry-ready

Curriculum Details

Course Contents	Duration
Unit 1 Language and Communication • Need for effective communication • The process and levels of communication • Professional communication • Communication networks/ flows • Forms and methods (verbal and non-verbal) of communication • Barriers to communication and solutions	**04 Hrs**
Unit 2 Introduction to LSRW • **Listening Skills:** Hearing and listening, Listening as an active skill; Types of Listening; Barriers to effective listening skills • **Speaking Skills**: Importance, Various oral business contexts/situations, Group communication, Preparing effective public speeches (Impromptu and Prepared) • **Reading Skills**: Benefits of effective reading, Types of reading (Skimming; Scanning, Intensive reading, Extensive reading) Overcoming common obstacles, Reading comprehension • **Writing Skills:** Importance, Paragraph writing techniques	**03Hrs**
Unit 3 Professional Correspondence • **Official correspondence** Principles, structure (elements) Layout (complete block, modified block, semi-block), Types (enquiry and reply, claim and adjustment) • **Office drafting** Writing notice, agenda, and minutes of the meeting • **Email writing** Advantages and limitations Style, structure, and content Email etiquette	**04 Hrs**

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Unit 4 Career Skills and Ethics	**03 Hrs**
• **Resume and cover letter writing** Types of resume Important features of selling resume Cover letter writing • **Job Interviews** Interview preparation FAQs (Frequently Asked Questions) • **Guidance for IELTS, TOFEL and GRE** • **Corporate etiquette and ethics**	

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
102.1	**Implement** verbal and non-verbal codes for effective communication
102.2	**Demonstrate** language learning skills- LSRW (Listening, Speaking, Reading, and Writing)
102.3	**Compose** business documents competently
102.4	**Enhance** employability and readiness for industry demand and career advancement

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
102.1	3	-	-	-	-	-	-	-	2	3	3	-	1
102.2	3	-	-	-	-	-	-	-	2	3	3	-	1
102.3	3	-	-	-	-	-	-	-	2	3	3	-	1
102.4	3	-	-	-	-	-	-	-	2	3	3	-	1

Suggested Learning Resources:

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Technical Communication: Principles and Practice	4th	Meenakshi Raman & Sangita Sharma	Oxford University Press	2022
2	Personality Development and Soft- Skills	2nd	Barun K. Mitra	Oxford University Press	2016
3	Communication Skills	2nd	Sanjay Kumar & Pushp Lata	Oxford University Press	2015
4	Communication Skills	3rd	Meenakshi Raman & Sangeeta Sharma	Oxford University Press	2013

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Business Communication	2nd	Urmila Rai and S.M. Rai	Himalaya Publishing House Pvt. Ltd.	2014
2	A University Grammar of English	1st	Randolph Quirk and S Greenbaum	Pearson	2007
3	Effective Technical Communication	2nd	B. K.Mitra	Oxford University Press	2006
4	Effective Technical Communication	2nd	M.Ashraf Rizvi	McGraw Hill Education	2005

Useful Links/Web Resources:

1. https://www.skillsyouneed.com
2. https://www.psychologytoday.com
3. https://www.britishcouncil.in
4. https://www.udemy.com
5. https://www.englishclub.com

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Course Title: Professional Communication Laboratory	
Course Code: 241ETCVSECP103	**Semester:** I/II
Teaching Scheme L-T-P: 0-0-2	**Credit:**01
Evaluation Scheme: ISE Marks: 25	**ESE Marks:** --

Prior knowledge of:	Basic language learning and people skills

Course Objectives:

1.	To **familiarize** students with English phonology and improve their pronunciation
2.	To **improve** language learning skills (LSRW) by providing ample practice
3.	To **develop** students' verbal and non-verbal communication
4.	To **cultivate** creative thinking and workplace skills

List of Lab Sessions

Session No	Title of Activities	Duration
01	**Icebreaking: Introducing self and others** Different ways of introducing self and others: demonstration	02Hrs
02	**Phonetics** Introduction to phonetics - consonants, vowels and diphthongs, stress, intonation in English with video samples	02Hrs
03	**Remedial English** Vocabulary-building games and identifying errors revising rules of English grammar	02Hrs
04	**Listening Practice** Listening comprehension, strategies for effective listening with audio/video samples	02Hrs
05	**Reading Practice** Improving Comprehension Skills, Techniques for good comprehension	02Hrs
06	**Technical Writing Practice** Paragraph writing, writing notices, agenda minutes of the meeting, email writing	02Hrs
07	**Public Speaking** Practicing extempore and prepared speeches	02Hrs
08	**Group discussion** Group discussions on current topics	02Hrs
09	**Mock Meetings** Purposes, preparation, and procedure for conducting effective meetings	02Hrs
10	**Mock Interviews** Preparing for FAQs and facing mock interviews	02Hrs
11	**Creative Writing** Blog Writing	02Hrs
12	**Film/Book Appreciation** Showing short films and appreciation of them. Reading novels or short stories and critical analysis of them.	02Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
103.1	**Demonstrate** effective LSRW skills
103.2	**Articulate** words accurately and create grammatically correct sentences
103.3	**Deliver** speeches and participate in GDs, business meetings, and mock interviews effectively
103.4	**Draft** business documents and blogs by following writing ethics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	`2	3	4	5	6	7	8	9	10	11	12
103.1	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**	-	**1**
103.2	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**	-	**1**
103.3	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**	-	**1**
103.4	**3**	-	-	-	-	-	-	-	**2**	**3**	**3**	-	**1**

Suggested Learning Resources:

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	A Practical Course in Spoken English	1st	J.K. Gangaj	PHI Learning Pvt. Ltd	2014
2	English Language Laboratories	2nd	Nira Konar	PHI Learning Pvt. Ltd	2014
3	Better English Pronunciation	2nd	J.D.O Connor	Cambridge University Press,	1980

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Communication Skills	2nd	Sanjay Kumar & Pushp Lata	Oxford University Press	2015
2	Technical Communication: Principles and Practice	2nd	Meenakshi Raman & Sangita Sharma	Oxford University Press	2011

Useful Links /Web Resources:

1. **https://www.indiabix.com**
2. **https://www.skillsyouneed.com**
3. **https://interviewbuddy.in**
4. **https://learnenglish.britishcouncil.org**
5. **https://www.fluentu.com**

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Course Title: Basics of Analog Electronics	
Course Code: 241ETCPCCL101	**Semester:** II
Teaching Scheme L-T-P: 2 – 0 - 0	**Credits:** 02
Evaluation Scheme: - ISE:	**ESE: - 50**

Prior Knowledge of:	Ohm's law, Semiconductor theory

Course Objectives:

1.	To make the students learn basic knowledge of electronic component and electronic devices
2.	To introduce fundamental concepts of Semiconductor devices.
3.	To study the fundamental principles of operational amplifiers and its Applications.
4.	To expose the students to the working principles of different types of Sensors

Curriculum Details

Course Contents	Duration
Unit-I: Basics of Electronic component • Definition and types of Resistor, capacitor, inductor • Classification of electronic component • Simplification of networks using series and parallel combinations(R,L,C) • Block diagram of Cathode ray oscilloscope, Digital storage Oscilloscope, Digital multi-meter, Function generator, Power supply	**06 Hrs**
Unit II: Semiconductor Devices • Introduction to semiconductor. • Construction, symbol, working, characteristics, applications of • P-N Junction, Light Emitting diode • Rectifiers:(HWR, FWR, Bridge) • Transistor: construction, types, operation; transistor configuration.	**06 Hrs**
Unit III: OP-AMP • Introduction to Operational amplifier • Block diagram of op-amp, • Dual input balanced output differential amplifier • Dual input unbalanced output differential amplifier • Open loop and Closed loop configuration of opamp • Applications of Op-amp - Summing Amplifiers, Differential amplifier, Integrator, differentiator	**06 Hrs**

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Unit IV: Sensors and Transducers • Classification of transducers • Difference between sensors and transducers • Temperature Sensor • Speed Sensor • Displacement Sensor • Pressure Sensor • Photo sensor • Piezoelectric sensor	**06Hrs**

Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
101.1	Explain the basic concept of electric Components & Instruments
101.2	Identify type of diodes, transistor configurations
101.3	Explain the operational amplifier with its Application
101.4	Classify different types of Sensors

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / Cos	BTL	1	2	3	4	5	6	7	8	9	10	11	12
101.1	2	2	2	-	-	-	-	-	-	-	-	-	1
101.2	2	2	2	-	-	-	-	-	-	-	-	-	1
101.3	2	2	2	-	-	-	-	-	-	-	-	-	1
101.4	2	2	2	-	-	-	-	-	-	-	-	-	1

Text Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Theory and problems of Basic Electrical Engineering	Eastern Economy Edition	I. J. Nagrath and Kothari	PHI learning 2. Pvt .Ltd	2009
2	Basic Electrical Engineering	2nd Edition.	V. N. Mittal and Arvind Mittal	Tata Mc Graw Hill	2007
3	Basic Electrical Engineering	1st Revised Edition	V.K. Mehta,	S. Chand & Co. Pvt . Ltd. New Delhi)	2008
4	Op Amps and Linear Integrated Circuits	IInd and latest edition	Ramakant A. Gaikwad	Pearson Education	

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	A textbook of Electrical Technology Vol I	1st Edition.	B. L. Theraja and A. K. Theraja	Chand & Co. Pvt. Ltd. New Delhi	2008
2	operational Amplifiers and Linear Integrated Circuits	VI th edition	Robert Coughlin, Fredric Driscoll	Pearson Education	2006

Useful Link /Web Resources:
NPTL: https://www.youtube.com/watch?v=0SnfR13p6Mc&t=12s

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Course Title: Python Programming	
Course Code: 241ETCVSECL103	**Semester:** I/II
Teaching Scheme L-T-P: 1 – 2 - 0	**Credits:** 02
Evaluation Scheme: - ISE: -25	**POE:** - 25

Prior knowledge of:	Basic Knowledge of computers

Course Description:
This subject covers basic principles of programming and programming ethics through the python programming language.

Course Objectives:

1.	
2.	
3.	

Curriculum Details

Course Contents	Duration
Unit 1 Introduction to Python and Decision Structures Input, Processing, and Output: Introduction to programming and Python, Basic syntax, Displaying Output with the print Function, Comments, Variables, Operators, Reading Input from the Keyboard, Performing Calculations Decision Structures: The if Statement, The if-else Statement, Comparing Strings, Nested Decision Structures and the if-elif-else Statement	**04 Hrs**
Unit 2 Repetition Structures and Functions Repetition Structures: Introduction to Repetition Structures, The while Loop: A Condition Controlled Loop, The for Loop: A Count-Controlled Loop, Calculating a Running Total, Sentinels, Input Validation Loops, Nested Loops Functions: Introduction to Functions, Defining and Calling a Void Function, Designing a Program to Use Functions, Local Variables, Passing Arguments to Functions, Global Variables and Global Constants, Introduction to Value-Returning Functions.	**03Hrs**
Unit 3 Python Data structures and String **Lists and Tuples:** Sequences, Introduction to Lists, List Slicing, Finding Items in Lists with the in Operator, List Methods and Useful Built-in Functions, Copying Lists, Processing Lists, Two Dimensional Lists, Tuples, **Dictionaries and Sets**: Operations and use. **Strings:** Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings.	**04 Hrs**
Unit 4 Modules and File Handling **Modules:** Writing Your Own Value-Returning Functions, The math Module, Storing Functions in Modules **Files:** Introduction to File Input and Output Using Loops to Process Files, Processing Records, Exceptions.	**03 Hrs**

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
103.1	Demonstrate use of decision and repetition structure in order to solve specific problem
103.2	Model a given big problem statement in to smaller parts to provide modular approach.
103.3	Choose proper data structure like list, touples, dictionaries etc. for solving given problem

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
103.1	1	-	-	-	2	-	-	1	-	-	-	-	1
103.2	1	-	-	-	2			1	-	-	-	-	1
103.3	1	-	-	-	2			1	-	-	-	-	1

Text Books:

1. Ethics for the Information Age 6th edition Michael J. Quinn
2. Starting Out with Python 5th Tony Gaddis Pearson March 17th 2021
Core Python Programming 3rd R. Nageswara Rao Dreamtech Press 1 Jan 2018

Reference Books:

1. Python: The Complete Reference Indian Edition Martin C. Brown MGH March 2018

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Course Title: Python Programming Laboratory	
Course Code: 241ETCVSECP104	**Semester:** I/II
Teaching Scheme L-T-P: 0 – 0 - 2	**Credits:** 01
Evaluation Scheme: - ISE: -25	

Prior knowledge of:	Basic Knowledge of computers

Course Description:
This subject covers basic principles of programming and programming ethics through the python programming language.

Course Objectives:

1.	
2.	
3.	

List of Experiment

Session No	Title of Activities	Duration
01	Program based on the decision structures (if, If else, nested if else, if elif else)	02Hrs
02	Program to demonstrate use of different types of looping statements.	02Hrs
03	1. Program to write and use different types of user defined function	02Hrs
04	Programs to demonstrate the use of various built-in functions in Python,	02Hrs
05	Program demonstrating operations and use of List and Touple	02Hrs
06	Program demonstrating operations and use of Dictionary and set.	02Hrs
07	Program to demonstrate modules	02Hrs
08	Program to perform CURD operations in a file using file handling.	02Hrs
09	Implement stack operations	02Hrs
10	Implement Queue operations	02Hrs

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Course Outcomes (COs): After successful completion of the course, students will be able to:

CO	Statements
104.1	Demonstrate use of decision and repetition structure in order to solve specific problem
104.2	Model a given big problem statement in to smaller parts to provide modular approach.
104.3	Choose proper data structure like list, touples, dictionaries etc. for solving given problem

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

POs / COs	BTL	1	2	3	4	5	6	7	8	9	10	11	12
104.1	1				2			1					1
104.2	1				2			1					1
104.3	1				2			1					1

Text Books:

1. Ethics for the Information Age 6th edition Michael J. Quinn
2. Starting Out with Python 5th Tony Gaddis Pearson March 17th 2021
Core Python Programming 3rd R. Nageswara Rao Dreamtech Press 1 Jan 2018

Reference Books:

2. Python: The Complete Reference Indian Edition Martin C. Brown MGH March 2018

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Course Title: Liberal Learning Course (LLC)	
Course Code: 241ETCCCA101	**Semester:** I/II
Teaching Scheme: L-T-P :0 – 0 – 4	**Credits:** 02
Evaluation Scheme ISE-50	**ISE Marks:** 50

Syllabus Contents (All Clubs)	Duration
1. PAINTING • Memory Drawing - Human sketching, Object Drawing Perspective Memory • 2D Drawing - Basic Drawing Elements Principles, Compositions, Colour Scheme/Texture • 3D Drawing - 3D Basic Forms,3D Sketching, Light effect (shade/shadow)	**30 Hrs**
2. DANCE • Hip-Hop. • Information about elements. • Old School- New School steps. • Variations in old school new school steps. • How to use old-school steps in dance. • Choreography on 2 songs	**30 Hrs**
3. YOGA & MEDITATION • Breathing practices and pranayama • Sectional Breathing • Yoga deep Breathing • Concept of bandha and mudra • Rictation of pranava mantra • Anter Maun • Breath Mediation • Om dhayna	**30 Hrs**
4. Music • Introduction of Music • Taal • Practical Raag (Harmonium Swar) • Group Song • Presentation	**30 Hrs**
5. GUITAR • Introduction of Guitar • Guitar Tuning • Open strings Exercise • Finger Exercise • Scales and Intervals • Major Scale • Minor Scale • Strumming Pattern • Lead	**30 Hrs**

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6. INTERIOR DESIGN **6.1 Primary elements in Architecture** • Elements of design such as point, line, shape, form, mass, space, color and texture patterns, light and shade; understanding the relations between them. **6.2 Principles in Architectural Design** • Principles of design such as harmony (unity), proportions, contrast, scale, balance (symmetric & asymmetric), rhythm (pattern), emphasis, scale proportion Finger Exercise **6.3 Color Theory** • Properties of color, color schemes, color value, intensity, Color texture, psychological effect of color. • Apply the knowledge of color theory and rendering techniques for Interior design assignments and portfolio Scales and Intervals • Introduction to Architectural lettering, size, and notation of drawing, symbolic representation of building elements and material, and other features as per standard practice. • Assignments included for Sketch plan measure drawing lettering and architectural symbols.	**30 Hrs**
7. ADVENTURE **7.1 Introduction to Adventure Activities** • Introduction • Benefits of adventure activities. • how to plan an adventure activity and prepare for safety.	
7.2 Safety Protocols, Risk Management and Basic First Aid for Adventure Activities • Equipment safety check • Emergency response procedure • Risk assessment and mitigation strategies. • Common injuries and ailments in adventure settings • Wound care and basic treatments • Heat and cold-related illnesses	
7.3 Adventure Cycling and Trekking Equipment Safety Check • Basic cycle/bike maintenance and repair • Cycling activity • Long-distance trekking and camping (One Day in Nature) • Route planning and logistics	**08 Hrs**
7.4 Environmental Stewardship and study of Wildlife • Leave No Trace principles • Environmental impact of adventure activities • Sustainability practices and conservation efforts • Habitat requirements and preferences of different species. • Interactions between wildlife and their environment. • Conservation strategies for maintaining viable populations. • Visit to Sanctuary -Dajipur, Radhanagari, Kolhapur,Jungle safari.	**08 Hrs**

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7.5 Adventure Sports: Self-defense and Personal Development, Leadership. • Benefits of Self-Defense Sports • Physical fitness and conditioning • Improved self-confidence and self-esteem • Enhanced coordination, agility, and reflexes • Stress relief and mental discipline • Practical self-defense skills and situational awareness • Example:- Wrestling, boxing, Karate, Martial arts, taekwondo, lathikati • Building resilience and mental toughness • Teamwork and collaboration in challenging environments • Leadership skills and decision-making under pressure	**4Hrs**
7.6 Study of Historical Monuments • Historical background and evolution of Indian Culture. • History of Maratha Empire. • Visit Forts, temples, Palace, etc • **VISIT TO VERTICAL ADVENTURE PARK, MASAI PATHAR-JEUR** • Zipline • Zorbing ball • Bungee Ejection • High rope course • Rappelling • Parasailing • Sports Climbing • Slack Line • Rock climbing	**4Hrs**
8. Foreign Language-German • Introducing self and others • Grammar: WH questions, personal pronouns, simple sentences, verb conjugation • Themes: hobbies, the week, numbers, the alphabet, months, seasons • Grammar: articles, plural, the verbs to have and to be basic directions / • Grammar: definite and indefinite articles; negation - kein and nicht; • Form Filling Can understand and use familiar, everyday expressions and very simple sentences, which relate to the satisfying of concrete needs. Can introduce him/herself and others as well as ask others about themselves – e.g. where they live, who they know and what they own – and can respond to questions of this nature. Can communicate in a simple manner if the person they are speaking to speaks slowly and clearly and is willing to help.	**28 Hrs**
9. Photography. **9.1 Introduction to Digital Photography** • Understanding film and paper photography. • Learning about the digital revolution. • How photos are used today.	**30 Hrs**

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9.2 Digital Basics • Digital image method of storing and processing digital image: Raster and Vector method Doodling. • Representation of digital image: Resolution – Pixel Depth **9.3 Digital Basics** • Windows Operating System • Concept of Internet • Image transportation through floppy, CD, zip and Internet. **9.4 Image Editing** • Image editing through image editing • Software like Adobe Photoshop – Adjustment of Brightness, Contrast, Tonal and Colour Values – • Experimenting with Level and Curve.	
10. Art & Craft **10.1 Craft Skills** • Cutting and Pasting Techniques - collage. • Paper folding Techniques -Origami.	**4 Hrs**
10.2 D.I.Y Project • Craft project using recycled material • Doodling.	**4 Hrs**
10.3 Field Trip • Cultural visit • Outdoor sketching • Visit to the exhibition and museum	**8 Hrs**
10.4 Workshop • Pottery Making • Lantern Making	**6 Hrs**
10.5 Cultural Activities • Drama, • skit, • Open Mic, • Singing, Dancing, etc.	**6 Hrs**
11. Film Making • Introduction of filmmaking • Short videos, Reels • Visit to Film Industry Kolhapur, • Information regarding instrument used in film industry	**30 Hrs**
12.Coding Club • Basics of C programming • Introduction • Datatypes • Operators • Keywords	**6 Hrs**

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Control Structure • If • If Else • Else If • For • While • Switch	**6 Hrs**
Functions • Types of Functions • Overloading & Overriding • Examples	**4 Hrs**
Arrays • Basics of Arrays • One Dimensional Array • Two-Dimensional Array	**4 Hrs** **4 Hrs**
Practice Problems	**4 Hrs**

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Electronics & Telecommunication Engineering Curriculum
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Course Title: Capstone Project	
Course Code: 241ETCMC104	**Semester:** II
Teaching Scheme: L-T-P:0-0-0	**Credits:** Grade (Mandatory Course)
Evaluation Scheme ISE: 50	**ESE Marks:** --

Course Objectives:

1	To inculcate independent learning by problem-solving in a social context.
2	To engage students in rich and authentic learning experiences.
3	To emphasize learning activities that are long-term, interdisciplinary, and student-centric.
4	To provide every student the opportunity to get involved either individually or as a group so as to develop team skills and learn professionalism.

Curriculum Details
As per the approved structure of the curriculum, students will be allowed to do capstone projects during the second semester of B. Tech. program.

Topics:

A Capstone Project may be a theoretical analysis, modeling & simulation, experimentation & analysis, prototype design, new equipment fabrication, correlation and analysis of data, software development, or a combination of these.

Group Structure:

Working in supervisor/mentor-monitored groups; the students plan, manage, and complete a task/project/activity which addresses the stated problem.

1. There should be a team/group of 4 -5 students
2. A supervisor/mentor teacher assigned to individual groups

Selection of Project:

The project demo model for learning is recommended. The model begins with the identifying of a problem, often growing out of a question or "wondering". This formulated problem then stands as the starting point for learning. Students design and analyze the problem within an articulated interdisciplinary or subject frame or based on Rural/Social internship.

A problem can be theoretical, practical, social, technical, symbolic, cultural, and/or scientific and grows out of students' wondering within different disciplines and professional environments. A chosen problem has to be exemplary. The problem may involve an interdisciplinary approach in both the analysis and solving phases.

By exemplarity, a problem needs to refer back to a particular practical, scientific, social and/or technical domain. The problem should stand as one specific example or manifestation of more general learning outcomes related to knowledge and/or modes of inquiry.

There are no commonly shared criteria for what constitutes an acceptable project. Projects vary greatly in the depth of the questions explored, the clarity of the learning goals, the content, and structure of the activity.

1. A few hands-on activities that may or may not be multidisciplinary.

2. Use of technology in meaningful ways to help them investigate, collaborate, analyze, synthesize, and present their learning.

3. Activities may include- Solving real life problem, investigation, /study and Writing reports of in-depth study, fieldwork.

Recommended Guidelines and phases:

Capstone project is learning through activity. One of the teachers can be appointed as guide for capstone project group. Following are the recommended guidelines that will work as an initiator and facilitator in process of completion of Capstone project.

1. In first week of commencement of 2nd semester, let the guide create awareness about capstone project (what, why, and how) among the students. Convey students expected outcomes, assessment process and evaluation criteria.
2. Get groups of students registered preferably 4-5 students per group.
3. Assign guide to each group.
4. Provide guidelines for title identification (Problem can be some real-life situation that needs technology solutions. This situation can be identified by rural/social internship, by meeting people around, visiting various industries, society, and institutes. The solution can be prototype, model, convertible solutions, survey and analysis, simulation, and similar).

5. Let students submit the problem identified in prescribed format (Problem Statement, Initial Survey for topic finalization, Abstract, Software, Hardware required, Title)

6. Guide can approve the problem statements based on feasibility and learning outcomes expected for first year engineering students
7. Guide is to monitor progress of the task during phases of project work. Broadly phases may include- requirements gathering, preparing a solution, technology design for the solution.
8. Weekly monitoring and continuous assessment record are to be maintained by guide.
9. Get the report submitted at the end of semester.

Student is required to prepare a capstone project and file containing documentary proofs of the activities done by him. The evaluation will be done by expert committee constituted by HoD/Departmental capstone project In-charge/ faculty mentor.

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Course Title: Rural/Social Internship	
Course Code: 241ETCMC102	**Semester:** I
Teaching Scheme: L-T-P :0-0-0	**Credits:** Grade (Mandatory Course)
Evaluation Scheme ISE: 50	**ESE Marks:** --

Course Objectives:

1	To provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job.
2	To exposure to the current technological developments relevant to the subject area of training.
3	To expose students to the engineer's responsibilities and ethics.
4	To understand the social, economic and administrative considerations that influence the working environment of industrial organizations
5	To gain experience in writing technical reports/projects.
6	To understand the social, economic, and administrative considerations that influence the working environment of industrial organizations

Curriculum Details

As per the approved structure of curriculum, students will be allowed to do internship during the first semester of B. Tech. program. During the internship, students are required to visit villages/wards/small industries/organizations etc

For following activities

1. Prepare and implement a plan to create local job opportunities.
2. Prepare and implement a plan to improve education quality in the village.
3. Preparing an actionable DPR for Doubling the village Income.
4. Developing a Sustainable Water Management system.
5. Prepare and improve a plan to improve the health parameters of villagers.
6. Developing and implementing Low-Cost Sanitation facilities
7. Prepare and implement a plan to promote Local Tourism through Innovative Approaches
8. Implement/Develop Technology solutions that will improve quality of life.
9. Prepare and implement solutions for energy conservation.
10. Prepare and implement a plan to Skill village youth and provide employment.
11. Develop localized techniques for Reduction in construction Costs.
12. Prepare and implement a plan for sustainable growth of the village.
13. Setting of Information imparting club for women leading to contribution to social and economic issues.
14. Developing and managing an Efficient garbage disposable system.
15. Contribution to any national-level initiative of the Government of India. For eg. Digital India/ Skill India/ Swachh Bharat Internship etc

Every student is required to prepare a file containing documentary proofs of the activities done by him. The evaluation will be done by an expert committee constituted by the HoD/Departmental Internship In-charge/ faculty mentor.

Course Code Draft Format

Format: {YY}{DDD}{U/P/D}{S}{T}{NN}

Abbr: Meaning
YY : Year -> Last 2 digits of Year
DDD : Dept Abbr.
L : Level -> UG/PG/Doctoral
S : Semester Number
T : Type -> NEP bucket (*list)
NN : Serial Number
A : Assessment -> Theory / Lab / Tutorial

eg. 24DSEU3A01

NEP Bucket List

NEP Course Category	Abbr.	Code
Ability Enhancement Courses	AEC	A
Basic Science Courses	BSC	B
Co-Curricular Activities	CCA	C
Audit Course	AC	D
Program Elective Courses	PEC	E
Community Engagement Project /. Field Project	CEP/FP	F
Humanities/Social Science, Management	HSSM	H
Internship	INT	I
Project	PR	J
Indian Knowledge System	IKS	K
Multi-Disciplinary Minor	MDM	M
Vocation Skill Enhancement Courses	VSEC	N
Open Elective Courses	OEC	O
Program Core Courses	PCC	P
Research Methodology	RM	R
Engineering Science Courses	ESC	S
Value Education Courses	VEC	V

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Indicative list for Honors Courses: VLSI Engineering

Department -										
Category	Course Name	Teaching Scheme				Theory			Practical		Total Marks
		Credits	L	P	T	ISE	MSE	ESE	INT	OE/ PoE	
23ETCU4Z01	Electronics equipment Integration and prototype building	04	3	1	-	20	30	50	25		125
23ETCU5Z02	Semiconductor device modelling and simulation	04	3	1	-	20	30	50	25		125
23ETCU6Z03	Digital IC Design	04	3	1	-	20	30	50	25		125
23ETCU7Z04	MEMS Technology	04	3	1	-	20	30	50	25		125
23ETCU8Z05	Design and Analysis of VLSI Subsystems (ODL only)	02	2	-	-	-	20	30	-	-	50

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Kasaba Bawada, Kolhapur

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KOLHAPUR

S.Y. B. Tech.

Structure and Curriculum Sem-III

Department of Electronics & Telecommunication Engineering

w.e.f. A.Y.2024-25

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D. Y. Patil College of Engineering and Technology Kolhapur
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SEMESTER-III

CourseCode	CourseCategory	CourseType	CourseName	TeachingScheme				Theory			Practical		Total Marks
				Credits	L	P	T	ISE	MSE	ESE	INT	OE/ PoE	
23ETCU3P01	Program Core Courses	PCC	ElectronicsCircuit AnalysisandDesign–I	3	3	-	-	20	30	50	-	-	100
23ETCU3P02			Analogand Digital Communication	3	3	-	-	20	30	50	-	-	100
23ETCU3P03			Applied Mathematics	2	2	-	-	20	30	50	-	-	100
23ETCU3P04			ElectronicsCircuit AnalysisandDesignLab	1	-	2	-	-	-	-	25	25	50
23ETCU3P05			Analogand Digital CommunicationLab	1	-	2	-	-	-	-	25	25	50
23ETCU3F06	Comm. Engg. Project(CEP)/Field Project (FP)	CEP/FP	SocietybasedMini- Project	2	-	4	-	-	-	-	50	-	50
23ETCU3M07	Multidisciplinary Minor	MDM-1	Digital Electronics	2	2	-	-	-	-	50	-	-	50
23ETCU3V08	Value Education Course	VEC	Personal Valuesand Ethics	2	2	-	-	20	30	-	-	-	50
23ETCU3O09	Open Elective Course	OEC-1	Basics of Arduino (ODL Only) (Theory)	3	3	-	-	20	30	50			100
23ETCU3O10	Open Elective Course	OEC-1	Basics of Arduino (ODL Only) (Practical)	1	-	2	-	-	-	-	25		25
23ETCU3H11	Humanities Social Science and Management	Entrepreneurship/ Economics/ Management course	FinancialManagement	2	1		-	25	-	-	25	-	50
23ETCU3D12	AUDIT Course	AC	FinishingSchoolTrainingIII	Audit	3*	-	-	50	-	-	-	-	Grade
23ETCU3C13	Co-Curricular Activities	CCA	LiberalLearning-I	Audit	2#	-	-	50	-	-	-	-	Grade
23ETCU3C14			LiberalLearning-II		2#								
23ETCU3C15			LiberalLearning-III		2#								
			Total	**22**	**22**	**10**		**225**	**150**	**250**	**150**	**50**	**725**

*** Values not included in total, #-2 contact hrs per club, Min Marks for passing: 40% of total marks of individual course**

S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Electronics Circuits Analysis & Design - I	
Course Code: 23ETCU3P01	**Semester: III**
Teaching Scheme: L-T-P :3-0-0	**Credit:3**
Evaluation Scheme: ISE+MSE Marks:20+30	**ESE Marks: 50**

Course Description:

This course aims to provide the basic knowledge of electronic device operation and the characteristics for various devices along with the basic designing parameters for different applications.

Course Objectives:

1	Apply the design techniques of analog electronic circuits using diodes and to develop analytical skills.
2	Apply the design techniques of analog electronic circuits using transistors to develop analytical skills.
3	Analyze the wave shaping circuits using analog components.
4	Provide an introduction and basic understanding of Semiconductor Devices viz. Diodes, BJT& JFET

Course Outcomes (COs):

At the end of the course the student should be able to:

23ETCU3P01.1	Analyze and Design unregulated & regulated DC Power supply.
23ETCU3P01.2	Analyze and Design IC regulators
23ETCU3P01.3	Apply the knowledge of electronic component basics to linear & non-linear Wave shaping Circuits
23ETCU3P01.4	Analyze and Design biasing circuits of Bipolar Junction Transistor & Field Effect Transistor

Prerequisite:	Physics, Fundamentals of Electrical & Electronics Engg.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)/PSOs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	PSO 1	PSO 2	BTL
23ETCU3P01.1	2	2	1										2	2	IV
23ETCU3P01.2	2	2	1										2	2	IV
23ETCU3P01.3	2	2	1										2	2	III

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23ETCU3P01.4	2	2	1									2	2	IV

Course Content

Content	Hrs.
Unit 1: Unregulated Power Supplies **Rectifiers:** Half Wave and Full Wave, Analysis for different parameters: V_{dc}, I_{dc}, PIV, TUF, efficiency, ripple factor, regulation, Form Factor, Regulation. **Filters:** Need of filters, Analysis for ripple factor of Capacitor, Inductor, LC, CLC filters. Design of unregulated power supply with filter.	8
Unit 2: Voltage Regulators Need of voltage regulator, Stabilization factors, Analysis of Shunt regulator, (using Zener diode & BJT), Series voltage regulator with Pre- regulator & Overload protection circuit.	4
Unit 3: IC Voltage Regulators IC Voltage Regulators:- Study and design of regulators using IC's:78XX, 79XX, LM723, LM317, Switching regulator: Introduction, study of Switched Mode Power Supply IC: LM3524, Design of DC Power supply using 78XX	6
Unit 4: Analysis of Wave Shaping Circuits **RC Circuits: -** High pass as a differentiator, Low pass as integrator, Low Pass & High Pass (square & step response). **Clipping Circuits:** -Classification, construction, working & Transfer characteristics of clipper circuits. **Clamping Circuits:-** Classification, construction, working clamping circuits.	6
Unit5: Bipolar Junction Transistor &Biasing **Bipolar Junction Transistor:** Construction, Operation, Common Base Configuration, Transistor Amplifying Action, Common Emitter Configuration, Common Collector Configuration, Transistor specifications, Heat Sinking. **BJT Biasing:** DC Load Line and Operating Point, Need of biasing, Introduction to Fixed & Collector-to-Base Bias, analysis & design of Self or Voltage divider Bias.	6
Unit6: Field Effect Transistor& Biasing **Field Effect Transistor:** n-Channel JFET, Characteristics of n – Channel JFET, p – Channel JFET, JFET Parameters, FET Voltage Amplification. **FET Biasing:** DC Load Line, Analysis of Fixed Voltage Bias Circuit, Self-Bias Circuit, Potential Divider Bias	6

Text Books:

1. Electronic devices & circuits, Allen Mottershed Prentice- Hall India
2. Electronic devices & circuits, J. Millman & C. Halkias, Tata Mc Graw Hill Publication

3. A Monograph on Electronics Design Principles N.C. Goyal & R.K. Khetan-Khanna Publishers

Reference Books:

1. Electronic devices & circuits, David A. Bell ,Oxford University
2. Electronic devices & circuits', Salivahanan, N Sureshkumar, Tata McGraw Hill Publication
3. Electronic devices &circuit theory, Robert L. Boylsted, Louis Nashelsky, Pearson Education

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Analog & Digital Communication	
Course Code: 23ETCU3P02	**Semester: III**
Teaching Scheme: L-T-P: 3-0-0	**Credits: 3**
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

Course deals with understanding the principles of Analog and Digital Communication, study of different types of Noise in communication system. It describes the Fundamentals of baseband transmission modulation techniques.

Course Objectives:

1	To understand the different types of Analog Modulation & Demodulation techniques.
2	To introduce the different types of Pulse Modulation & demodulation techniques.
3	To study various types of Noise in communication systems
4	To provide the basic of baseband transmission and Reception

Course Outcomes (COs):

At the end of the course the student will be able to:

23ETCU3P02.1	Explain different modulation schemes.
23ETCU3P02.2	Explain different demodulation schemes
23ETCU3P02.3	Describe different types of noise and their Classification
23ETCU3P02.4	Understand the baseband transmission and Reception.

Prerequisite:	**Basic Electronics**

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

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Course Outcomes (COs) / Program Outcomes (POs)/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
23ETCU3P02.1	3	1	1										1	1	III
23ETCU3P02.2	3	1	1										2	2	III
23ETCU3P02.3	3	1	1										1	1	III
23ETCU3P02.4	3	1	1			1							2	2	II

Contents	Hours
Unit 1: Amplitude Modulation & Demodulation Introduction to Analog Communication System, Radio spectrum and frequency allocation. Need for modulation, Amplitude Modulation principles, AM envelope, frequency spectrum & BW, AM transmitters: Block of low level DSBFC, High level DSBFC, SSB suppression techniques. Characteristics of Receiver, Block diagram of TRF and Super heterodyne receiver.	8
Unit 2: Angle Modulation Introduction to frequency and phase modulation. Mathematical representation of F.M. Frequency spectrum of F.M. wave. Generation of F.M. methods. Types of FM Receivers. Case study of AM/ FM station.	7
Unit 3: Digital transmission of analog signals Introduction, Shannon's theorem of information, Sampling theorem, Classification of Pulse Modulation, Study of Pulse Code Modulation- Uniform & Non uniform quantization, DPCM, Delta Modulation.	7
Unit 4: Noise Noise sources and types. Quantization noise, Signal to quantization noise ratio. Influence of noise on PCM.	6
Unit 5: Baseband transmission & reception Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester Baseband pulse Shaping, M-array Signaling, eye diagram, Optimum Receivers-Matched Filters, Correlation receivers	6
Unit 6: Baseband modulation techniques ASK, FSK, PSK, DPSK, QPSK, & QAM. Coherent, Non- Coherent Detection. Comparison of modulation techniques based on Baud rate, BER, Power Spectral density. DSSS.	8

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Text Books:

1. George Kennedy, "Electronic Communications", McGraw Hill.
2. Wayne Tomasi 'Electronics Communication System' -Fundamentals through Advanced. - Vth Edition- Pearson Education.
3. Analog and Digital communication – J S Chitode Technical Publications, 2009

Reference Books:

1. B.P. Lathi, "Analog and Digital Communication", OXFORD University press.
2. Simon Haykin, "An introduction to analog & digital communications", John Wiley & Sons.
3. R P Singh, S D Sapre 'Communication System-Analog & Digital' IInd Edition –Tata Mc Graw Hill Publication.

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Semester-III

Course Title: Applied Mathematics	
Course Code: 23ETCU3P03	**Semester: III**
Teaching Scheme: L-T-P: 2-0-0	**Credits: 2**
Evaluation Scheme: ISE+MSE Marks:20+30	**ESE Marks: 50**

Course Description: Applied Mathematics for Electronics and Telecommunication Engineering focuses on the mathematical techniques and tools essential for solving engineering problems. The course covers topics such as differential equations, linear algebra, complex variables, and numerical methods, providing students with a strong mathematical foundation to analyze and model Electronics and Telecommunication engineering systems

Course Objectives:

1	Equip students with knowledge of how to apply differential equations to real-world problems.
2	Enable students to effectively use Laplace transforms for solving linear differential equations.
3	Teach numerical differentiation and integration techniques, including Newton's forward and backward difference formulas, and the trapezoidal and Simpson's rules.
4	Educate students on vector calculus concepts such as gradient, divergence, and curl, and their applications in analyzing scalar and vector fields.

Course Outcomes (COs):

At the end of the course the student will be able to:

23ETCU3P03.1	Solve linear differential equations using methods for finding complementary functions and particular integrals.
23ETCU3P03.2	Apply Laplace transforms and their inverses to solve differential equations, evaluate integrals, and handle complex problems involving derivatives and integrals.
23ETCU3P03.3	Implement numerical differentiation and integration techniques such as Newton's forward and backward difference formulas, and the trapezoidal and Simpson's rules.
23ETCU3P03.4	Apply vector calculus operations including gradient, divergence, and curl to analyze scalar and vector fields.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO 2	BTL
23ETCU3P03.1	3	3	2	3	2	-							-	-	II
23ETCU3P03.2	3	3	2	3	2	-							-	-	III
23ETCU3P03.3	2	3	2	3	2	-							-	-	IV
23ETCU3P03.4	2	3	2	3	-	2				2			-	-	III

Content	*Hrs.*
Unit 1: Linear differential Equations and Its applications Definitions, complete solutions, operator D, Rules for finding complementary functions, Inverse operator, Rules for finding the particular integral, Applications of linear Differential equations to oscillatory electrical circuit.	7
Unit 2: Laplace transform and Inverse Laplace transforms Introduction, Laplace transform of elementary functions, properties of Laplace transforms, Transforms of derivatives, Transforms of Integrals, Multiplication by t^n, Division by t, Evaluation of Integrals by Laplace transforms, inverse Laplace transforms definition, Inverse Laplace transform by partial fractions, Convolution theorem, Applications of Laplace transform to solve linear differential equations.	7
Unit 3: Numerical Differentiation and Integration Numerical differentiation – Newton's forward difference, Newton's backward difference, Central difference formula (Stirling's formula) Numerical Integration- Trapezoidal rule, Simpson's $1/3^{rd}$ and $3/8^{th}$ rule	7
Unit 4: Vector Calculus Introduction, Scalar and Vector point functions, vector operator Del applied to scalar point functions, Gradient Directional Derivative, Del applied to vector point functions, Divergence and Curl.	7
Unit 5: Z – Transform Introduction, Definition, Properties, z-transform of basic functions, z- transform of some standard discrete functions, Evaluation of inverse z- transform, Applications to difference equation	7

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Unit 6: Fourier series Introduction, Euler's formulae, conditions for a Fourier expansion ,Functions having points of discontinuity, change of interval, Expansion of odd or even periodic functions, Half range series.	7

Text Books:

1	Advanced Engineering Mathematics, Erwin Kreyszig Wiley Eastern Ltd. Publication,1st Edition,1978.
2	A Text Book Of Applied Mathematics, Vol I and II , P.N. and J.N. Wartikar, Vidyarthi Griha Prakashan, Pune, 2006.
3	Higher Engineering Maths, B.S.Grewal, Khanna Publication, 39th Edition, 2005.
4	Fundamental of Mathematical Statistics, Gupta and Kapoor

Reference Books:

1	Advanced Engineering Mathematics, Wylie C.R., Tata McGraw Hill Publication, 8th Edition,1999.
2	Advanced Engineering Mathematics, H.K. Dass, S. Chand and company Ltd., 1st Edition 1988.
3	An Introduction to probability and Statistics, Vijay Rohatgi,

Web links:

1. https://www.youtube.com/watch?v=lkAvgVUvYvY
2. https://www.youtube.com/watch?v=c9NibpoQjDk

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Electronics Circuits Analysis & Design – I Lab	
Course Code: 23ETCU3P04	**Semester: III**
Teaching Scheme: L-T-P: 0-0-2	**Credit: 1**
Evaluation Scheme: ISE Marks: NA	**INT Marks: 25, POE Marks: 25**

Lab Course Description:

This lab course aims to introduce students with basics of various electronic components and devices. It will also develop the capacity to analyze, interpret and design different electronics circuits among students.

Course Objectives:

1	To introduce the applications of diodes & passive components & ICs in DC power supply
2	To determine regulation of IC regulators
3	To introduce the applications of electronic components in wave shaping circuits
4	Provide an introduction and basic understanding of Semiconductor Devices viz. Diodes, BJT & JFET

Course Outcomes (COs):

At the end of the course the student should be able to:

23ETCU3P04.1	Design unregulated and regulated power to meet the required parameters
23ETCU3P04.2	Determine the line & load regulation of IC regulators
23ETCU3P04.3	Observe the performance of linear & non-linear Wave shaping Circuits
23ETCU3P04.4	Analyze the performance of biasing circuits using BJT or FET

Prerequisite:	Physics, Fundamentals of Electrical Electronics Engg. of First Year

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Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU3P04.1	2	2	1		2								2	2	IV
23ETCU3P04.2	2	2	1		2								2	2	IV
23ETCU3P04.3	2	2	1		2								2	2	II
23ETCU3P04.4	2	2	1		2								2	2	III

Course Content

List of Experiments			
Expt. No.	Name of Experiment	Type	Hrs.
1	Introduction to Analog Electronics Laboratory.	H/W	2
2	To design Canter tapped Full Wave Rectifier without & with filters	H/W	2
3	To design Bridge Rectifier without & with filters using simulator	S	2
4	To design Zener Shunt Regulator	H/W	2
5	To study Series, Pass Regulator	S	2
6	To determine line & load regulation for fixed IC regulator i.e./ 78XXC	H/W	2
7	To determine line & load regulation for adjustable IC regulator i.e./ LM317	H/W	2
8	To study the sinusoidal frequency response and square wave response of Low Pass Filter	H/W	2
9	To study the sinusoidal frequency response and square wave response of High Pass Filter using Simulator	S	2

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10	To design and observe input output variations for various Clipper Circuits	H/W	2
11	To design and observe input output variations for various Clamper Circuits using Simulator	S	2
12	To design Collector to base bias using Simulator for BJT	S	2
13	To design Voltage divider bias for BJT	H/W	2
14	To design Collector to voltage Divider bias using Simulator for FET using Simulator	S	2
15	To design Self bias for FET using Simulator	S	2

S: indicates Simulation type and H/W: indicates Hardware type,
Note: Subject in-charge should conduct any of the 10 experiments listed

Text Books:

1. Electronic devices & circuits, Allen Mottershed Prentice- Hall India
2. Electronic devices & circuits, J. Millman & C. Halkias, Tata Mc Graw Hill Publication
3. A Monograph on Electronics Design Principles N.C. Goyal & R.K. Khetan-Khanna Publishers

Reference Books:

1. Electronic devices & circuits, David A. Bell, Oxford University
2. Electronic devices & circuits', Salivahanan, N Sureshkumar, Tata McGraw Hill Publication
3. Electronic devices &circuit theory, Robert L. Boylsted, Louis Nashelsky, Pearson Education

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w.e.f. 2024-2025

Course Title: Analog & Digital Communication Lab	
Course Code: 23ETCU3P05	**Semester: III**
Teaching Scheme: L-T-P: 0-0-2	**Credit: 1**
Evaluation Scheme: ISE Marks: NA	**INT Marks: 25, POE Marks: 25**

Course Description: The Lab course includes experiments based on Analog & Digital Modulation Techniques. This course will help students to get practical exposure on actual working of transmission & reception of Analog & Digital Signal. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course) from the list or otherwise

Course Objectives:

1	To make the students understand the concept of Analog Modulation & Demodulation.
2	To make the students understand the concept of Digital Modulation & Demodulation.
3	To make the students understand the concept of baseband transmission & reception.
4	To make the students understand the concept of data formats used in digital communication systems, including their structures and applications.

Course Outcomes (COs):

At the end of the course the student will be able to

23ETCU3P05.1	Effectively modulate and demodulate analog signals with different modulation techniques.
23ETCU3P05.2	Effectively modulate and demodulate digital signals with different modulation techniques.
23ETCU3P05.3	Execute signal sampling and reconstruction processes, applying the Nyquist theorem to ensure accurate signal recovery.
23ETCU3P05.4	Utilize and evaluate pulse code modulation (PCM), delta modulation (DM), and adaptive delta modulation (ADM) techniques,

Course Articulation Matrix: Mapping of Laboratory Outcomes (LOs) with Program Outcomes (POs)

Course	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL

Outcomes (COs) / Program Outcomes (POs)/PSOs														
23ETCU3P05.1	2	1	1									2	2	III
23ETCU3P05.2	2	1	1									2	2	III
23ETCU3P05.3	2	1	1									2	2	III
23ETCU3P05.4	2	1	1									2	2	IV

List of Experiments			
Expt. No.	Name of Experiment	Type	Hours
1	To study Amplitude Modulation & Demodulation	O	2
2	To study Frequency Modulation & Demodulation	O	2
3	To study DSB Modulation & Demodulation	O	2
4	To study SSB Modulation & Demodulation	O	2
5	To study Pulse Amplitude Modulation & demodulation.	O	2
6	To study signal sampling & reconstruction	O	2
7	To study PCM Transmitter & Receiver	O	2
8	To study Delta Modulation & Demodulation	O	2
9	To study Adaptive Delta Modulation & Demodulation.	O	2
10	To Study different Data Formats.	O	2
11	To study ASK	O	2
12	To study FSK	O	2
13	To study PSK	O	2
14	To study PWM technique	O	2
15	Study of quantization noise measurement.	O	2

S-Study, O-Operational, Note: Subject in charge should conduct any of the 10 experiments listed

References:

1. B.P. Lathi, "Analog and Digital Communication", OXFORD University press.
2. Simon Haykin, "An introduction to analog & digital communications", John Wiley & Sons
3. R P Singh, S D Sapre 'Communication System-Analog & Digital' IInd Edition –Tata Mc Graw Hill Publication.
4. Louis E. Frenzel, "Principals of electronic communication system", III[rd] Ed., TMH Pub.

S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Society Based Mini Project	
Course Code: 23ETCU3F06	**Semester: III**
Teaching Scheme: L-T-P: 0-0-4	**Credits:2**
Evaluation Scheme: INT- 50	**ESE, POE Marks: NA**

Lab Course Description: This course gives introduction of electronic hardware systems and provides hands-on training with identification, testing, assembling, dismantling, and fabrication of societal electronics project.

Course Objective:

1	To design working, reliable electronic circuits to meet specifications
2	To understand concepts of interfacing different electronics peripherals.
3	To design and implement the solution using hardware / software or both
4	To create an interest in the field of electronic design as a prospective career option.

Course Outcomes (COs):

At the end of the course the student should be able to:

23ETCU3F06.1	Apply the fundamental concepts and working principles of electronics devices to design electronics circuits to solve Societal problems.
23ETCU3F06. 2	Analyze datasheets and select appropriate components and devices.
23ETCU3F06 .3	Develop simulation using software's.
23ETCU3F06. 4	Enable the Students to develop application-based projects and estimate project cost.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU3F06.1	3	-	-	-	-	-	-	-	-	-	-	-	2	2	III
23ETCU3F06.2	3	1	-	-	1	-	-	-	-	-	-	-	2	1	III
23ETCU3F06.3	3	2	3	-	3	-	-	-	-	-	-	-	1	2	VI
23ETCU3F06.4	3	2	3	-	3	-	-	-	3	-	-	-	2	2	VI

Sr. No.	**Mini project work should consist of following steps**
1	Students should propose societal problem-based project ideas & finalize the project idea in consultation with guide. (Problem statement).

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2	Students should submit implementation plan to the subject incharge. This will cover weekly activity of project report.
3	Problem definition and specification development in the form of synopsis.
4	Design of circuit with calculation & should include a) Analog part b) digital part c) Power supply d) Test strategy if firmware is required produce flow chart.
5	Simulation of design using tools like eSim, OrCAD, Matlab, etc.
6	Design calculation component selection.
7	Fabrication & assembly of PCB & enclosure.
8	Testing, Measurement of specifications & calibration.
9	Bill of Material.
10	Final Demo and Project Report.

References:

1. The First Book of Electronics Workshop: Can't Beat a Practical Approach - River Publishers Series in Communications.
2. Handbook of Electronic projects, by Arsath Natheem.
3. Fundamentals of Electrical Engineering – Bharati Dwivedi and AnurasgTripathi – Willey Precise
4. Electronics Devices and Circuit Theory- Robert L. Boylestad and Louis Nashelsky, Pearson Education Publication

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Digital Electronics (MDM-1)	
Course Code: 23ETCU3M07	**Semester: III**
Teaching Scheme: L-T-P: 2-0-0	**Credits: 2**
Evaluation Scheme: ISE: NA, MSE: NA	**ESE Marks: 50**

Course Description: This course provides a comprehensive exploration of digital logic design, covering combinational and sequential circuits, programmable logic devices (PLDs), and various logic families. Students gain practical skills in designing and analyzing circuits using advanced tools and methodologies, preparing them for real-world applications in digital system design and implementation.

Course Objectives:

1.	To design combinational logic circuits
2.	To analyze synchronous sequential circuits
3.	To implement logic circuits using PLDs
4.	To Compare different logic families

Course Outcomes (COs):

At the end of the course the student should be able to:

23ETCU3M07.1	Design and implement combinational logic circuits
23ETCU3M07.2	Analyze and synthesize synchronous sequential circuits
23ETCU3M07.3	Implement logic circuits using PLDs
23ETCU3M07.4	Compare different logic families

Prerequisite:	Basics of digital electronics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

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Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU3M07.1	3	2	3	2	2	-	-	-	-	-	-	-	2	1	III
23ETCU3M07.2	3	3	3	3	2	-	-	-	-	-	-	-	2	1	IV
23ETCU3M07.3	3	2	3	2	3	-	-	-	-	-	-	-	2	1	III
23ETCU3M07.4	2	2	2	2	2	-	-	-	-	-	-	-	2	1	II

Course Contents	Hrs.
Unit 1: Combinational Logic Circuits: Karnaugh maps simplification up to 6 variables, Quine-McCluskey Method, Parallel adder, BCD adder, code converters (binary to gray & gray to binary, BCD to Excess Barrel shifter, Magnitude Comparator, ALU.	7
Unit 2: Sequential Machines: Finite State Machines, Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo N –Counters. Finite state machine-capabilities and limitations, Mealy and Moore models	7
Unit 3: Programmable Logic Devices (PLDs): Introduction, ROM as a PLD, Programmable Logic Array (PLA), Programmable Array Logic (PAL), Features of PLD, Complex Programmable Logic Devices (CPLDs), Field Programmable Gate Array (FPGA). Architecture of Xilinx Spartan 3 FPGA, Architecture of Xilinx 9500 series CPLD	7
Unit 4: Logic Families and Interfacing: Logic families: Transistor – Transistor Logic, Complementary MOS (CMOS) Logic, Comparison of TTL and CMOS families. TTL NAND gate, Specifications, Noise margin, Propagation delay, fan-in, fan- out, Tristate TTL, ECL, CMOS families and their interfacing.	7

Text Book:

1. Fundamentals of Digital Circuits, Anand Kumar, PHI
2. Digital Design,3rd Edition, M. Morris Mano, PHI

Reference Books:

1. An Engineering Approach to Digital Design, Willim I. Fletcher, PHI/ Pearson
2. Digital Logic Design Principals, Norman Balabanian Bradle Carlson, Wiley Publication.

S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Personal Values and Ethics	
Course Code: 23ETCU3V08	**Semester: III**
Teaching Scheme: L-T-P :2-0-0	**Credits:2**
Evaluation Scheme: ISE: 20, MSE:30	**ESE Marks: NA**

Course Description:

This course introduces students to the ethical considerations and professional values necessary for a career in electronics engineering. It covers foundational principles, ethical decision-making frameworks, responsibilities towards society, and professional conduct.

Course Objectives:

1	Understand the importance of professional ethics in engineering.
2	Apply ethical decision-making frameworks to engineering scenarios.
3	Analyze case studies related to ethical dilemmas in E & TC engineering.
4	Develop awareness of societal responsibilities and environmental impact of electronic technologies.

Course Outcomes (COs):

At the end of the course the student should be able to:

23ETCU3V08.1	Identify and analyze ethical issues in electronics engineering practices.
23ETCU3V08.2	Apply ethical theories and principles to resolve ethical dilemmas.
23ETCU3V08.3	Evaluate the social and environmental impact of electronic technologies.
23ETCU3V08.4	Demonstrate awareness of professional codes of conduct and responsibilities.

Prerequisite:	Personal Communication

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)/PSOs	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
23ETCU3V08.1	2	3	1	-	-	3	-	3	-	1	-	-	1	1	IV
23ETCU3V08.2	2	3	1	-	-	3	-	3	-	1	-	-	1	1	III
23ETCU3V08.3	2	3	2	-	-	3	3	3	-	1	-	-	1	1	VI
23ETCU3V08.4	2	3	1	-	-	3	3	3	1	2	-	2	1	1	III

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Course Content

Content	Hrs.
Unit 1: Introduction to Professional Ethics Importance of ethics in engineering; Professional codes of conduct; Ethical theories and frameworks; Case studies on ethical issues in electronics engineering	7
Unit 2: Ethical Decision-Making Ethical decision-making models; Stakeholder analysis; Handling conflicts of interest; Case studies and role-play exercises	7
Unit 3: Societal Responsibilities Social impacts of electronic technologies; Environmental considerations; Sustainable engineering practices; Corporate social responsibility (CSR) in electronics industry.	7
Unit 4: Professional Conduct and Development Professional integrity and honesty; Career development and lifelong learning; Professional organizations and networking; Personal and professional growth in electronics engineering	7

Note: Subject in-charge should conduct any of the activities listed

List of Activities:

- Group discussions on case studies;
- Debates on ethical dilemmas;
- Guest lectures by industry professionals on CSR and environmental sustainability;
- Field visits to understand real-world implications of electronic technologies

Text Books:

1. "Engineering Ethics: Concepts and Cases" by Charles E. Harris Jr., Michael S. Pritchard, and Michael J. Rabins, Cengage Learning.
2. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger, McGraw-Hill Education.

Reference Books:

1. "Professional Ethics in Engineering" by William H. Frey and Christopher G. Brusaw, Pearson Education.
2. "Ethical Issues in Engineering" by Deborah G. Johnson and Helen Nissenbaum, IEEE Press.

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Open Elective Course -I (Basics of Arduino) ODL ONLY	
Course Code: 23ETCU3O09	**Semester: III**
Teaching Scheme: L-T-P: 2-0-0	**Credit: 3**
Evaluation Scheme: ISE+MSE Marks:20+30	**ESE Marks: 50**

Course Description:

This course provides a comprehensive introduction to electronic components, Arduino programming, and advanced interfacing techniques. Students will learn to write and upload sketches, interface with sensors and displays, integrate wireless communication, delve into assembly and C programming for AVR microcontrollers, and culminate in designing and executing Arduino-based projects, fostering creativity and practical problem-solving skills.

Course Objectives:

1.	To equip students with the knowledge of essential electronic components.
2.	To teach students how to use the Arduino platform effectively.
3.	To explore advanced techniques such as PWM, ADC, and seven-segment displays for more sophisticated input and output operations.
4.	To introduce wireless communication modules and their integration with Arduino for remote control and data transfer.
5.	To teach assembly and C programming for AVR microcontrollers, emphasizing optimization and advanced functionalities.
6.	To guide students in planning, designing, and executing a complete Arduino-based project, integrating skills learned throughout the course.

Course Outcomes (COs):

At the end of the course the student should be able to:

23ETCU3O09.1	Understand the importance of breadboards, wires, and connectors for prototyping circuits without soldering.
23ETCU3O09.2	Acquire a strong theoretical foundation in Arduino programming, including the use of the Integrated Development Environment (IDE).

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23ETCU3O09.3	Understand the significance of controlling devices like LCDs and Tricolor LEDs and how to program them effectively.
23ETCU3O09.4	Explore the principles of establishing communication over Wi-Fi and Bluetooth for IoT applications.
23ETCU3O09.5	Understand the advantages of mixing low-level assembly with high-level C code.
23ETCU3O09.6	Understand how to approach circuit design, code writing, and system testing with a focus on debugging and troubleshooting to ensure a project's success.

Prerequisite:	Knowledge of Basic Electronics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU3O09.1	3												2	2	II
23ETCU3O09.2	2				2								2	2	III
23ETCU3O09.3	2	2											2	2	IV
23ETCU3O09.4	2	2			2								2	2	IV
23ETCU3O09.5	2	2											2	2	IV
23ETCU3O09.6	2	2											2	2	VI

Course Contents	Hrs.
Unit 1: Introduction to Basic Components and Arduino: Functions and usage of Resistors, Capacitors, Diodes, Transistors, LEDs, Sensors Prototyping and creating circuits without soldering with the help of Breadboards, Wires, and Connectors, Introduction to Arduino: Overview of Arduino Platform, What is Arduino?, Types of Arduino boards (Uno, Mega, Nano), Understanding microcontrollers and their role in Arduino, Arduino Components and IDE: Microcontroller, digital and analog pins, power supply, communication ports, Setting up the (Integrated Development Environment) IDE, Writing, compiling, and uploading code (sketches)	7

Unit 2: Basic Programming and Interfacing First Arduino Program-Blink Program, Writing and understanding the "Blink" program, Functions: setup () and loop (), Arduino with Tricolor LED and Push Button- Tricolor LED, Connecting and programming a tricolor LED, Push Button- Using push buttons as digital inputs, Reading button states and controlling LED colors, Arduino with LCD (Liquid Crystal Display)-Connecting an LCD to Arduino, Using the Liquid Crystal library, Displaying text on the LCD	7
Unit 3: Display Counter using Arduino Counter Program-Incrementing and displaying a counter value, Using the Serial Monitor for output, Seven Segment Display- Seven Segment Display Basics, Understanding and wiring a seven-segment display, Programming digits on the display, Pulse Width Modulation (PWM)- PWM Basics, Understanding PWM, Controlling LED brightness and motor speed with PWM, Analog to Digital Conversion (ADC)-ADC Basics, Using analog sensors with Arduino, Reading analog values with analogRead()	7
Unit 4: Advanced Connectivity and Interfacing Wireless Connectivity to Arduino, Wireless Modules- Overview of ESP8266, Bluetooth, NRF24L01, Basic Setup and Communication- Example: Connecting to Wi-Fi using ESP8266, Establishing wireless communication	5
Unit 5: Intermediate Level Programming Assembly Programming through Arduino- AVR Assembly Language Writing and integrating assembly code with Arduino sketches, Digital Logic Design with Arduino- Digital Logic Gates, Implementing AND, OR, NOT gates using Arduino, AVR-GCC Programming through Arduino-AVR-GCC Compiler, Setting up AVR-GCC compiler, Writing C programs for AVR microcontrollers, Uploading and testing C programs on Arduino, Interfacing LCD through AVR-GCC Programming, LCD Interfacing- Interfacing an LCD using AVR-GCC, Writing and testing code to display text on LCD, Mixing Assembly and C Programming-Combining Assembly and C Code, Practical examples and applications, Benefits of mixed programming	9
Unit 6: Arduino Project Development Project Selection-Selecting a project idea based on interest and complexity, Project Planning and Requirements, gathering requirements and planning the project steps, Designing the Circuit and Writing the Code, Creating the circuit diagram, Writing and testing the code, Testing and Troubleshooting, Debugging and ensuring the project works as expected	7

Web Resources: -

https://spoken-tutorial.org/tutorial-search/?search_foss=Arduino&search_language=English

https://www.arduino.cc/

https://www.arduino.cc/en/software

https://onlinecourses.swayam2.ac.in/aic20_sp04/preview

https://docs.arduino.cc/learn/starting-guide/getting-started-arduino/

S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: OEC-1 Basics of Arduino Practical	
Course Code: 23ETCU3O10	**Semester: III**
Teaching Scheme: L-T-P: 0-0-2	**Credit: 1**
Evaluation Scheme: ISE: NA MSE: NA	**INT Marks: 25**

Course Description: This course provides a comprehensive introduction to electronic components, Arduino programming, and advanced interfacing techniques. Students will learn to write and upload sketches, interface with sensors and displays, integrate wireless communication, delve into assembly and C programming for AVR microcontrollers, and culminate in designing and executing Arduino-based projects, fostering creativity and practical problem-solving skills.

Course Objectives:

1.	To develop teamwork skills by engaging in collaborative activities and projects, fostering an essential competency for industrial and research environments.	
2.	To bridge theoretical knowledge with practical applications by integrating concepts from related courses to address industry-relevant challenges.	
3.	To enhance communication and presentation abilities through team-based presentations, preparing students for professional and academic scenarios.	
4.	To cultivate critical evaluation and peer learning by analyzing and assessing the work of other teams, promoting a culture of constructive feedback and continuous improvement.	

Course Outcomes (COs):

At the end of the course the student will be able to

23ETCU3O10.1	Understand and explore hardware components and their operation, including control mechanisms using relevant software tools.
23ETCU3O10.2	Apply theoretical knowledge from related courses to solve practical problems and meet industry requirements.
23ETCU3O10.3	Develop the ability to work collaboratively in teams, fostering essential skills for industrial and professional environments
23ETCU3O10.4	Enhance teamwork-based presentation skills, focusing on effective communication essential for research and industry settings.

Course Articulation Matrix: Mapping of Laboratory Outcomes (LOs) with Program Outcomes (POs)

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Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU3O10.1	2	1						3			2		2	2	II
23ETCU3O10.2	2	2	1		2			3			2		2	2	III
23ETCU3O10.3	2	2	1		2			3			2		2	2	IV
23ETCU3O10.4								3		3	3	3	2	2	IV

Content	Hrs.
This course is a project type. The plan of conducting this course is given below: **1. Team Formation** Form groups of 4–5 students. Assign roles **2. Problem Statement** Select a project topic from the list or propose a new idea (subject to faculty approval). Define a clear objective and scope for the project. **3. Circuit Design and Simulation** Design the circuit using theoretical concepts. Perform simulations using software tools (e.g., Arduino IDE). **4. Hardware Implementation** Assemble the circuit using appropriate components. Test and troubleshoot the circuit for functionality and performance. **5. Documentation** Prepare a detailed report that includes: Project title Objective and scope Circuit diagram and theoretical background Components used (with specifications) Procedure and observations Results and analysis Challenges faced and solutions Conclusion and future scope **6. Presentation** Create a concise 10-minute presentation with visuals to showcase your project. Include objectives, methodology, results, and challenges.	2

Each team member must contribute to the presentation.	

Web Resources: -

https://spoken-tutorial.org/tutorial-search/?search_foss=Arduino&search_language=English

https://www.arduino.cc/

https://www.arduino.cc/en/software

https://onlinecourses.swayam2.ac.in/aic20_sp04/preview

https://docs.arduino.cc/learn/starting-guide/getting-started-arduino/

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Second Year (B.Tech.) Curriculum

w.e.f. 2024-2025

Course Title: Financial Management	
Course Code: 23ETCU3H11	**Semester: III**
Teaching Scheme: L-T-P :1-0-0	**Credits: - 2**
Evaluation Scheme: ISE:25	**INT: 25**

Course Objectives:

1	Overview of Indian financial system, their instruments and market.
2	Basic concepts of Time Value of Money, returns and risks
3	Knowledge about of Corporate Finance & Capital Budgeting, NPV, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR)
4	Knowledge about sources of finance, capital structure, Trade Credit, Bank Finance, Commercial Paper, Project Finance.

Course Outcomes (COs):

At the end of the course the student will be able to:

23ETCU3H11.1	Understand Indian finance system and Financial Markets.
23ETCU3H11.2	Evaluate of Time Value of Money, returns and risks.
23ETCU3H11.3	Apply the knowledge of Corporate Finance & Capital Budgeting, NPV, MIRR, IRR
23ETCU3H11.4	Develop the knowledge about sources of finance & capital structure.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL

(COs) / Program Outcomes (POs)															
23ETCU3H11.1	2	2	1	1	1	-	-	-	-	-	1	-	1	1	II
23ETCU3H11.2	1	1	1	1	1	-	-	-	-	-	2	-	1	1	III
23ETCU3H11.3	2	2	1	1	1	-	-	-	-	-	2	-	1	1	III
23ETCU3H11.4	2	2	2	2	2	-	-	-	-	-	2	-	1	1	III

Content	Hrs.
Unit 1: **Overview of Indian Financial System** Characteristics, Components and Functions of Financial System. Financial Instruments — Equity Shares, Preference Shares, Bonds-Debentures, Certificates of Deposit, and Treasury Bills. **Financial Markets:** Capital Market, Money Market and Foreign Currency Market Financial Institutions- Commercial Banks, Merchant banks & Stock Exchanges.	4
Unit 2: **Concepts of Returns and Risks:** Measurement of Historical Returns and Expected Returns of a Single Security and a Two-security Portfolio; Measurement of Historical Risk and Expected Risk of a Single Security and a Two-security Portfolio. **Time Value of Money:** Future & present Value of a Lump Sum, Ordinary Annuity. Continuous Compounding and Continuous Discounting.	3
Unit 3: **Overview of Corporate Finance:** Objectives of Corporate Finance, Financial Ratio Analysis: Overview of Financial Statements— Balance Sheet, Profit and Loss Account, and Cash Flow Statement. **Capital Budgeting:** Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of	

Return (IRR), and Modified Internal Rate of Return (MIRR)	
Unit 4: **Sources of Finance:** Long Term Sources—Equity, Debt, and Hybrids; Mezzanine Finance; Sources of Short-Term Finance—Trade Credit, Bank Finance, Commercial Paper; Project Finance. **Capital Structure:** Factors Affecting an Entity 's Capital Structure; Overview of Capital Structure. Relation between Capital Structure and Corporate Value	3

Expt. No.	Name of Experiment	Hrs.
1	Find FRA, LR for following financial statements.	2
2	Find efficiency & activity ratio for following financial statements.	2
3	Find rate of return, PP, DPP for following financial statements.	2
4	Find net present value (NPV)for following financial statements.	2
5	Estimate the working capital for following different businesses.	2
6	Prepare a project report for any one business.	2
7	Illustrate bank project finance process in detail.	2
8	Income tax and PF calculation of employee.	2
9	Examples on balance sheet.	2
10	Visit to bank/industry to see FM strategies.	2

Reference Books:

1. Fundamentals of Financial Management, 13th Edition (2015) by Eugene F.Brigham and Joel F. Houston; Publisher: Cengage Publications, New Delhi.
2. Analysis for Financial Management, 10th Edition (2013) by Robert C. Higgins; Publishers:McGraw Hill Education, New Delhi.
3. Indian Financial System, 9th Edition (2015) by M. Y. Khan; Publisher: McGraw Hill.

Education, New Delhi.

4. Financial Management, 11th Edition (2015) by I. M. Pandey; Publisher: S. Chand (G/L) &Company Limited, New Delhi.
5. Financial Management: Theory and Practice Twelfth Edition Eugene F. Brigham and Michael C. Ehrhardt by Thomson.

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Semester-III

Course Title: Liberal Learning Course-I (Drone Club)	
Course Code: 23ETCU3C13	**Semester: III**
Teaching Scheme: L-T-P: 2-0-0	**Credits: Audit**
Evaluation Scheme: ISE: 50, MSE: NA	**ESE Marks: NA**

Course Description: This course imparts knowledge of drone parts and components and the principles of flying applied to the drone technology. It takes the technician through the process of understanding the setting up of drone parameters through the use of a simulator. It also imparts the knowledge related to performing testing and quality cheek on the drone prior to dispatch and commissioning of the Drone.

Aim:

1. Providing members with opportunities to learn about drone technologies, protocols, and applications through workshops, seminars, and online resources.

2. Encouraging members to explore and develop innovative drone projects, fostering creativity and problem-solving skills.

3. Facilitating collaboration among members to work on joint projects, share ideas, and build a supportive community.

4. Creating a platform for members to connect with industry professionals, researchers, and promoting the practical application of drone technology in various domains, encouraging them to work on real-world projects like agro drone, surviliience drone

5. Enhancing members' skills in programming, data analytics, hardware integration, and other relevant areas crucial for drone projects.

Course Objectives:

1	Understanding the components, operational basics of a Drone.
2	Understanding flying principles with a Drone flight Simulation
3	Performing Manufacture, Assembly, Testing and Quality check of the Drone
4	Commissioning of the Drone

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Course Outcomes (COs):

At the end of the course the student will be able to:

23ETCU3C13.1	To Understanding the components, operational basics of a Drone
23ETCU3C13.2	To Understanding Flying principles with a Drone flight Simulator
23ETCU3C13.3	To Performing Manufacture, Assembly, Testing and Quality check of the Drone

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU3C13.1	3	3			2								3	2	II
23ETCU3C13.2	3	2		3									3	2	III
23ETCU3C13.3	3		3	3	3								3	3	IV

Prerequisite: Basic knowledge of communication System & Circuit Designs

Contents	Hours
• Operational basics of a Drone • Flying principles with a Drone flight Simulator • Performing Manufacture, Assembly, Testing and Quality check of the Drone • Seminars • Workshops • Short courses • Certifications • Hackathons • Project competitions • Industrial Projects • Research and Development	30

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Evaluation Guidelines:

- Attendance: Regular attendance in Expert lectures, workshops, and club meetings.
- Engagement: Active participation in discussions, Q&A sessions, and group activities.
- Teamwork: Collaboration with peers on projects and challenges.
- Technical Proficiency: Ability to operate drone design, use relevant software and troubleshoot common issues.
- Project Execution: Successful completion of assigned projects and tasks within the given timeframe.
- Innovation: Demonstration of creativity and innovative thinking in project design and implementation.
- Event Participation: Involvement in organizing and participating in competitions. workshops, and awareness campaigns.
- Community Building: Contribution to building a supportive and collaborative club environment.
- Competition Performance: Participation and performance in internal and external competitions.
- Project Showcase: Presentation of completed projects during club meetings or events.
- Awards and Accolades: Recognition received for outstanding work and contributions.

Certification Levels:

1. Beginner Level Certification:

- Attend at least 75% of the boot camps and workshops.
- Complete a basic drone designs project (e.g., designing and implementing simple projects).
- Demonstrate understanding of basic drone concepts operations & their components

2. Intermediate Level Certification:

- Successfully complete multiple drone design projects, including a complex design.
- Participate in at least one internal competition or challenge.
- Show proficiency in troubleshooting and maintaining drone technology applications.

3. Advanced Level Certification:

- Lead a team in a major drone technology project or competition.
- Find and work on industrial consultancy & social Projects
- Organize or contribute significantly to a club event or workshop.
- Conduct a presentation or seminar on a specialized drone applications topic.
- Publish a Research Article in Journal or Conference.

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S. Y. B. Tech. Curriculum
w.e.f. 2024-2025
Semester-III

Course Title: Liberal Learning Course-II (Robotics Club)	
Course Code: 23ETCU3C14	**Semester: III**
Teaching Scheme: L-T-P: 2-0-0	**Credits: Audit**
Evaluation Scheme: ISE: 50, MSE: NA	**ESE Marks: NA**

Course Description:
The Robotics Club envisions a dynamic and collaborative environment where students passionately explore and advance the field of robotics. As a student-led initiative within the Electronics and Telecommunication Engineering Department, our mission is to foster innovation, learning, and competition in robotics. By providing structured activities such as boot camps, awareness sessions, and competitions, we aim to cultivate a profound understanding and practical expertise in robotics technologies among our members. Our ultimate goal is to empower students to become leaders in robotics, contributing to technological advancements and solving real-world challenges.

Aim:
1. Cultivate Interest and Enthusiasm: Inspire a passion for robotics among students.
2. Provide Hands-on Experience: Offer practical training with robotics technologies.
3. Encourage Innovation: Foster creativity in design and manufacturing processes.
4. Bridge Theory and Practice: Connect theoretical knowledge with real-world applications.
5. Build a Community. Create a network of individuals passionate about robotics.

Course Objectives:

1	Train students in both fundamental and advanced Robotics techniques.
2	Enable experienced members to guide beginners.
3	Motivate students to undertake cutting-edge projects and research.
4	Foster teamwork and collaborative problem solving through group projects and peer-to-peer learning sessions
5	Create connections with industry professionals and academic experts to enhance learning.
6	Acknowledge outstanding achievements in various robotics challenges.

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Course Outcomes (COs):

At the end of the course the student will be able to:

23ETCU3C14.1	Apply foundational knowledge in robotics, programming, and electronics to design and build functional robotic systems.
23ETCU3C14.2	Analyze and solve complex problems through hands-on projects and challenges in robotics.
23ETCU3C14.3	Collaborate effectively with team members, enhancing their communication and teamwork skills through group projects and competitions.
23ETCU3C14.4	Innovative and unique robotic solutions, contributing to advancements in the field.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU3C14.1	3		3		3	2							3	3	II
23ETCU3C14.2	3	3	3	3	2								2	3	III
23ETCU3C14.3	2								3	3			2	3	IV
23ETCU3C14.4	3	2	3	3	2								2	3	VI

Prerequisite: Basic knowledge of Electronics and telecommunication engineering and any programming language.

Contents	Hours
• Seminars • Workshops • Short courses • Certifications • Hackathons • Project competitions • Industrial Projects	30

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• Research and Development	

Evaluation Guidelines:

- Attendance: Regular attendance in Expert lectures, workshops, and club meetings.
- Engagement: Active participation in discussions, Q&A sessions, and group activities.
- Teamwork: Collaboration with peers on projects and challenges.
- Technical Proficiency: Ability to operate lot development boards, use relevant software and troubleshoot common issues.
- Project Execution: Successful completion of assigned projects and tasks within the given timeframe.
- Innovation: Demonstration of creativity and innovative thinking in project design and implementation
- Event Participation: Involvement in organizing and participating in competitions, workshops, and awareness campaigns.
- Community Building: Contribution to building a supportive and collaborative club environment.
- Competition Performance: Participation and performance in internal and external competitions.
- Project Showcase: Presentation of completed projects during club meetings or events.
- Awards and Accolades: Recognition received for outstanding work and contributions.

Certification Levels:

1. Beginner Level Certification:

- Attend at least 75% of the boot camps and workshops.
- Complete a basic robotics project (e.g. designing and assembling a simple robot).
- Demonstrate understanding of basic robotics concepts and equipment operation.

2. Intermediate Level Certification:

- Successfully complete multiple robotics projects, including a complex design.
- Participate in at least one internal competition or challenge.
- Show proficiency in troubleshooting and maintaining robotics equipment.

3. Advanced Level Certification:

- Lead a team in a major robotics project or competition,
- Organize or contribute significantly to a club event or workshop.
- Conduct a presentation or seminar on a specialized robotics topic.
- Publish a research article in a Journal or Conference.

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S. Y. B. Tech. Curriculum
w.e.f. 2024-2025
Semester-III

Course Title: Liberal Learning Course-III (IoT and Automation Club)	
Course Code: 23ETCU3C15	**Semester: III**
Teaching Scheme: L-T-P: 2-0-0	**Credits: Audit**
Evaluation Scheme: ISE: 50, MSE: NA	**ESE Marks: NA**

Course Description:
The club has vision to provide a platform for learning, networking, staying updated on the latest advancements in IoT and automation technology and explore, innovate, and collaborate on IoT-Automation related projects.

Aim:

1. Providing members with opportunities to learn about IoT technologies, protocols, and applications through workshops, seminars, and online resources.
2. Encouraging members to explore and develop innovative IoT and automation based projects, fostering creativity and problem-solving skills.
3. Facilitating collaboration among members to work on joint projects, share ideas, and build a supportive community.
4. Creating a platform for members to connect with industry professionals, researchers, and promoting the practical application of IoT and Automation in various domains, encouraging them to work on real-world projects.
5. Enhancing members' skills in programming, data analytics, hardware integration, and other relevant areas crucial for IoT and Automation development.

Course Objectives:

1	To better understand IoT and Automation technologies, applications, and their implications through workshops, seminars, and knowledge-sharing sessions.
2	Provide opportunities for members to acquire and enhance technical skills relevant to IoT including programming, hardware integration, and data analytics.
3	Encourage members to collaborate on IoT and Automation projects, enhancing

	teamwork and hands- on experience in developing real-world applications.
4	Promote a culture of innovation by supporting members in exploring new ideas, conducting research, and developing novel IoT and automation solutions.
5	Create a supportive community where members can share knowledge, seek advice. and collaborate on various IoT and Automation related endeavors.

Course Outcomes (COs):

At the end of the course the student will be able to:

23ETCU3C15.1	Understand IoT and Automation technologies and their applications.
23ETCU3C15.2	Implement the technical skills relevant to IoT and Automation.
23ETCU3C15.3	Analyze and solve the real world problem with innovative thinking.
23ETCU3C15.4	Create the systems by contributing and work as team member.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU3C15.1	3	3		2									3	2	II
23ETCU3C15.2	3	3	2	2	3								3	3	III
23ETCU3C15.3	3	3											2	3	IV
23ETCU3C15.4			3		3				3	3			2	3	VI

Prerequisite: Basic knowledge of programming, cloud computing, automation systems.

Contents	Hours
• Seminars • Workshops • Short courses • Certifications • Hackathons • Project competitions • Industrial Projects	30

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• Research and Development	

Evaluation Guidelines:

- Attendance: Regular attendance in Expert lectures, workshops, and club meetings.
- Engagement: Active participation in discussions, Q&A sessions, and group activities.
- Teamwork: Collaboration with peers on projects and challenges.
- Technical Proficiency: Ability to operate lot development boards, use relevant software and troubleshoot common issues.
- Project Execution: Successful completion of assigned projects and tasks within the given timeframe.
- Innovation: Demonstration of creativity and innovative thinking in project design and implementation
- Event Participation: Involvement in organizing and participating in competitions, workshops, and awareness campaigns.
- Community Building: Contribution to building a supportive and collaborative club environment.
- Competition Performance: Participation and performance in internal and external competitions.
- Project Showcase: Presentation of completed projects during club meetings or events.
- Awards and Accolades: Recognition received for outstanding work and contributions.

Certification Levels:

1. Beginner Level Certification:

- Attend at least 75% of the boot camps and workshops.
- Complete a basic robotics project (e.g. designing and assembling a simple robot).
- Demonstrate understanding of basic robotics concepts and equipment operation.

2. Intermediate Level Certification:

- Successfully complete multiple robotics projects, including a complex design.
- Participate in at least one internal competition or challenge.
- Show proficiency in troubleshooting and maintaining robotics equipment.

3. Advanced Level Certification:

- Lead a team in a major robotics project or competition,
- Organize or contribute significantly to a club event or workshop.
- Conduct a presentation or seminar on a specialized robotics topic.
- Publish a research article in a Journal or Conference.

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S.Y. B. Tech.

Structure and Curriculum Sem-IV

Department of Electronics & Telecommunication Engineering

w.e.f.A.Y.2024-25

D.Y. PATIL EDUCATION SOCIETY (Deemed to be University) Kasaba Bawada, Kolhapur 416 006 School of Engineering & Management KOLHAPUR

SEMESTER- IV

Course Code	Course Category	Course Type	Course Name	Teaching Scheme				Theory			Practical		
				Credits	L	P	T	ISE	MSE	ESE	INT	OE/PoE	
23ETCU4P01	Program Core Courses	PCC	Electronics Circuits Analysis & Design – II	3	3	-	-	20	30	50	-	-	100
23ETCU4P02			Signal & Systems	3	3	-	-	20	30	50	-	-	100
23ETCU4P03			Instrumentation & Control Systems	2	2	-	-	20	30	50	-	-	100
23ETCU4P04			Electronics Circuits Analysis & Design Lab. II	1		2	-	-	-	-	25	25	50
23ETCU4P05			Signal & Systems Lab	1		2	-	-	-	-	25	25	50
23ETCU4M06	Multidisciplinary Minor	MDM-2	Microcontrollers(CISC)	2	2	-	-	-	-	50	-	-	50
23ETCU4V07	Value Education Course	VEC (Environmental Study)	Environmental Study	2	2	-	-	-	-	50	-	-	50
23ETCU4H08	Humanities Social Science and Management	Entrepreneurship/Economics/ Management course	Industrial Management & Startups	2	2	-	-	20	30	-		-	50
23ETCU4A09	Ability Enhancement course	AEC	Electronics Workshop Practice	2	1	2	-	-	-	-	25	25	50
23ETCU4O10	Open Elective Course	OEC-II	Electronic Automation	2	2	-	-	-	-	50	-	-	50
23ETCU4N11	Vocational Skills Enhancement Course	VSEC	Model Based Programming & Simulation	2	1	2	-	25	-	-	25	-	50
23ETCU4D12	Mandatory Course	MC	Finishing School Training IV	Audit	2*	-	-	50	-	-	-	-	Grade
23ETCU4C13	Co-Curricular Activities	CCA	Liberal Learning-I	Audit	2#	-	-	50	-	-	-	-	Grade
23ETCU4C14			Liberal Learning-II		2#								
23ETCU4C15			Liberal Learning-III		2#								
			Total	**22**	**22**	**8**	**-**	**205**	**120**	**300**	**100**	**75**	**700**
23ETCU4Z01	Honors Courses/Double (Minor)	HC (Optional)	Honors Paper- I Electronics equipment integration and prototype building	04	3	2	-	20	30	50	-	25	125

*** - Values not included in total, # - 2 contact hrs per club**

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w.e.f. 2024-2025

Course Title: Electronics Circuits Analysis & Design – II	
Course Code: 23ETCU4P01	**Semester: IV**
Teaching Scheme: L-T-P :3-0-0	**Credit: 3**
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description: This course aims to provide the basic knowledge and analysis of electronic devices & basic circuit operation and the characteristics for various devices along with the basic designing parameters for different applications.

Course Objectives:

1	To develop h parameter model of amplifier along with its design
2	To study the behavior of amplifier at various frequencies
3	To analyze & design various types of amplifiers
4	To provide the basic knowledge of MOSFET to design Amplifier

Course Outcomes (COs):

At the end of the course the student will be able to:

PCCL204.1	Analyze the performance of amplifiers in different configuration in terms of h parameters and design single stage Amplifier
PCCL204.2	Develop the frequency response of single stage RC coupled amplifiers
PCCL204.3	Analyze & design Multistage, Feedback and Power Amplifiers
PCCL204.4	Develop fundamental knowledge of MOSFETS along with its biasing and design

Prerequisite:	Physics, EEE

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Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
PCCL204.1	3	3	3	2	2	-	1	2	2	2	1	2			IV
PCCL204.2	3	3	3	2	2	-	1	2	2	2	1	2			IV
PCCL204.3	3	3	3	2	2	-	1	2	2	2	1	2			IV
PCCL204.4	3	3	3	2	2	-	1	2	2	2	1	2			IV

Content	Hrs.
Unit 1: BJT and FET Amplifiers BJT: H-Parameters, Hybrid model for transistor and their approximate model (CE, CB & CC configuration), Study & Design of single stage RC coupled BJT.	7
Unit 2: Frequency Response Amplifiers **Low Frequency:** BJT (Common Emitter) Amplifier, Effect of coupling and bypass capacitors. **High Frequency:** Effect of Internal Transistor Capacitances, Common Emitter Hybrid πmodel, Common Emitter Short Circuit and resistive Current Gain, Gain Bandwidth Product,	7
Unit 3: Multistage Amplifiers Need of Cascading, Parameter evaluation such as Ri , R0, Av, Ai & Bandwidth for General Multistage Amplifier, Different Types of Coupling, Analysis of direct coupled & transformer coupled Amplifier.	7

Unit 4: Feedback Amplifiers General theory of feedback, reasons for negative feedback. Types of negative feedback in transistor circuits: Voltage series, Current series, Voltage shunt, Current shunt feedback amplifiers, Darlington pair, Darlington amplifier using bootstrapping principle, Design of Voltage series feedback amplifier	7
Unit 5: Analysis of Power Amplifiers Need of Power amplifier, classification of power amplifier, Power considerations, Distortion in power amplifiers: Phase, Frequency, amplitude/ harmonic / nonlinear distortion, Class A single ended transformer coupled amplifier& class A Push pull amplifiers analysis, Class B amplifier & class B push pull amplifier analysis, crossover distortion.	7
Unit 6: MOSFETS Construction, working and Characteristics of MOSFET, Small-Signal Equivalent Model, Analysis of Common Source (CS). Design of Common Source (CS) single stage MOSFET Amplifier,	7

Text Books:

1. Electronic devices & circuits, Allen Mottershed Prentice- Hall India
2. Electronic devices & circuits, J. Millman & C. Halkias, Tata Mc Graw Hill Publication
3. A Monograph on Electronics Design Principles N.C. Goyal & R.K. Khetan-Khanna Publishers

Reference Books:

1. Electronic devices & circuits, David A. Bell, Oxford University.
2. Electronic devices & circuits', Salivahanan, N Sureshkumar, Tata McGraw Hill Publication.
3. Electronic devices &circuit theory, Robert L. Boylsted, Louis Nashelsky, Pearson Education

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Course Title: Signals and Systems	
Course Code: 23ETCU4P02	**Semester: IV**
Teaching Scheme: L-T-P :3-0-0	**Credit: 3**
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description: This is prerequisite course for Digital Signal Processing. In this course, students will learn Different signals and systems and their properties. The various mathematical tools like Fourier Transform, Discrete Fourier Transform, Laplace Transform and Z-transform will be studied to analyze the signals.

Course Objectives:

1	Explain classification of continuous and discrete time signals and systems.
2	Demonstrate Analysis and Characterization of the CT and DT systems through Timedomain method.
3	Explain Characterization of the CT systems through Laplace, Z Transform and FourierTransform.
4	Explain Analysis and Characterization of the DT systems

Course Outcomes (COs):

At the end of the course the student will be able to:

23ETCU4P02.1	**Classify** different types of signals & systems.
23ETCU4P02.2	**Develop** total response of linear time invariant system by differential equations.
23ETCU4P02.3	**Construct** the signals using various operations
23ETCU4P02.4	**Solve** the response of linear systems in time domain.
23ETCU4P02.5	**Utilize** Fourier Transform technique for continuous & discrete signals.

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Prerequisite:	Applied Mathematics-II

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU4P02.1	2							2		2					II
23ETCU4P02.2	3	1						2		2					III
23ETCU4P02.3	3	1						2		2					III
23ETCU4P02.4	3	2						2		2					III
23ETCU4P02.5	3	2						2		2					iii

Content	Hrs.
Unit 1: Introduction to Signals: Signals, Continuous and discrete time signals, Standard test signals, Basic Operation on Signals Classification of Signals, Periodic aperiodic, even & odd energy and power signals, deterministic and random signals, complex exponential and sinusoidal signals, periodicity properties of discrete time signals, complex exponential, unit impulse, unit step, impulse functions	7
Unit 2: Time domain analysis of discrete and continuous time signals: Zero state response, Zero input response, Impulse response, Step response, Convolution sum and convolution integral, Graphical representation of convolution, Direct form I & direct form II. FIR and IIR systems	7

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Unit 3: System Analysis using Laplace transform: Introduction , ROC, S-plane, properties of Laplace and inverse Laplace transform, transfer function analysis, solution of LTI differential equation, Poles & Zeros, Analysis of electrical networks	7
Unit 4: System analysis using Z-transform: A brief introduction to Z–transform, its properties & inverse – Z transform ROC, connection between Laplace transform and Z–transform, transfer function analysis, solution of LTI difference equation, and stability in Z-domain.	7
Unit 5: Fourier analysis of continuous signals: Periodic representation by trigonometric Fourier series, Fourier spectrum, Fourier transform and its properties, Sampling Theorem, Nyquist criterion Relation between Fourier and Laplace Transform	7
Unit 6: Fourier analysis of discrete signal: Introduction, properties of D.T. F. T., relation between DTFT & Z-transform, , DFT,IDFT, DIT-FFT,DIF-FFT , IDFT using FFT algorithm	7

Text Books:

1. A.V. Oppenheim, A.S. Willsky, S.H. Nawab, Signals and Systems, Prentice Hall, 1997.
2. Simon Haykin, Barry Van Veen, Signals and systems, Wiley, 2003
3. Anand Kumar, "Signals & Systems", PHI

Reference Books:

1. B. P. Lathi, Linear systems and signals, Oxford University press, 2005
2. M. J. Roberts, Signals and systems, Tata Macgraw Hill,2005
3. Kumar, A. A. "Signals and Systems", PHI Learning Pvt. Ltd.
4. Ramesh Babu, R. Anandnatarajan, "Signals and Systems" 5th Edition, SCITECH.

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Course Title: Instrumentation & Control System	
Course Code: 23ETCU4P03	**Semester: IV**
Teaching Scheme: L-T-P: 2-0-0	**Credits: 2**
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**ESE Marks: 50**

Course Description:

Instrumentation and control system plays the primary role in the designing of control and instrumentation-based systems. In today's telecommunication world knowing physical parameter is very important to forecast certain things, and this is possible only when we study instrumentation and control system subject. The students will learn different types of sensors and actuators, and Virtual Instrumentation along with basic concepts of control systems.

Course Objectives:

1. To explain student with different types of sensors and transducers along with working principles.
2. To motivate students to study the electronic instruments & display devices.
3. To motivate students to study the time domain, frequency domain and stability of LTI systems.

Course Outcomes (COs):

At the end of the course the student will be able to:

PCCL206.1	Analyze and identify the instrument suitable for specific measurements.
PCCL206.2	Use and identify the basic principles of Transducers & Sensors.
PCCL206.3	Analyze and identify open loop & closed loop control systems.
PCCL206.4	Analyze the LTI system in time domain and frequency domain.
PCCL206.5	Test the stability of LTI system using conventional methods.

Prerequisites:	Students should know the differential mathematics; Laplace transform and basic electronic components

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Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs), Program Specific Outcomes (PSOs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
PCCL206.1	3	3	3	2	2	2	-	-	2	-	-	2			IV
PCCL206.2	3	2	2	2	2	1	-	-	2	-	-	1			II
PCCL206.3	3	2	2	2	2	-	-	-	2	-	-	1			IV
PCCL206.4	3	2	2	2	2	-	-	-	2	-	-	1			III
PCCL206.5	3	2	2	2	2	-	-	-	2	-	-	1			III

Contents	Hours
Unit 1: Transducers & Sensors Definition and Classification of Transducers & Sensors, Characteristics and Choice of Transducers, Potentiometer, Strain Gauges, RTD, Thermistor, Thermocouple, LVDT, Capacitive Transducer, Piezo-Electric Transducer, Photo Emissive Cell, Photoconductive Cell, Photovoltaic Cell, Photo Diode, Photo Transistor. **Magnetic sensors:** Proximity measurement Hall effect and Hall drive, performance characteristics.	7
Unit 2: Virtual Instrumentation: Introduction to virtual instrumentation, Role of Software in Virtual Instrumentation, Virtual Instrumentation with Lab VIEW, Components of Lab VIEW applications.	5
Unit 3: Dual trace, Dual beam CRO and Spectrum Analyzer Dual trace CRO block diagram, applications, differences between them,1X & 10X Probes, applications, Spectrum analyzer block diagram, applications & Wave analyzer block diagram, applications.	6
Unit 4: Introduction of Control system Introduction to open & close loop control systems, advantages, disadvantages & applications, Transfer function concepts, Block diagram algebra, and Signal flow graphs. Illustrative examples	7

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Unit 5: Time and Frequency Response Analysis Introduction, Standard test signals, Time response of first and second order systems for standard test inputs Performance indices, Frequency response of second order systems, bode plots, Assessment of relative stability–Gain Margin and Phase Margin, Illustrative examples.	6
Unit 6: Stability Analysis Concept of Stability in S domain, Classification of Stability, stability analysis by Hurwitz criterion and Routh array, determining range of K for stable operation. Illustrative examples.	5

Text Books:

1. Sawhney A.K., Electrical and Electronics Measurements and Instruments, Dhanpat Rai&Co.02ndEd.
2. W. D. Cooper & A. D. Helfrick, 'Electronic Instrumentation and Measurement Techniques', PHI, 4the/d,1987.
3. David Bell,' Electronic Instrumentation and Measurements',PHI,2e/d Ogata Katsuhiko,"Modern Control Engineering",5thEdition,PHI
4. NagrathI. J. and M.Gopal, "Control Systems Engineering",6th edition, New Age international
5. Dr.S.D.Bhide, R.A.Barapate, "Feedback Control Systems", 9th Revised Edition, Tech. Max Publications.
6. Ramesh Babu, R. Ananda Natarajan, "Control System Engineering", SCITECH Publications

Reference Books:

1. Hewlett Packard, Tektronics, Advantest, Aplab,"Application Notes on Measurement".
2. BouwensA.J., "Digital Instrumentation", McGraw-Hill, second edition.

TUTORIALS:

1. Minimum 12 tutorials should be conducted.
2. At least two tutorials on each topic
3. 50% Theoretical & 50% mathematical based tutorials should be conducted

List of tutorials:

Sr. No.	Name of Tutorial	Unit No.
1	Theoretical tutorial on transduces.	1
2	Theoretical tutorial on sensors.	1
3	Theoretical tutorial on Virtual Instrumentation.	2

4	Theoretical tutorial on Virtual Instrumentation.	2
5	Theoretical tutorial on dual trace Oscilloscope.	3
6	Theoretical tutorial on Spectrum Analyzer, Wave Analyzer.	3
7	Numerical on Transfer function.	4
8	Numerical on Block diagram algebra, and Signal flow graphs.	4
9	Numerical on Time response of first and second order systems for standard test inputs.	5
10	Numerical on Bode plots.	5
11	Numerical on relative stability–Gain Margin and Phase Margin.	6
12	Numerical on stability analysis by Hurwitz criterion and Routh array,	6

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Course Title: Electronics Circuits Analysis & Design – II Lab.	
Course Code: 23ETCU4P04	**Semester: IV**
Teaching Scheme: L-T-P :0-0-2	**Credit: 1**
Evaluation Scheme: ISE + MSE Marks: NA	**INT:25, POE: 25**

Course Description: The course includes experiments based on Transistor applications in Amplifiers. Various performance parameters are evaluated for Transistor and MOSFET.

Course Objectives:

1	To determine h parameters from the characteristics of CE amplifier
2	To observe the behavior of single stage amplifier at various frequencies
3	To make the students aware of the applications of electronic components such as Transistor and MOSFET
4	To develop the practical skills to study the performance of various amplifiers, their analysis & design

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Course Outcomes (COs):

At the end of the course the student will be able to:

PCCP204.1	Determine the h parameters from the characteristics of CE Amplifier
PCCP204.2	Apply the knowledge of transistor to observe the frequency response of single stage Amplifier
PCCP204.3	Design various amplifiers in simulators and using hardware
PCCP204.4	Design MOSFET Amplifier and observe it's characteristics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
PCCP204.1	3	3	3	2	2	-	-	2	2	2	-	1			II
PCCP204.2	3	3	3	2	2	-	-	2	2	2	-	1			III
PCCP204.3	3	3	3	2	3	-	-	2	2	2	-	1			III
PCCP204.4	3	3	3	2	2	-	-	2	2	2	-	1			III

List of Experiments			
Expt. No.	**Name of Experiment**	**Type Hours**	**Type Hours**
1	To determine h-parameters of single stage RC coupled amplifier from its characteristics using Simulator	S	2
2	To study frequency response of single stage RC coupled amplifier.	O	2

3	To design of single stage RC coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input	O	2
4	To study the behavior of single stage RC coupled Amplifier for Square Wave input	O	2
5	To observe effect of Negative feedback on gain and Bandwidth of single stage RC coupled amplifier.	O	2
6	To design of two stage RC coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input	O	2
7	To design of direct coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input with the help of Simulator	S	2
8	To design of voltage series feedback Amplifier and determine its bandwidth from frequency response without and with feedback	O	2
9	To simulate the Class A power amplifier and calculate the efficiency	S	2
10	To simulate the Class B Complementary Symmetry Amplifier and calculate the efficiency	S	2
11	To observe and plot the characteristics of MOSFET using Simulator	O	2
12	Design Common Source MOSFET Amplifier	O	2
13	Mini project based on Transistor application	O	6

S: Indicates Study type O: Operational type

Text Books:

1. Electronic devices & circuits, Allen Mottershed Prentice- Hall India
2. Electronic devices & circuits, J. Millman & C. Halkias, Tata Mc Graw Hill Publication
3. A Monograph on Electronics Design Principles N.C. Goyal & R.K. Khetan-Khanna Publishers

Reference Books:

1. Electronic devices & circuits, David A. Bell, Oxford University
2. Electronic devices & circuits', Salivahanan, N Sureshkumar, Tata McGraw Hill Publication

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Course Title: Signals and Systems Lab.	
Course Code: 23ETCU4P05	Semester: IV
Teaching Scheme: L-T-P :0-0-2	Credit: 1
Evaluation Scheme: ISE + MSE Marks: NA	INT:25, POE: 25

Course Description: The course includes experiments based on Transistor applications in Amplifiers. Various performance parameters are evaluated for Transistor and MOSFET.

Course Objectives:

1	Develop proficiency in using MATLAB for signal generation, manipulation, analysis, and visualization, including understanding and utilizing different operators and commands effectively.
2	Gain practical experience in generating and analyzing various types of continuous-time (CT) and discrete-time (DT) signals.
3	Apply Fourier series and Fourier transform techniques to analyze signals in both time and frequency domains.
4	Validate theoretical concepts such as the sampling theorem, Laplace transform (LT), and Z-transform (ZT) through practical experiments in MATLAB.

Course Outcomes (COs):

At the end of the course the student will be able to:

23ETCU4P05.1	Demonstrate proficiency in using MATLAB for signal generation, manipulation, analysis, and visualization.
23ETCU4P05.2	Analyze the characteristics of these signals in both time and frequency domains, including understanding the effects of sampling and aliasing.

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23ETCU4P05.3	Apply Fourier series and Fourier transform techniques to analyze signals.
23ETCU4P05.4	Apply their knowledge and skills acquired in MATLAB and SIMULINK to solve real-world signal processing and system analysis problems.

Prerequisite	Basic programming, MATLAB.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU4P05.1	3	3	3	3	3	1	1	2	2	2	1	2			II
23ETCU4P05.2	3	3	3	3	3	1	1	2	2	2	1	2			IV
23ETCU4P05.3	3	3	3	3	3	1	1	2	2	2	1	2			III
23ETCU4P05.4	3	3	3	3	3	2	1	2	2	2	1	2			III

List of Experiments			
Expt. No.	**Name of Experiment**	**Type Hours**	**Type Hours**
1	Introduction to simulation tools (MATLAB) for Signal & System Lab	S	2
2	Generation of elementary continuous and discrete time signals	O	2
3	Perform various operations on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.	O	2
4	Study of linear convolution and circular convolution	O	2
5	Compute auto correlation and cross correlation between signals	O	2
6	Perform waveform synthesis using Laplace Transform and Z Transform of a given signal	O	2

7	Locate the zeros and poles and plotting the pole zero maps in s-plane and Z-plane for the given transfer function	O	2
8	Study Fourier Transform of a given signal and plot its magnitude and phase spectrum	O	2
9	Calculate Discrete Fourier Transform and inverse Discrete Fourier Transform of given digital signal.	O	2
10	Verification of sampling signal	O	2
11	Introduction to SIMULINK.	O	2
12	Mini Project based on various Signals and Systems	O	2

S: Indicates Study type O: Operational type

Text Books:

1. A.V. Oppenheim, A.S. Willsky, S.H. Nawab, Signals and Systems, Prentice Hall, 1997.
2. Simon Haykin, Barry Van Veen, Signals and systems, Wiley, 2003

Reference Books:

1. B. P. Lathi, Linear systems and signals, Oxford University press, 2005
2. M. J. Roberts, Signals and systems, Tata Macgraw Hill,2005
3. Kumar, A. A. "Signals and Systems", PHI Learning Pvt. Ltd.
4. Ramesh Babu, R. Anandnatarajan, "Signals and Systems" 5th Edition, SCITECH.

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Course Title: Microcontrollers (CISC) (MDM-2)	
Course Code: 23ETCU4M06	**Semester: IV**
Teaching Scheme : L-T-P : 2-0-0	**Credit: 2**
Evaluation Scheme: ISE + MSE Marks: NA	**ESE Marks : 50**

Course Description: This course provides a comprehensive introduction to microcontrollers based on Complex Instruction Set Computing (CISC) architecture. Emphasis is placed on understanding the principles and practices of programming and interfacing CISC-based microcontrollers in practical applications.

Course Objectives:

1.	To understand the basic architecture of 8051 microcontroller.
2.	To program 8051 microprocessor using Assembly Level Language
3.	To understand interfacing and programming I/O devices
4.	To understand the operation and use of inbuilt Timers/Counters and Serial port of 8051.

Course Outcomes (COs):

At the end of the course the student should be able to:

MDML202.1	Identify features of 8051 microcontroller
MDML202.2	Write assembly language programs for given application
MDML202.3	Interface microcontroller with hardware for given application
MDML202.4	Configure and program the timers, counters, serial communication interfaces of the 8051 microcontroller for various applications.

Prerequisite	Basics of digital electronics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

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Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
MDM202.1	3	3	3	2	2	1	1	2	2	1	-	2			II
MDM202.2	3	3	3	2	2	1	1	2	2	1	-	2			II
MDM202.3	3	3	3	2	2	1	1	2	2	1	-	2			III
MDM202.4	3	3	3	2	2	1	1	2	2	1	-	2			III

Course Contents	Hrs.
Unit 1: The Microcontroller 8051 8051 Microcontroller: Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Internal Memory organization.	7
Unit 2: 8051 Instruction Set Addressing Modes, Data Transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Bit manipulation instructions. Simple Assembly language program examples (without loops) to use these instructions.	7
Unit 3: 8051 Stack, I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops. Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status..	7
Unit 4: 8051 Timers and Serial Port: 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode 2 on a port pin. 8051 Serial Communication- Basics of Serial Data Communication, Simple Serial Port programming in Assembly to transmit a message and to receive data serially..	7

Text Book:

1. The 8051 Microcontroller and Embedded Systems – using assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay Pearson, 2006

2. The 8051 Microcontroller, 3rd Edition Kenneth J. Ayala, Thomson/Cengage Learning

Reference Books:

1. The 8051 Microcontroller Based Embedded Systems, Manish K Patel, McGraw Hill, 2014
2. Microcontrollers: Architecture, Programming, Interfacing and System Design Raj Kamal, Pearson Education ,2005

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Course Title: Environmental Study	
Course Code: 23ETCU4V07	**Semester: IV**
Teaching Scheme: L-T-P: 2-0-0	**Credits: 2**
Evaluation Scheme: ISE—MSE Marks: NA	**ESE Marks: 50**

Course Description: The main objective of course is to create awareness among students regarding environmental issues and its impact on society. Knowledge regarding environmental components, its degradation and protection of environment is need for sustainable future ahead.

Course Objectives:

1. Understand the scope and importance of Environmental Studies and sustainable development.
2. Understand connection between environmental health and developmental activities
3. Understand the importance of Environmental Management for its protection through technical and legislative point of view
4. Acquire problem solving skills through visits to different locations, identifying the Environmental problems and proposing solution for societal benefits

Course Outcomes (COs):

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

VECL202.1	Understand the scope and importance of Environmental awareness and Sustainable development
VECL202.2	Understand various Environmental issues due to development

VECL202.3	Understand various modes of Environmental management through technoly and legislation
VECL202.4	Acquire problem solving attitude through actual field experience, reporting it in the form of Field project work.

Prerequisite:	Understanding of Environmental Education course

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSOs):

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
VECL202.1	-	-	-	-	-	3	3	2	2	2	1	2	-	-	II
VECL202.2	-	-	-	-	-	3	3	2	2	2	1	2	-	-	II
VECL202.3	-	-	-	-	-	3	3	2	2	2	1	2	-	-	III
VECL202.4	-	-	-	-	-	3	3	2	3	3	3	3	-	-	III

Content	Hours
Unit 1: Our Environment Introduction to Environment, Scope of Environmental studies, importance of environmental awareness, Concept of sustainability, Sustainable Development- history and Goals, environmental ethics, Sustainability ethics, Population growth of world and reduced health content of the environment.	5
Unit 2: Development and Environmental health **Natural resources:** Types (renewable and non-renewable), developmental benefits Forest- Benefits, problems (Deforestation), Biodiversity-- importance, threats, conservation Ecosystems- importance, problem associated with major ecosystems, ecological restoration Air- Benefits, problems (Pollution, climate change), Water- Benefits, problems (Depletion, pollution), Soil/ Land- Benefits, problems (Degradation, loss of fertility, desertification) Mineral- Benefits, problems (Mining, over exploitation, depletion, pollution), Energy resources- Benefits, problems (depletion, energy crisis)	9

Urbanization and Environmental health (2): Urban problems, Solid waste- Effects of MSW, Plastic waste, Hazardous waste, E- waste	
Unit 3: Environmental Management Renewable energy technologies- current, new (Bio gas, Bio fuel, hydrogen, etc) (1), Pollution abetment – 5R, ZLD, carbon credit, bio remedies (1), Soil/ land reclamation, Sustainable agriculture (1), Concept of EIA, Environmental audit, ISO certification (ISO 14001) (2), Role of CPCB and MPCB in Environmental protection of India (1), Emerging technologies for environmental management- GIS, Remote sensing, Smart bin, IoT integration, Waste-to-Energy Technologies, Recycling Automation, Advanced Data Analytics, Circular Economy Practices, Sustainable Packaging Solutions, Community Engagement and Education, Decentralized Waste Treatment, Zero-Waste Initiatives, Legislative and Regulatory Changes (2), Environmental legislation- Environmental Protection Act, Air Act, Water Act, Solid waste Management Act, Hazardous waste Management Rule, E- Waste (Management) Rules, 2022 (2)	**9**
Unit 4: Field project work Case studies based on site visit (Each candidate has to go for field visit and complete a project work on Environmental issues and probable solutions)	**5**

Text Books:

1. Handbook of Environmental Studies by Dr. G. R. Parihar, Publisher: Satyam Publishers and Distributors (1 January 2013), ISBN-10: 9382664408, ISBN-13 : 978-9382664406
2. Environmental Studies by Anubha Kaushik, New Age International Private Limited (1 January 2007), ISBN-10 : 8122422403, ISBN-13 : 978-8122422405
3. Introduction to Environmental Engineering and Science 3e, by Masters, Publisher : Pearson Education India; 3rd edition (1 January 2015), ISBN-10 : 9332549761, ISBN-13 : 978-9332549760
4. Solid Waste Management in developing countries, by Bhide A. D. and Sundersen B. B.- Indian National Scientific Documentation Centre, New Delhi.

Reference Books:

1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I &II, Environmental Media
2. Ecology and Environment Pb, by P. D. Sharma, Rastogi Publications (1 January 2011)

Online Resources:

1. Environmental English Book 1-3-2022 Final Corrected copy_compressed.pdf
2. Manual on Municipal Solid Waste Management- Ministry of Urban Development, Govt. of India

S.Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Name: Industrial Management and Start-ups	
Course Code: 23ETCU4II08	**Semester: IV**
Teaching Scheme: L-T-P :2-0-0	**Credits: 2**
Evaluation Scheme: ISE + MSE Marks: 20 + 30	**INT Marks: NA**

Course Description:

This course covers essential concepts in industrial management and entrepreneurship, including management principles, electronic product design and quality control, and entrepreneurial processes. It also addresses challenges and opportunities for MSMEs and start-ups, highlighting government schemes and incentives. Students will gain the skills to manage effectively and innovate within industrial and startup environments.

Course Objectives:

1	To understand the core principles and functions of management and their application in various organizational contexts.
2	To learn the comprehensive design process for electronic products, focusing on quality control and various design for Electronic system.
3	To understand the key elements of entrepreneurship and the processes involved in creating and managing a new business venture.
4	To gain knowledge about the challenges and support mechanisms for MSMEs and start-ups, including government schemes and the application process for proposals.

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Course Outcomes (COs):

At the end of the course the student should be able to:

HSSML202.1	Explain the fundamental principles of management and effectively analyze and apply these principles within an organizational setting.
HSSML202.2	Design electronic products that meet high standards of quality and reliability while considering factors like cost, manufacturability, and environmental impact.
HSSML202.3	Assess business opportunities, create viable business models, and develop strategies for launching and managing successful entrepreneurial ventures.
HSSML202.4	Identify the challenges of MSMEs, utilize government schemes effectively, and develop well-structured project proposals for new business start-ups.

Prerequisite:	Commercial aspects

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BT L
HSSML202.1	1	2	2	1	1	2	1	2	2	2	2	2	1	1	III
HSSML202.2	3	3	3	2	2	2	3	2	2	2	2	2	3	3	V
HSSML202.3	2	3	3	2	2	2	2	2	2	2	3	2	1	1	IV
HSSML202.4	2	3	3	2	2	2	2	2	2	2	3	2	1	1	III

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Content	Hrs.
Unit 1: Fundamentals of management History of industrial development, Introduction, Definition of management, characteristics of management, functions of management, Principles of Management, Administration and management, Nature and levels of management, managerial skills, managerial roles, Forms of Organization. Forms of ownerships introduction to Globalization.	7
Unit 2: Design Process & Quality Control for Electronic products General Electronic product Design, Process, Design for: Reliability (DFR), Security, Compliance, Supply Chain (DFSC), Cost, Assembly (DFA), Testability (DFT), Manufacturing (DFM), Serviceability (DFS), Environment, Recyclability, Disassembly & Serviceability, Energy Efficiency, Compliance, Managing for Quality in the Electronics Industry: product quality, reliability, availability, defect level	7
Unit 3: Fundamentals of Entrepreneurship Definition characteristics of entrepreneur Entrepreneurial traits, true motivation & leadership, understanding of the Entrepreneurial process, Opportunity assessment for new ventures, creating a business model with technology differentiators, launching and managing venture, Human resource aspects, understanding of personal aspirations, Entrepreneurial personality development, Entrepreneurial communication, determinants of winning business model, building a balanced team, and sources of capital for creating fixed and working assets including government incentives Entrepreneurship in Indian Scenario and Future prospects in India and emerging economies.	7
Unit 4: MSME, DPIIT and various government schemes for start-ups Challenges of MSMEs, Preventing Sickness in Enterprises Specific Management Problems; Industrial Sickness; Industrial Sickness in India Symptoms, process and Rehabilitation of Sick Units. Various schemes of government for new start-ups, Process of applying for MSME, SSI proposal and writing a project proposal for a new business start-up	7

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Reference Books:

1. Stephen P. Robbins, Mary, June 2016, "Fundamentals of Management 9th edition Pearson Education India.
2. Management: A Global, Innovative, and Entrepreneurial Perspective by Heinz Weihrich, Mark V.
3. Electronic Product Design by J. D. Andrews
4. Design for Manufacturability and Concurrent Engineering by David M. Anderson
5. Design for Reliability" by Dev G. Raheja and Louis J. Gullo

S. Y. B. Tech. Curriculum

w. e. f. 2024-2025

Course Title: Electronics Workshop Practice (Ability Enhancement Course)	
Course Code: 23ETCU4A09	**Semester: IV**
Teaching Scheme: L-T-P: 1-0-2	**Credit: 2**
Evaluation Scheme: ISE + MSE Marks: NA	**INT Marks: 25, POE Marks:25**

Course Description: This course gives introduction of electronic hardware systems and provides hands-on training with familiarization, identification, testing, assembling, dismantling, fabrication and repairing such systems by making use of the various tools and instruments available in the Electronics Workshop.

Course Objectives:

1.	To Identify and familiarize with the tools used in electronic shop.
2.	To enhance the knowledge of electronics components and their applications.
3.	To make students familiar with Interfacing of analog and digital electronics.
4.	To enable students to design & fabricate their own Hardware.

Course Outcomes (COs):

At the end of the course the student should be able to:

AECP201.1	Illustrate the different types of Electronics tools and their application.
AECP201.2	Analyze the working of semiconductor devices and their application.

AECP201.3	Integrate the knowledge of basic Sensors and digital electronics.
AECP201.4	Enable the Students to develop application-based micro-projects and estimate

Prerequisite:	Basics of digital electronics

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
AECP201.1	3	2	2	2	3	-	-	-	2	2	1	2	2	1	IV
AECP201.2	3	3	3	2	2	-	-	-	2	2	1	2	2	1	IV
AECP201.3	3	3	3	2	2	-	-	-	2	2	1	2	2	1	IV
AECP201.4	3	3	3	3	2	-	-	-	3	3	3	2	2	1	IV

Course Contents	Hrs.
Unit 1: Safety Measures Familiarization/Identification of electronic components with specification (Functionality, type, size, color coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals	2
Unit 2: Electronic Component Testing Testing of electronic components [Resistor, Capacitor, Diode, Transistor, UJT and JFET using multi-meter.] [Multi-meter, Function generator, Power supply, CRO etc.]	2
Unit 3: Applications of Diode and Transistor To familiarize with diode application like Reverse Current Protection Circuits, Logic Gates using diode, Voltage Multiplier etc. Applications of transistor like switch, transistor as driver, transistor as logic gates etc.	2

Unit 4: Applications of Sensor To familiarize with Sensors like IR Digital Sensor , Color IR Sensor, Light Sensor ,Sound Sensor, Ultrasonic sensor, moisture sensor etc.	2
Unit 5: PCB Design, Soldering and Circuit Simulation PCB Design using CAD, Types of soldering, Circuit Simulation using CAD.	2
Unit 6: Open Source Hardware Platforms Overview of Arduino, its Programming, Interfacing.	2

List of Experiments		
Expt. No.	**Name of Experiment**	**Hrs.**
1	To study Testing of Electronic components- resistors, capacitors, inductor, diode, transistor, LED and switches.	2
2	To study Testing of Electronic components- resistors, capacitors, inductor, diode, transistor, LED and switches using multi-meter & C.R.O.	2
3	Familiarization/Application of testing instruments and commonly used tools Multi-meter, Function generator, Power supply, CRO etc.	2
4	To familiarize with diode application like Reverse Current Protection Circuits, Logic Gates using diode, Voltage Multiplier	2
5	To familiarize with Transistor application like switch, transistor as driver, transistor as logic gates etc.	2
6	To familiarize with IC555 Timer application like Timer, LED flip flop, LED chaser or sequencer	2
7	To familiarize Logic gates & its applications like Burglar Alarm & Buzzers, Push button switches, lights ON/OFF, Digital Lock, Fire Alarm etc.	2
8	To Familiarize with PCB Design, Simulation of CAD	2
9	To familiarize with Arduino, Introduction to Arduino open source platform, Arduino Simulation software	2
10	To familiarize with Sensors like IR Digital sensor, Color IR sensor, Light sensor, Sound sensor, Ultrasonic sensor, Moisture sensor etc. & its interfacing to Arduino.	2
11	Development of Project to solve real world problem.	4

* Minimum 10 experiments and one Mini project should be performed to cover the entire curriculum of course.

Reference Books:

1. Fundamentals of Electrical Engineering, Bharati Dwivedi and Anurasg Tripathi, Wiley

Precise, 2013

2. Electronics Devices and Circuit Theory, Robert L. Boylestad and Louis Nashelsky, Pearson Education 2009

Web Resources:

https://archive.nptel.ac.in/courses/122/106/122106025/

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Electronic Automation (Open Elective Course-II)	
Course Code: 23ETCU4O10	Semester: IV
Teaching Scheme: L-T-P: 2-0-0	Credit: 2
Evaluation Scheme: Theory-ISE + MSE Marks: NA	ESE Marks: 50

Course Description: This course aims to acquaint students with vital components of automation such as motor control circuits, typical input/output devices, programmable logic controller (PLC), Distributed control circuit, supervisory control and data acquisition and Human machine interface. This will facilitate students to develop understanding and skills related with operation and maintenance of basic building of electronic automation, which will turn enable them to effectively upkeep the automated systems in industry.

Course Objectives:

1.	Understand the fundamentals and importance of Arduino
2.	Analyze different types of sensors and basic fundamentals of robots used in electronic automation
3.	Analyze to develop a PLC program for an automatic control system and its applications
4.	Understand the mechanism, architecture, working principles and applications of DCS and SCADA

Course Outcomes (COs):

At the end of the course the student should be able to:

23ETCU4O.1	Apply the concept and analyze the importance and application of Arduino
23ETCU4O.2	Describe different types of sensors and basic fundamentals of robot used in electronic automation modelling to design digital circuits
23ETCU4O.3	Demonstrate the PLC program for an automatic control system and its application design digital circuits
23ETCU4O.4	Analyze the concepts of DCS and SCADA

Prerequisite:	Basics of digital electronics

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Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU4O.1	3	3	3	2	3										III
23ETCU4O.2	3	3	3	2	2										III
23ETCU4O.3	3	3	3	2	3										IV
23ETCU4O.4	2	2	2	3	2										IV

Course Contents	Hrs.
Unit 1: Sensors used in electronic automation: Motion sensors, velocity and acceleration sensor, force and pressure sensors, position, displacement and level sensors, temperature and Acoustic sensor	7
Unit 2: Automation: Fundamentals of industrial automation, need and role of automation, evolution of automation. PLC introduction: types of processes, comparison, evolution of PLC, definition, functions, advantages, Architecture, DI-DO-AI-AO examples and ratings, I/O module, working of PLC, scan time **Robotic Automation**: Basic fundamentals of Robot, Robot structure and definition, classification of Robot, robot drives, robot controller, Robot sensors and vision system	7
Unit 3: PLC Programming: PLC programming: Development of Relay Logic Ladder Diagram, Introduction to PLC Programming, Programming devices.	7
Unit 4: SCADA System: Concept of SCADA systems, Programming techniques for : Creation of pages, Sequencing of pages, Creating graphics & animation, Dynamos programming with variables, Trending, Historical data storage & Reporting	7

Text Book:

Text Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Programmable Logic Controllers: Principles and Application	John Webb, Resis Ronald,	Prentice hall of india	Fifth	2007
02	Programmable Logic Controllers: Programming Methods and Applications	Hackworth	Pearson india	First	2008
03	Programmable Logic Controllers	Frank Petruzella	Elsevier India	Third	2007
04	Concept of SCADA System and its Evolution	Mini S. Thomas, John Douglas, McDonald	CRC Press	First	2015
05	Handbook of SCADA Control-System Security	Robert Radvonovsky, Jacob Brodsky	CRC Press	First	2013

Reference Books:

Reference Books:					
Sr. No	**Title**	**Author**	**Publisher**	**Edition**	**Year of Edition**
01	Programmable Controllers	Batten G. L	McGraw Hill Inc	Second	-
02	Real Time Computer Control	Bennett Stuart	Prentice Hall	First	1988
03	Measurement Systems	Doebelin E. O.	McGraw-Hill International Editions	Fourth	1990
04	Practical Modern SCADA Protocols	Gordan Clark, Deem Reynders	ELSEVIER	First	2004
05	Programmable Logic Controllers with Applications	P. K. Srivstava	BPB Publications	First	2004

Web Resources:

https://nptel.ac.in/courses/112105249

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Model Based Programming & Simulation	
Course Code: 23ETCU4N11	**Semester : IV**
Teaching Scheme : L-T-P : 1-0-2	**Credit: 2**
Evaluation Scheme : ISE Marks : 25	**INT Marks : 25**

Course Description:

This course will introduce students to computer programming and problem solving using Matlab. It is an introductory course for students aimed at developing their skill in scientific computing. Matlab is a language designed especially for processing, evaluating and graphical displaying of numerical data. The class is lab-focused, so students will spend much more time doing hands-on exercises in computer lab. There are no maths or programming prerequisites; however elementary skills in computer science will be an advantage.

Course Objectives:

1.	Write simple computer programs in MATLAB
2.	Apply the skills to evaluate scientific problems
3.	Provide a foundation in programming for engineering problem solving using the MATLAB

Course Outcomes (COs):

At the end of the course the student should be able to:

VSECP201.1	An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.
VSECP201.2	An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs
VSECP201.3	An ability to develop and conduct appropriate experimentation, analyze and
VSECP201.4	Students will have an understanding of various programming constructs and how they can be used to solve a computational problem.

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Prerequisite:	Basic knowledge of electronics components, software & Computer keys

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs) and Program Specific Outcomes (PSO)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
VSECP201.1	3	2	1	1	3	1							2	2	III
VSECP201.2	2	2	1	1	3	1							2	2	III
VSECP201.3	2	2	1	1	3	1							2	2	III
VSECP201.4	2	2	2	1	3	1	2	1	1	1	1	3	2	2	III

Course Contents	**Hrs.**
Unit 1 – Introduction to MATLAB Basic features, A minimum MATLAB session , Starting MATLAB, Using MATLAB as a calculator, Quitting MATLAB, Getting started : Creating MATLAB variables, Overwriting variable, Error messages, Making corrections, Controlling the hierarchy of operations or precedence, Controlling the appearance of floating point number, Managing the workspace, Keeping track of your work session, Entering multiple statements per line, Miscellaneous commands, Getting help	4
Unit 2 –MATLAB functions Mathematical functions, Basic plotting: overview, Creating simple plots, Adding titles, axis labels, and annotations, Multiple data sets in one plot, Specifying line styles	4

and colours, Matrix generation: Entering a vector, Entering a matrix, Matrix indexing, Colon operator, Linear spacing, Colon operator in a matrix, Creating a sub-matrix, Deleting row or column , Dimension, Continuation, Transposing a matrix, Concatenating matrices, Matrix generators, Special matrices, Arra operations and Linear equations:: Matrix arithmetic operations, Array arithmetic operations, Matrix functions, Matrix inverse	
Unit 3 **Introduction to programming in MATLAB** Introduction, M-File Scripts , M-File functions: Anatomy of a M-File function, Input and output arguments, Input to a script file, Output commands, Control flow and operators: Introduction , Control flow: The ''if...end'' structure, Relational and logical operators, The ''for...end'' loop, The ''while...end'' loop, Other flow structures, Operator precedence	4
Unit 4-**Debugging M-files** Introduction, Debugging process: Preparing for debugging, Setting breakpoints, Running with breakpoints, Examining values, Correcting and ending debugging, Ending debugging, Correcting an M-file, Summary of commands	4

List of Experiment

Experiment No.	Name of Experiment	S/O	Hours
1	Introduction to MATLAB Environment	S	2
2	Basic Arithmetic and Variables	O	2
3	Matrix Creation and Indexing	O	2
4	Array Operations (Element-wise Operations)	O	2
5	Plotting Basic Graphs	O	2
6	Using Functions and Scripts	O	2
7	Control Flow with Loops (For and While loops)	O	2

8	Control Flow with Conditional Statements (If-else)	O	2
9	Solving Equations using MATLAB	O	2
10	Vectorization in MATLAB	O	2
11	Basic Statistical Analysis	O	2
12	Basic File I/O Operations	O	2

(S: Study O: Operational)

Text Book:

1. Introduction to MATLAB for engineering students, School of Engineering and Applied Science (Northwestern University), David Houcque Northwestern University, August 2005
2. Automatic Control Systems, 8th edition, B. C. Kuo John wiley and son's, 2003

Reference Books:

1. Introduction to MATLAB for Engineers, 3rd Edition ,William J.Palm III , paperback 2008
2. MATLAB Programming for Engineers, 4th Edition, Stephen, J.Chapman paperback 2007, paperback Ogata
3. Modern Control Engineering., 3rd edition, Katsuhiko , Prentice Hall of India Pvt. Ltd.,1998 Modeling & Control of Dynamic Systems, Narciso F. Macia George J. Thaler, Thomson Publishers

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Kasaba Bawada, Kolhapur
Department of Electronics and Telecommunication Engineering

T.Y. B. Tech. Curriculum.e.f.A.Y.2024-2025
(As Per National Education Policy 2020)
Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5P01,** Digital System Design
Prerequisite/s			Basics of digital electronics
Teaching Scheme: Lecture/Tutorial/Practical			**03**/00/00
Credits			**03**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	**20/30/50**
	P	**INT / OE/POE**	00/00/00
		Total	**100**

Course Description: This course provides a foundational understanding of digital logic circuits and systems. It covers binary number systems, Boolean algebra, combinational and sequential logic design, including the analysis and design of various logic gates, flip-flops, counters, and finite state machines. The course also introduces different logic families and memory technologies.

Course Objectives:

1	Introduce fundamental concept of digital techniques.
2	Enhance basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
3	Conduct the analysis and design of various digital electronic circuits
4	Develop a skill to build and troubleshoot digital circuits.

Course Outcomes (COs):

At the end of the course the student will be able to:

1	Understand number systems and its arithmetic operations and Illustrate use of Boolean algebra.
2	Formulate and apply Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms
3	Design of combinational circuits like comparators multiplexers, de-multiplexers, encoder, decoder and different code converters.
4	Understand working of flip-flops, shift registers.
5	Design of sequential circuits like counters and FSM
6	Understand Memory and Programmable Logic Devices (PLDs)

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL

CO1	2	2	1	1	-	-	-	-	-	-	-	-	1	2	
CO2	2	2	1	1	-	-	-	-	-	-	-	-	-	-	
CO3	1	1	1	1	-	-	-	-	-	-	-	-	1	1	
CO4	1	1	1	1											
CO5	2	2	2	1	-	-	-	-	-	-	-	-	1	2	
CO6	1	1	2	2	-	-	-	-	-	-	-	-	-	-	

Content	Hrs.
Unit I: Binary Codes and Boolean algebra Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers, Subtraction using 2's complement method. Binary codes: weighted and non-weighted codes, self-complementary codes, BCD, Gray codes, Alphanumeric codes, ASCII Codes. Boolean algebra: Boolean Laws and Expression using Logic Gates, Realization of different gates using Universal gates, De-Morgan's Theorem, Duality Theorems.	7
Unit II: Boolean Function Minimization Techniques Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using logic gates, Propagation delay in logic gate. Karnaugh map: K-map, mapping and minimization of SOP and POS expression, Don't care condition, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits	7
Unit III: Combinational Logic Design: Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, 8 bit Arithmetic and logic unit, Parity Generator/Checker, Seven Segment display decoder	7
Unit IV: Sequential Logic Design: Latches, flip-flops: S-R, D, JK and Master-Slave JK FF, Edge triggered FF, Flip Flop conversion, Use of preset and clear, Excitation Table and characteristic equations for flip flops, and Conversion of flip flops, Timing parameters of FF, Shift registers (SISO, SIPO, PIPO, and PISO).	7
Unit V: Counters and Finite State Machines: Classification, Ripple or asynchronous counter, Effect of propagation delay in ripple counters, up-down counter, Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter. FSM, Moore/Mealy machines, state diagram, state table, state assignment and state reduction, Sequence detector.	7
Unit VI: Memory and Programmable Logic Devices: Introduction, Memory Hierarchy, RAM (Random Access Memory), Read Only Memory (ROM), Types of ROM, Cache Memory. read only memory, Overview of PLDs: PROM, PLA, PAL, GAL, CPLD, FPGA.	7

Text Books:

1	A. Anand Kumar 'Fundamentals of Digital Circuits'. PHI Publications

2	Anil K. Maini , "Digital Electronics: Principles and Integrated Circuits" 2nd Edition, Wiley India, 2017
3	R.P. Jain-'Modern Digital Electronics' IIIrd Edition- Tata Mc Graw Hill, Publication

Reference Books:

1	Zvi. Kohavi (2004), Switching and Finite Automata Theory, Tata McGraw Hill, India.
2	Donald D. Givone (2002), Digital Principles and Design, Tata McGraw Hill, India
3	Rajkamal 'Digital Systems Principals and Design' Pearson Education

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_ee39/preview

T.Y. B. Tech. Curriculum.e.f.A.Y.2024-2025
(As Per National Education Policy 2020)
Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5P02,** Linear Integrated Circuits
Prerequisite/s			Basic knowledge of Basic Electronics Engineering
Teaching Scheme: Lecture/Tutorial/Practical			**03**/00/00
Credits			**03**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	**20/30/50**
	P	**INT / OE/POE**	00/00/00
		Total	**100**

Course Description: This course provides a comprehensive study of linear integrated circuits, focusing on the design, analysis, and applications of operational amplifiers and other analog ICs. It covers internal circuit configurations, characteristics, and practical usage in signal processing, instrumentation, and control systems, preparing students for advanced analog electronic design.

Course Objectives:

1	Explain the internal circuit of the operational amplifier and its electrical parameters.
2	Discuss the importance of an Op-amp in building an analog computer.
3	Explain the application of Op-amps in building signal conditioning circuits, filters, waveform generators etc.
4	Develop practical skills for building and testing circuits using analog ICs.

Course Outcomes (COs):
At the end of the course the student will be able to:

1	Select an appropriate Op-amp for a particular application by referring data sheets.

2	Design Op-amp Op-amp-based circuit to give the specified gain.
3	Explain the frequency response characteristics of an amplifier using Op-amp.
4	Compute component values to design different Op-amp based circuits which include arithmetic building blocks, filters, waveform generators etc
5	Understand the functionalities of PLL and its use in various applications in communication and control systems
6	Understand the working and applications of IC555, IC565, and other special-purpose ICs

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
CO1	3	2	1	2	3			1	1	1	1	2	1		II
CO2	3	3	3	2	3		1			1	2	2	1	1	III
CO3	3	3	1	2	2		1			1		2	2	2	II
CO4	3	3	3	3	3		1			1	2	2	1		III
CO5	3	3	2	2	2		2			1	1	3			II
CO6	3	2	2	2	2		1			1	1	2			II

Content	Hrs.
Unit-I Introduction to op-amp Definition, symbol, Block diagram of OP-AMP, Explanations of each block, Differential Amplifier configurations, Differential amplifier analysis (AC & DC) for dual-input balanced-output configuration using 'r' parameters, level shifter, current mirror circuits, ideal parameters and practical parameters of OP-AMP and their comparison, internal circuit of IC741. detail circuit analysis of IC CA3140	7
Unit II: Actuators and mechanisms Virtual ground concept, Open loop configuration, closed loop configuration, unity gain amplifier, frequency Response of both configurations, Stability considerations, Frequency Compensation, Slew Rate.	7
Unit III: Applications of Op-amp Summing, Scaling & Averaging Amplifiers using Op-amps, Differential amplifier using op-amp, Subtractor Circuit, Instrumentation amplifier, V to I & I to V Converter, Precision Rectifiers, Log & Anti-log Amplifiers, Study of comparator, Schmitt Trigger, Window Detector, Clippers & Clampers, Peak Detectors, Sample & Hold Circuits.	6
Unit IV: Microprocessors and microcontrollers Introduction, Analysis & Design of Butterworth filters: High Pass filter, Low Pass filter (First & Second order), Band Pass filter, Band Reject filter, All Pass Filter, Introduction to Chebyshev Filter, notch filter.	7

Unit V: Waveform Generators Analysis & Design of Square wave generator, Triangular wave generator, Sawtooth wave generator. Analysis & Design of RC phase shift oscillator, RC wein bridge oscillator, Colpitts oscillator, Hartley oscillator..	6
Unit VI: Special purpose ICs IC 555 Timer: Block Diagram, Operating Principle, Multi-vibrator using IC 555. IC 565 PLL: Operating Principles, applications, Introduction of (block diagram, features, application areas) : IC OP177 opamp, IC AD620 instrumentation amplifier	6

Text Books:

1	Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education second and latest edition
2	Salivahanan and Kanchana Bhaskaran, "Linear Integrated Circuits", Tata McGraw Hill,India 2008

Reference Books:

1	Robert Coughlin, Fredric Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth edition, PE, 2006. (Ch-6)
2	David Bell, "Operational Amplifiers and Linear ICs", Third ed, Oxford University Press
3	B. Somanathan Nair, "Linear Integrated Circuits- Analysis, Design & Applications", Wiley India.
4	Datasheets

	Useful Links
1	https://www.youtube.com/watch?v=lpXNCwsnxjM&list=PLuv3GM6-gsE3npYPJJDnEF3pdiHZT6Kj3

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Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5P03,** Electromagnetic and Anntena Wave Prapogation
Prerequisite/s			A strong foundation in basic calculus (differential and integral) and vector algebra is essential.
Teaching Scheme: Lecture/Tutorial/Practical			**03/00/**00
Credits			**03**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	**20/30/50**
	P	**INT / OE/POE**	00/00/00
		Total	**100**

Course Description: This course introduces the fundamental mathematical and physical concepts of static and time-varying electromagnetic fields, culminating in the study of Maxwell's equations, wave propagation, and transmission lines. Students will learn to analyze electromagnetic phenomena and apply these principles to practical engineering problems.

Course Objectives:

1	To introduce the fundamental concepts of electromagnetic fields, including scalar and vector quantities.
2	To explain the principles governing electrostatic and magneto static fields.
3	To discuss the concepts of time-varying electromagnetic fields and Maxwell's equations.
4	To define the characteristics of plane electromagnetic waves in different media

Course Outcomes (COs):
At the end of the course the student will be able to:

CO1	Apply Vector Analysis to Electromagnetic Fields.
CO2	Analyze Static Electromagnetic Fields and Their Interactions with Materials.
CO3	Utilize Maxwell's Equations to Analyze Time-Varying Electromagnetic Phenomena and Wave Propagation.
CO4	Evaluate Transmission Line Characteristics and Their Applications.

Course Outcomes (COs) with Program Outcomes (POs):

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CO1	3	2	1	1	2	-	-	-					2	1	III

CO2	3	3	2	2	1	1	1	-					2	1	IV
CO3	3	3	2	2	2	1	1	-					2	1	IV
CO4	3	2	3	1	3	1	1	-					2	1	V

Content	Hrs.
Unit I: Fundamentals of Electromagnetic Fields Introduction and Significance of Electromagnetic Fields, Scalar, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems Line, surface and volume integrals Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Verify theorems, Curl of a vector field, Stoke's theorem, Verify theorems, Null identities, Helmholtz's theorem	6
Unit II: Static Electromagnetic Fields **Electrostatic Field:** Coulomb's Law, Electric Field Intensity, Electric Field due to Distributed Charges, Flux Density, Gauss Law and Applications, Divergence Theorem, Work Done, Electric Potential, Potential Gradient, Electric Dipole, Polarization, Electrostatic Energy Density, Boundary Conditions for Electrostatic Field. **Magnetostatic Field:** Biot-Savart Law, Ampere's Circuital Law and Application, Stoke's Theorem, Magnetic Flux Density, Magnetic Scalar & Vector Potential, Energy Stored in Magnetic Field, Boundary Conditions for Magnetic Field.	7
Unit III: Time-Varying Fields and Electromagnetic Waves Continuity Equation for Static Conditions, Displacement Current, Faraday's Law, Inconsistency of Ampere's Law, Maxwell's Equations in Point and Integral Form, Maxwell's Equations for Time Varying Fields, Wave Propagation in Perfect Dielectric, Lossy Dielectric and Conducting Media, Wave Equations for Sinusoidal Time Variations, Poynting Theorem and Power Flow in Electromagnetic Field, Skin Depth, Phase Velocity and Group Velocity.	7
Unit IV: Wire Antennas Antenna parameters, Linear Antennas, Infinitesimal dipole, small dipole, finite and half wave dipole, loop antenna. Antenna Arrays: Two element array, N-element array Uniform spacing and uniform non-uniform amplitude, binomial array, Dolph -Tschebyscheff's Array, planar and circular array.	6
Unit V: Aperture Antennas Circular Apertures, Rectangular Aperture, Horn Antenna: E-plane, HPlane pyramidal and conical horn antenna, Reflector Antennas: Plane Reflector, Corner reflector and Parabolic Reflector.	5
Unit VI: Travelling Wave Antennas Long wire, V Antenna, Rhombic Antenna, Broad band Antennas: Helical Antenna, Yagi-Uda of Linear elements, Yagi - Uda Array of Loops, Spiral Antennas, Log-Periodic Antenna. **Microstrip Antennas:** Basic Characteristics, feeding methods, methods of analysis, rectangular patch, circular patch, quality factor, bandwidth efficiency, input impedance, circular polarization, arrays and feed networks.	8

Text Books:

1	William Hayt, "Engineering Electromagnetics", Mc Graw Hill.
2	John. D. Kraus, "Antennas & Wave Propagation", Fifth Edition, Tata McGraw Hill.

3	C. A. Balanis, "Antenna Theory Analysis and Design", John Wiley.

Reference Books:

1	E.C. Jordan & K.G. Balmain, "Electromagnetic waves & Radiating Systems", Prentice Hall, India
2	K.D. Prasad, "Antenna & Wave Propagation" Satya Prakashan
3	G. S. N. Raju, "Antennas and Wave Propagation", Pearson Education.

	Useful Links
1	https://archive.nptel.ac.in/courses/108/106/108106073/
2	https://archive.nptel.ac.in/courses/108/104/108104099/

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Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5P04,** Digital System Design Lab.
Prerequisite/s			Basics of digital electronics
Teaching Scheme: Lecture/Tutorial/Practical			00/00/02
Credits			**01**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	00/00/00
	P	**INT / OE/POE**	**25/00/25**
		Total	**50**

Course Description: This laboratory course focuses on the practical design and implementation of fundamental digital logic circuits. Students will gain hands-on experience with combinational and sequential logic, including gates, adders, subtractors, multiplexers, decoders, flip-flops, and various counter types.

Course Objectives:

1	Introduce fundamental concept of digital techniques.
2	Enhance basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
3	Conduct the analysis and design of various digital electronic circuits
4	Develop a skill to build and troubleshoot digital circuits.

Course Outcomes (COs):

At the end of the course the student will be able to:

1	Understand number systems and its arithmetic operations and Illustrate use of Boolean algebra.
2	Formulate and apply Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms
3	Design of combinational circuits like comparators multiplexers, de-multiplexers, encoder, decoder and different code converters.
4	Understand working of flip-flops, shift registers.
5	Design of sequential circuits like counters and FSM.
6	Understand Memory and Programmable Logic Devices (PLDs).

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
CO1	2	2	1	1	-	-	-	-	-	-	-	-	1	2	II

CO2	2	2	1	1	-	-	-	-	-	-	-	-	-	-	III
CO3	1	1	1	1	-	-	-	-	-	-	-	-	1	1	III
CO4	1	1	1	1											II
CO5	2	2	2	1	-	-	-	-	-	-	-	-	1	2	III
CO6	1	1	2	2	-	-	-	-	-	-	-	-	-	-	II

List of Experiments	
Exp. No.	**Name of Experiment**
1	Design and implementation of basic logic gates
2	Design and implementation of basic Universal Logic Gates (NOR, NAND)
3	Design and implementation of K map based combinational logic.
4	Design and implementation of half adders, full adders
5	Design and implementation of half subtractor, full subtractor
6	Design and implementation of Study of 7 segment decoder
7	Design and implementation Multiplexers
8	Design and implementation De-multiplexer
9	Design and implementation of D, T, SR, JK Flip-flops
10	Design and implementation of SISO, SIPO, PIPO, and PISO Shift Registers
11	Design and implementation of MOD N counter
12	Design and implementation of Johnson Counter

Text Books:

1	A. Anand Kumar 'Fundamentals of Digital Circuits'. PHI Publications
2	Anil K. Maini , "Digital Electronics: Principles and Integrated Circuits" 2nd Edition, Wiley India, 2017
3	R.P. Jain-'Modern Digital Electronics' IIIrd Edition- Tata Mc Graw Hill, Publication

Reference Books:

1	Zvi. Kohavi (2004), Switching and Finite Automata Theory, Tata McGraw Hill, India.
2	Donald D. Givone (2002), Digital Principles and Design, Tata McGraw Hill, India
3	Rajkamal 'Digital Systems Principals and Design' Pearson Education

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_ee39/preview

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Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5P05,** Linear Integrated Circuit Lab
Prerequisite/s			Basic knowledge of Basic Electronics Engineering
Teaching Scheme: Lecture/Tutorial/Practical			00/02/00
Credits			**01**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	00/00/00
	P	**INT / OE/POE**	**25/00/25**
		Total	**50**

Course Description: This course provides a comprehensive study of linear integrated circuits, focusing on the design, analysis, and applications of operational amplifiers and other analog ICs. It covers internal circuit configurations, characteristics, and practical usage in signal processing, instrumentation, and control systems, preparing students for advanced analog electronic design.

Course Objectives:

1	Explain the internal circuit of the operational amplifier and its electrical parameters.
2	Discuss the importance of an Op-amp in building an analog computer.
3	Explain the application of Op-amps in building signal conditioning circuits, filters, waveform generators etc.
4	Develop practical skills for building and testing circuits using analog ICs.

Course Outcomes (COs):

At the end of the course the student will be able to:

1	Select an appropriate Op-amp for a particular application by referring data sheets.
2	Design Op-amp Op-amp-based circuit to give the specified gain.
3	Explain the frequency response characteristics of an amplifier using Op-amp.
4	Compute component values to design different Op-amp based circuits which include arithmetic building blocks, filters, waveform generators etc
5	Understand the functionalities of PLL and its use in various applications in communication and control systems
6	Understand the working and applications of IC555, IC565, and other special-purpose ICs

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO 2	BTL
CO1	3	2	1	2	3			1	1	1	1	2	1		II
CO2	3	3	3	2	3		1			1	2	2	1	1	III
CO3	3	3	1	2	2		1			1		2	2	2	II
CO4	3	3	3	3	3		1			1	2	2	1		III
CO5	3	3	2	2	2		2			1	1	3			II
CO6	3	2	2	2	2		1			1	1	2			II

List of Experiments	
Expt. No.	**Name of Experiment**
1	Study of Inverting amplifier for DC & AC inputs using Opamp
2	Study of Non-Inverting amplifier for DC & AC inputs using opamp
3	Frequency Response of Inverting & Non-Inverting amplifier using opamp
4	Study of op-amp as Summing, Scaling, & Averaging amplifier in Inverting & Non-Inverting
5	Study of V-I & I-V Converter
6	Study of Schmitt Trigger using opamp & Window detector using opamp
7	Study of Comparator & Zero Crossing Detector using opamp
8	Study of Butterworth Filter using opamp
9	Study of Triangular & square wave generator using opamp
10	Design of IC 555 Timer as Astable & Monostable Multivibrator
11	Study of IC NE 565 PLL 15.
12	Study of Wein Bridge Oscillator using opamp.
13	Study of Function Generator using IC 8038

Text Books:

1	Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education second and latest edition
2	Salivahanan and Kanchana Bhaskaran, "Linear Integrated Circuits", Tata McGraw Hill,India 2008

Reference Books:

1	Robert Coughlin, Fredric Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth edition, PE, 2006. (Ch-6)

2	David Bell, "Operational Amplifiers and Linear ICs", Third ed, Oxford University Press
3	B. Somanathan Nair, "Linear Integrated Circuits- Analysis, Design & Applications", Wiley India.
4	Datasheets

	Useful Links
1	https://www.youtube.com/watch?v=lpXNCwsnxjM&list=PLuv3GM6-gsE3npYPJJDnEF3pdiHZT6Kj3

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Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5P06,** Electromagnetic and Antenna Wave Propagation Lab
Prerequisite/s			Basic knowledge of Basic Electronics Engineering
Teaching Scheme: Lecture/Tutorial/Practical			00/00/02
Credits			**01**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	00/00/00
	P	**INT / OE/POE**	**25**/00/00
		Total	**25**

Course Description: This course introduces the fundamental mathematical and physical concepts of static and time-varying electromagnetic fields, culminating in the study of Maxwell's equations, wave propagation, and transmission lines. Students will learn to analyze electromagnetic phenomena and apply these principles to practical engineering problems.

Course Objectives:

1	To introduce the fundamental concepts of electromagnetic fields, including scalar and vector quantities.
2	To explain the principles governing electrostatic and magneto static fields.
3	To discuss the concepts of time-varying electromagnetic fields and Maxwell's equations.
4	To introduce the fundamental concepts of electromagnetic fields, including scalar and vector quantities.

Course Outcomes (COs):

At the end of the course the student will be able to:

1	Apply Vector Analysis to Electromagnetic Fields.
2	Analyze Static Electromagnetic Fields and Their Interactions with Materials.
3	Utilize Maxwell's Equations to Analyze Time-Varying Electromagnetic Phenomena and Wave Propagation.
4	Evaluate Transmission Line Characteristics and Their Applications.

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO 2	BTL
CO1	3	2	1	1	2	-	-	-					2	1	III
CO2	3	3	2	2	1	1	1	-					2	1	IV
CO3	3	3	2	2	2	1	1	-					2	1	IV

CO4	3	2	3	1	3	1	1	-					2	1	V

List of Experiments	
Expt. No.	**Name of Experiment**
1	Write MATLAB program to simulate the radiation pattern of Hertzian Dipole antennas
2	Write MATLAB program to simulate the radiation pattern of Finite Length Dipole antennas
3	Write MATLAB program to simulate the radiation pattern of Half Wave Dipole antennas
4	Carry out the Far Field Measurements and Plot the Radiation pattern and find the directivity, gain, effective length for the Half wave dipole
5	Carry out the Far Field Measurements and Plot the Radiation pattern and find the directivity, gain, effective length for the Helix Antenna
6	Write Program for Antenna arrays to plot the radiation pattern for End-Fire, Broadside, Binomial, Tschebyshev"s
7	To measure the gain and E-plane/H-plane beamwidths of a pyramidal or conical horn antenna.
8	To study the directive properties, gain, and front-to-back ratio of a Yagi-Uda antenna.
9	Measurement of radiation pattern of 3 element Yagi-UDA antenna
10	Measurement of radiation pattern of 5 element Yagi-UDA antenna
11	Measurement of radiation pattern of 7 element Yagi-UDA antenna

Text Books:

1	William Hayt, "Engineering Electromagnetics", Mc Graw Hill.
2	John. D. Kraus, "Antennas & Wave Propagation", Fifth Edition, Tata McGraw Hill.
3	C. A. Balanis, "Antenna Theory Analysis and Design", John Wiley.

Reference Books:

1	E.C. Jordan & K.G. Balmain, "Electromagnetic waves & Radiating Systems", Prentice Hall, India
2	K.D. Prasad, "Antenna & Wave Propagation" Satya Prakashan
3	G. S. N. Raju, "Antennas and Wave Propagation", Pearson Education.

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_ee83/preview
2	https://onlinecourses.nptel.ac.in/noc20_ee20/preview

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Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5M07,** Microcontrollers(RISC)
Prerequisite/s			A foundational understanding of digital electronics and basic programming concepts
Teaching Scheme: Lecture/Tutorial/Practical			**03/--/--**
Credits			**03**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	**20/30/50**
	P	**INT / OE/POE**	--/--/--
		Total	**100**

Course Description: This course explores RISC microcontroller architectures, contrasting them with CISC designs, and delves into the specifics of AVR and ARM Cortex-M series microcontrollers. Students will gain practical skills in programming and interfacing these devices with essential peripherals for embedded system applications.

Course Objectives:

1	Explain the fundamental architectural differences between CISC and RISC microcontrollers
2	Demonstrate the architecture, instruction set, and programming.
3	Describe the key features of ARM Cortex-M series microcontrollers.
4	Illustrate the principles and practical implementation of interfacing various peripherals

Course Outcomes (COs):
At the end of the course the student will be able to:

1	To compare and contrast CISC and RISC architectures
2	To program AVR microcontrollers (e.g., ATmega328) in both assembly and C
3	To explain the architectural components, memory map, and interrupt handling mechanisms
4	To design and implement interfacing solutions for various peripherals

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
CO1	3	1	-	-	-	-	-	-	-	-	-	1			II

CO2	3	2	2	-	3	-	-	-	-	1	-	2			III
CO3	3	1	-	-	-	-	-	-	-	-	-	1			II
CO4	3	3	3	2	3	1	-	-	1	1	1	2			III

Content	Hrs.
Unit 1: Introduction to Microcontrollers & RISC Architecture Comparison between CISC and RISC architectures, Harvard vs Von Neumann architecture, Overview of RISC microcontrollers (e.g., ARM, AVR, PIC), Features and advantages of RISC-based microcontrollers, Introduction to Embedded Systems & Applications.	7
Unit 2: AVR Microcontroller Architecture (e.g., ATmega328) Pin configuration and architecture, I/O ports and memory organization, Instruction set (RISC format), addressing modes, Programming using assembly and C	7
Unit 3: ARM Cortex-M Series Microcontroller ARM Cortex-M series overview (Cortex-M0/M3/M4), Registers, pipeline, and exceptions, NVIC (Nested Vector Interrupt Controller), Memory map, bit-banding, Thumb instruction set	7
Unit 4: Peripherals and Interfacing (RISC-Based MCUs) Timers and Counters, ADC/DAC interfacing, Serial communication protocols: UART, SPI, I2C, GPIO programming, PWM, DC motor, and servo motor control	7

Text Books:

1	"The AVR Microcontroller and Embedded Systems" – Mazidi, Naimi, & Mazidi
2	"ARM System Developer's Guide" – Andrew Sloss

Reference Books:

1	"Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C" – Yifeng Zhu
2	Datasheets: ATmega328P, STM32F103, ARM Cortex-M series

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_ee12/preview

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Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5M08,** Microcontrollers(RISC)-Lab
Prerequisite/s			A foundational understanding of digital electronics and basic programming concepts
Teaching Scheme: Lecture/Tutorial/Practical			00/00/**02**
Credits			**01**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	00/00/00
	P	**INT / OE/POE**	**25**/00/00
		Total	**25**

Course Description: This course explores RISC microcontroller architectures, contrasting them with CISC designs, and delves into the specifics of AVR and ARM Cortex-M series microcontrollers. Students will gain practical skills in programming and interfacing these devices with essential peripherals for embedded system applications.

Course Objectives:

1	Explain the fundamental architectural differences between CISC and RISC microcontrollers
2	Demonstrate the architecture, instruction set, and programming.
3	Describe the key features of ARM Cortex-M series microcontrollers.
4	Illustrate the principles and practical implementation of interfacing various peripherals

Course Outcomes (COs):

At the end of the course the student will be able to:

1	To compare and contrast CISC and RISC architectures
2	To program AVR microcontrollers (e.g., ATmega328) in both assembly and C
3	To explain the architectural components, memory map, and interrupt handling mechanisms
4	To design and implement interfacing solutions for various peripherals

Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO 2	BTL
CO1	3	1	-	-	-	-	-	-	-	-	-	1			II

CO2	3	2	2	-	3	-	-	-	-	1	-	2			IV
CO3	3	1	-	-	-	-	-	-	-	-	-	1			II
CO4	3	3	3	2	3	1	-	-	1	1	1	2			II

List of Experiments	
Expt. No.	**Name of Experiment**
1	Overview of popular microcontroller simulators (MPLAB X Simulator, Proteus, Keil µVision Simulator, AVR Studio Simulator)
2	Basic I/O Simulation Simulate LED blinking program using GPIO pins
3	Delay Generation Implement software delay using loops
4	Timer Simulation Configure timers in simulation
5	Interrupt Simulation Enable and simulate external interrupt on pin change
6	ADC Simulation Simulate analog input readings using ADC modules (in simulators supporting analog models)
7	Serial Communication Simulation Simulate UART transmission and reception
8	Peripheral Interfacing Simulation LCD display simulation (16x2 LCD)
9	Mini Project Integrate multiple modules: e.g., sensor data acquisition + display + communication

Text Books:

1	"The AVR Microcontroller and Embedded Systems" – Mazidi, Naimi, & Mazidi
2	"ARM System Developer's Guide" – Andrew Sloss

Reference Books:

1	"Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C" – Yifeng Zhu
2	Datasheets: ATmega328P, STM32F103, ARM Cortex-M series

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_ee12/preview

D.Y. Patil Education Society, Kolhapur
(Deemed to be University)
School of Engineering &Management
Kasaba Bawada, Kolhapur
Department of Electronics and Telecommunication Engineering

T.Y. B. Tech. Curriculum.e.f.A.Y.2024-2025
(As Per National Education Policy 2020)
Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5O09,** Biomedical Instrumentation
Prerequisite/s			Electronic circuits, and signal processing fundamentals
Teaching Scheme: Lecture/Tutorial/Practical			**02/--/--**
Credits			**02**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	**--/--/50**
	P	**INT / OE/POE**	**--/--/--**
		Total	**50**

Course Description: This course provides a foundational overview of biomedical instrumentation, covering bio signal acquisition, diagnostic analyzers, therapeutic devices, and medical imaging systems. It emphasizes the role of electronics in healthcare monitoring and diagnosis. The course prepares students for careers in medical device design, hospital equipment maintenance, diagnostic labs, healthcare technology management, and further studies in biomedical engineering or clinical research.

Course Objectives:

1	To understand the principles of biosignal generation, acquisition, and analysis in biomedical systems.
2	To familiarize students with key analytical instruments used in clinical diagnostics.
3	To explore the design and functioning of medical therapeutic devices and biomedical lasers.
4	To introduce modern medical imaging technologies and discuss noise reduction in low-level biomedical measurements.

Course Outcomes (COs):
At the end of the course the student will be able to:

1	Understand and Analyze bio-signal acquisition and analysis.
2	Explain key clinical analytical instruments.
3	Describe therapeutic medical devices.
4	Analyze and interpret medical imaging data and signal recording systems

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
CO1	3	2	1	2	2	1	-	-	-	1	-	2		3	IV
CO2	3	2	2	1	2	2	-	-	-	-	-	1		3	II
CO3	3	2	2	1	2	1	1	-	-	-	-	1		3	II
CO4	3	2	2	2	3	-	-	-	-	1	-	2		3	IV

Content	Hrs.
Unit 1: Introduction to biomedical engineering Biosignal: Physiological systems – Bioelectric potentials – Electrodes – Transducers – Block diagram of biomedical instrumentation system – System approach to biological systems – Physiological signal amplifiers – Medical preamplifier design – Analysis of periodic, aperiodic, and random signals – Acquisition of biomedical signals (ECG, EMG, EEG, EOG) – Concept only.	6
Unit 2: Analytical Equipment Concept and significance – Classification based on clinical application – Autoanalyzer – Blood gas analyzer – CBC analyzer – Coagulometer – ELISA Reader – Chemiluminescence Analyzer (CLIA) – PCR and qPCR – Basic working concept and DNA/RNA analysis – Analytical role of ECG and EEG systems.	7
Unit 3: Medical Therapeutic Equipment Cardiac Equipment: External and implantable pacemakers – Programmable pacemakers – Power sources – Design of encapsulation and leads – Pacing system analyzers Respiratory Equipment: Principles of electronic ventilators Electrotherapy Equipment: TENS – Interferential therapy Biomedical Lasers: Principles and applications – CO_2, HeNe, Nd:YAG, Ruby lasers.	6
Unit 4: Medical Imaging & Signal Recording Modern imaging systems: X-ray machines – Nuclear medical imaging – Magnetic Resonance Imaging (MRI) – Ultrasound – Computed Tomography (CT) – Thermal imaging Recording systems: Basic recording devices – Signal conditioners – Sources and types of noise in low-level biomedical signal measurement.	7

Text Books:

1	Dr. M. Arumugam, "Biomedical Instrumentation", Anuradha publications, 2nd ed., 1994.

Reference Books:

1	John G Webster, "Medical Instrumentation – Application and Design", 4th ed., John Wiley and Sons, 2007.
2	Leslie Cromwell, Fred. J. Weibell, Erich. A. Pfeiffer, "Biomedical Instrumentation & Measurements, 2nd ed., Pearson Education., 2001.

Useful Links	
1	https://onlinecourses.swayam2.ac.in/nou23_bt05/preview

T.Y. B. Tech. Curriculum.e.f.A.Y.2024-2025
(As Per National Education Policy 2020)
Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5010,** Industrial Automation-II
Prerequisite/s			Basics of Electronics
Teaching Scheme: Lecture/Tutorial/Practical			**02**/00/00
Credits			**02**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	**00/00/50**
	P	**INT / OE/POE**	00/00/00
		Total	**50**

Course Description:

This course introduces students to the fundamentals of industrial automation, focusing on the application of PLCs, SCADA, and DCS in automated control systems. It emphasizes system architecture, programming, and integration of industrial communication protocols in process industries.

Course Objectives:

1	To provide knowledge of basic concepts and principles of industrial automation systems.
2	To familiarize students with the fundamentals of logic development for automation processes.
3	To develop the ability to design and simulate ladder logic programs for real-time industrial applications using PLCs.
4	To impart hands-on skills in testing, debugging, and troubleshooting of digital and analog automation programs.
5	To explore SCADA and DCS architecture and their applications in monitoring and controlling large-scale industrial operations.

Course Outcomes (COs):

At the end of the course the student will be able to:

1	Summarize the fundamental principles of industrial automation
2	Apply the concepts of fundamentals of logic for various processes of automation.
3	Analyze and formulate the requirements of appropriate ladder programs to provide solutions using PLCs.
4	Construct, debug and test the programs developed for digital and analog operations.
5	Build architecture of SCADA and explain the importance of SCADA in critical infrastructure
6	Identify the knowledge of PLC, SCADA and DCS with industrial networking protocols for process industries.

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CO1	3														II
CO2	3	2													III
CO3	3	3	3												III
CO4	3	3	3	2											III
CO5	3	2													II
CO6	3	2	2		2										II

Unit	Course Contents	Hours
1	**Programmable logic Controller:** Fundamentals of industrial automation, Definition and Goals of Automation, need and role of automation, evolution of automation. Types of processes, comparison, evolution of PLC, Types of Automation Hardware Components, Basic PLC structure, Types of PLC, Inputs and Outputs, Factors to consider in selecting PLC, General PLC Programming Procedure, PLC Programming Languages, Processor Memory Organization, Creating ladder diagram for real time task, Mnemonic Programming Code	6
2	**PLC Functions:** Programming Timers, Programming Counters, Program control instructions, Data Manipulation Instructions, Math Instructions, Sequence rand Shift Register Instructions, Creating ladder diagram from process control descriptions, program editing ,commissioning and monitoring, preventive maintenance and troubleshooting	6
3	**Introduction to SCADA systems:** Introduction, definitions and history of Supervisory Control and Data Acquisition, typical SCADA system Architecture, Communication requirements, Desirable Properties of SCADA system, features, advantages, disadvantages and applications of SCADA. SCADA Architectures (First generation - Monolithic, Second generation - Distributed, Third generation – Networked Architecture),	6
4	**SCADA Protocols and SCADA systems in industries:** Open systems interconnection (OSI) Model, TCP/IP protocol, DNP3 protocol, IEC61850 layered architecture, Control and Information Protocol (CIP), Device Net, Control Net, Ether Net/IP, Flexible Function Block process (FFB), Process Field bus (Profibus).Implementation of SCADA Systems and related various applications.	6

Text Books:

Sr. No	Title
1	Webb, J., & Ronald, R. (2007). Programmable Logic Controllers: Principles and Application (5th ed.). Prentice Hall of India.
2	Hackworth. (2008). Programmable Logic Controllers: Programming Methods and Applications (1st ed.). Pearson India.
3	Petruzella, F. (2007). Programmable Logic Controllers (3rd ed.). Elsevier India.
4	Thomas, M. S., & McDonald, J. D. (2015). Concept of SCADA System and its Evolution (1st ed.). CRC Press.
5	Radvonovsky, R., & Brodsky, J. (2013). Handbook of SCADA Control-System Security (1st ed.). CRC Press.

Reference Books:

Sr. No	Title
1	Batten, G. L. (2005). Programmable Controllers (2nd ed.). McGraw Hill Inc.
2	Bennett, S. (1988). Real Time Computer Control (1st ed.). Prentice Hall.
3	Doebelin, E. O. (1990). Measurement Systems (4th ed.). McGraw-Hill International Editions.
4	Clark, G., & Reynders, D. (2004). Practical Modern SCADA Protocols (1st ed.). ELSEVIER.
5	Srivastava, P. K. (2004). Programmable Logic Controllers with Applications (1st ed.). BPB Publications.

T.Y. B. Tech. Curriculum.e.f.A.Y.2024-2025
(As Per National Education Policy 2020)
Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU6E11,** Information Theory and Coding
Prerequisite/s			Understanding of linear algebra and discrete mathematics, Digital Communication
Teaching Scheme: Lecture/Tutorial/Practical			**04**/00/00
Credits			**04**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	**20/30/50**
	P	**INT / OE/POE**	00/00/00
		Total	**100**

Course Description: This course introduces the foundational concepts of information theory and error control coding used in digital communication systems. It covers the measurement of information, source and channel coding theorems, and various types of codes such as Huffman, cyclic, BCH, and Reed-Solomon. Emphasis is placed on entropy, mutual information, and channel capacity for both discrete and continuous systems. Additionally, it explores methods of error detection and correction to improve data reliability in noisy communication channels

Course Objectives:

1	To understand the basic concepts and mathematical measures in information theory.
2	To study source and channel coding techniques and analyze their efficiency.
3	To explore error control coding methods for reliable communication.
4	To apply theoretical concepts in practical encoding/decoding scenarios.

Course Outcomes (COs):

At the end of the course the student will be able to:

1	Define and compute entropy, information rate, and mutual information.
2	Analyze and implement source coding algorithms such as Shannon and Huffman coding.
3	Evaluate the performance limits of communication channels and calculate channel capacity.
4	Explain and construct linear block codes, cyclic codes, and convolutional codes.
5	Apply error detection and correction techniques using matrix and syndrome-based approaches.
6	Design and evaluate advanced coding schemes such as BCH, RS, and Golay codes for real-world applications

Course Outcomes (COs) with Program Outcomes (POs):

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
CO1	3	3		2	2							1	1		
CO2	3	3		2	2							1	1	1	
CO3	3	3		2	2	1						1	2	2	
CO4	3	2	2	2	2							1	2		
CO5	3	2	2	2	3							1	1		
CO6	3	2	2	2	3						1	2			

Content	Hrs.
Unit I: Information Theory: Introduction, Measure of information, Average information content of symbols in long independent sequences, Average information content of symbols in long dependent sequences. Mark-off statistical model for information source, Entropy and information rate of mark-off source	7
Unit II: Source Coding: Encoding of the source output, Shannon's encoding algorithm. Communication Channels, Discrete communication channels, Continuous channels.	6
Unit III: Fundamental Limits on Performance: Source coding theorem, Huffman coding, Discrete memoryless Channels, Mutual information, Channel Capacity. 6 Hours	6
Unit IV: Channel coding: Channel coding theorem, Differential entropy and mutual information for continuous ensembles, Channel capacity Theorem	6
Unit V: Introduction to Error Control Coding: Introduction, Types of errors, examples, Types of codes Linear Block Codes: Matrix description, Error detection and correction, Standard arrays and table look up for decoding. Binary Cycle Codes, Algebraic structures of cyclic codes, Encoding using an (n-k) bit shift register, Syndrome calculation. BCH codes.	7
Unit VI: Convolution Codes RS codes, Golay codes, shortened cyclic codes, Burst error correcting codes. Burst and Random Error correcting codes. Convolution Codes, Time domain approach. Transform domain approach.	7

Text Books:

1	Digital and analog communication systems, K. Sam Shanmugam, John Wiley, 1996
2	Digital communication, Simon Haykin, John Wiley, 2003

Reference Books:

1	ITC and Cryptography, Ranjan Bose, TMH, II edition, 2007
2	Digital Communications - Glover and Grant; Pearson Ed. 2nd Ed 2008

Useful Links	
1	https://onlinecourses.nptel.ac.in/noc22_ee103/preview

T.Y. B. Tech. Curriculum.e.f.A.Y.2024-2025
(As Per National Education Policy 2020)
Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5E13,** Microelectronics
Prerequisite/s			Fundamental electrical concepts like voltage, current, resistance, and basic circuit elements.
Teaching Scheme: Lecture/Tutorial/Practical			**04/00/**00
Credits			**04**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	**20/30/50**
	P	**INT / OE/POE**	**00/00/00**
		Total	**100**

Course Description: This course delves into the fundamental physics of semiconductors, exploring energy bands, charge carrier behavior, and the principles governing junctions. It then builds upon these foundations to analyze the operation and characteristics of essential electronic devices, including various transistors and optoelectronic components.

Course Objectives:

1	To provide students with a sound understanding of existing semiconductor devices to give meaning to their studies of electronic circuits and systems.
2	To explain carrier transport phenomena in solids on the basis of energy band theory and Boltzmann transport equation which forms the basis of electrical characteristics of semiconductor devices
3	To develop capability in students to learn on their own about the new researched devices as they keep emerging in the market in future and lay the foundation for of a constant career updating and self-education
4	To prepare the students for GATE in order to motivate them for higher studies.

Course Outcomes (COs):

At the end of the course the student will be able to:

1	Explain the formation of bandgaps in solids, formation of depletion-diffusion layer capacitance in p-n junction diodes and characteristics of illuminated p-n junction, incoherent (LEDs) and coherent light sources (Lasers)
2	Apply continuity equation and Poisson's equation to derive time dependence of carrier concentration on electric fields and potentials by considering band diagram of p-n junction in equilibrium.
3	Model the operation of bipolar junction transistor in three regions (cut-off, linear and saturation) using Ebers Moll coupled diode model.
4	Analyze BJT band diagram and explain current gain, base transport factor, and emitter injection efficiency.
5	Interpret C-V characteristics of MOS capacitor and I-V characteristics of JFET,MOSFET with relevance to their ethical parameters like pinch off voltage, threshold voltage etc

Course Articulation Matrix: Mapping of Course Outcomes (COs) with Program Outcomes (POs)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2	BTL
CO1	2													1	II
CO2	3													1	III
CO3	3	2													III
CO4	3	2													IV
CO5	2	2												1	IV

Content	Hrs.
Unit I: Energy Bands and Charge Carriers in Semiconductors Bonding forces and energy bands in solids, Charge carriers in semiconductors, Carrier concentration, drift of carriers in electric and magnetic fields, invariance of Fermi level at equilibrium.	6
Unit II: Excess Carriers in Semiconductors Diffusion of carriers, Diffusion current, Drift current, Mobility of carriers, Recombination, Continuity equation, Quasi Fermi levels, Gradients in Quasi Fermi levels, resistivity of materials	6
Unit III: Junctions Formation of p-n junctions, Equilibrium conditions, Steady state conditions, Transient and AC conditions, deviations from simple theory, Metal Semiconductor Junctions.	8
Unit IV: Field Effect Transistors JFET (characteristics), MOS capacitor (threshold voltage, C-V characteristics), MOSFET: I-V characteristics, Equivalent circuits for the MOSFET.	7
Unit V: Bipolar Junction Transistors Minority carrier distributions and terminal currents, Generalized Biasing: The Coupled-Diode Model, Charge control analysis; switching, drift in base region, base narrowing, avalanche breakdown, thermal effects, Kirk effect.	7
Unit VI: Optoelectronic Devices Photodiodes: I-V characteristics in an illuminated junction, Solar Cells, Photodetectors; LEDs, Semiconductor Lasers.	6

Text Books:

1	B.G. Streetman, S. K. Banerjee, " Solid State Electronic Devices ", 7th edition, Pearson India Education Service Pvt. Ltd., 2017.
2	"Semiconductor Physics and Devices: Basic Principles" by Donald A. Neamen
3	"Solid State Electronic Devices" by Ben G. Streetman and Sanjay Kumar Banerjee

Reference Books:

1	S. M. Sze, "Physics of Semiconductor Devices", 2nd Edition, PHI, 2005.

2	Donald. A. Neamen, "Semiconductor Physics and Devices: Basic Principles", 3rd Edition, McGraw Hill Higher Education, 2003

	Useful Links
1	https://onlinecourses.nptel.ac.in/noc21_ee86/preview

T.Y. B. Tech. Curriculum.e.f.A.Y.2024-2025
(As Per National Education Policy 2020)
Semester-V

Class			T.Y. B. Tech, Semester- V
Course Code and Course Title			**23ETCU5E13,** Network Analysis
Prerequisite/s			Fundamental electrical concepts like voltage, current, resistance, and basic circuit elements.
Teaching Scheme: Lecture/Tutorial/Practical			**04/00/**00
Credits			**04**
Evaluation Scheme	**T**	**ISE / MSE / ESE**	**20/30/50**
	P	**INT / OE/POE**	00/00/00
		Total	**100**

Course Description: This course provides a comprehensive understanding of fundamental electrical circuit analysis techniques, including network theorems, transient analysis, steady-state AC analysis, resonance, two-port networks, and basic filter design.

Course Objectives:

1	Apply fundamental circuit laws and network reduction techniques.
2	Analyze transient responses of first and second-order R-L, R-C, and R-L-C circuits with DC and AC excitation.
3	Apply the concepts of impedance and phasors to analyze the steady-state behavior of various circuits.
4	Explain the phenomenon of resonance in series and parallel RLC circuits.
5	Determine the y, z, h, and ABCD parameters of two-port networks.
6	Classify different types of filters based on their characteristics and pass/stop bands.

Course Outcomes (COs):

At the end of the course the student will be able to:

1	Simplify complex resistive networks using reduction techniques and network theorems to determine circuit variables.
2	Analyze the transient behavior of first and second-order circuits.
3	Analyze AC circuits in the steady state using impedance concepts and phasor diagrams.
4	Explain the phenomenon of resonance in electrical circuits.
5	Determine the parameters of two-port networks and analyze their interconnections in various configurations.
6	Design and analyze basic constant K and m-derived filters for specific frequency response characteristics.

Mapping of Course Outcomes (COs) with Program Outcomes (POs):

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10		12	PSO 1	PSO 2	BTL
CO1	3	2	2	1	1							1	2	1	III
CO2	3	2	2	1	1							1	2	1	IV
CO3	3	2	2	1	1							1	2	1	IV
CO4	2	2	1	1	1							1	2	1	II
CO5	3	2	2	1	1							1	2	1	III
CO6	3	2	3	1	2				1	1		2	3	3	III

Content	Hrs.
Unit I: Circuit Fundamentals Types of circuit components, Types of Sources, Network reduction techniques-series, parallel circuits, Star-Delta conversion and Source Transformations, Mesh analysis and Nodal analysis, problem solving with resistances only including dependent sources also. Principal of Duality with examples. Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer Theorem.	7
Unit II: Transients First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem-solving using R-L-C elements with DC excitation and AC excitation. Response as related to s-plane rotation of roots. Laplace transform: introduction, Laplace transformation, basic theorems, problem solving using Laplace transform, partial fraction expansion, Heaviside's expansions, problem solving using Laplace transform.	7
Unit III: Steady State Analysis of A.C Circuits Impedance concept, phase angle, series R-L, R-C, R-L-C, circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem, solving using mesh and nodal analysis, numerical problems.	6
Unit IV: Resonance Circuits Series resonance circuit, Frequency response of a series resonant circuit, Effect of Q on bandwidth and selectivity, Relation between bandwidth and Q, Impedance of a series resonant circuit, Resonance by variation of L and C, Parallel resonant circuit.	6
Unit V: Two- port network parameters: y, z, h, A B C D Inter-conversion of two port networks, cascade connection series connection, series parallel connection, T and network representation of a two port network.	6
Unit VI: Filters Introduction, the neper and decibel, filter fundaments: pass and stop bands, characteristics of different filters, Design and analysis of constant K filter (low pass, high pass, band pass, and band stop filters): The m derived T section, the m derived π section.	7

Text Books:

1	A.Sudhakar, Shymmohan S. Palli, 'Circuit and Network – Analysis and Synthesis', 3rd Edition, Tata McGraw Hill Publication.
2	Engineering Circuit Analysis by William H. Hayt, Jack Kemmerly, Jamie Phillips, Steven M. Durbin, 9th Edition 2020
3	Network Analysis – ME Van Valkenburg, Prentice Hall of India, revised 3rd Edition, 2019.

Reference Books:

1	D. Roy Choudhuri, 'Networks and Systems', New Age International Publisher.
2	M.E.Van Valkenburg, 'Network Analysis', IIIrd edition, Pearsons Education/PHI.
3	Soni Gupta, 'Electrical Circuit Analysis', Dhanpat Rai and Co.

	Useful Links
1	https://onlinecourses.nptel.ac.in/noc20_ee46/preview