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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School of Engineering & Management
Department of Electronics & Telecommunication Engineering

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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School of Engineering & Management, Kolhapur

Kasaba Bawada, Kolhapur

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EDUCATION SOCIETY
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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

Department of Electronics & Telecommunication Engineering

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.

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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	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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S. Y. B. Tech. Curriculum

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

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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.

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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).

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.

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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/

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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

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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	4

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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Kasaba Bawada, Kolhapur 416 006

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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D. Y. Patil Education Society, Kolhapur

(Deemed to be University)

School of Engineering & Management, Kolhapur

Kasaba Bawada, Kolhapur

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KOLHAPUR

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 * School of Engineering & Management * Kasaba Bawada, Kolhapur 416 006 * KOLHAPUR *

Department of Electronics & Telecommunication Engineering
(Teaching and Evaluation Scheme from Year 2024-25 (as per NEP-2020)

SEMESTER- IV													
				Teaching Scheme				Theory			Practical		
Course Code	**Course Category**	**Course Type**	**Course Name**	**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 Studies	2	2	-	-	-	-	50	-	-	50
23ETCU4H08	Humanities Social Science and Management	Entrepreneurship/Economics/ Management course	Industrial Management & Startups	2	2	-	-	50	-	-		-	50
23ETCU4A09	Ability Enhancement course	AEC	Electronics Workshop	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**	**-**	**235**	**90**	**300**	**100**	**75**	**700**
23ETCU4Z01	Honors Courses/Double (Minor)	HC (Optional)	Honors Paper- I Electronics equipment Integration and prototype building	03	3		-	20	30	50	-		100
23ETCU4Z02	Honors Courses/Double (Minor)	HC (Optional)	Honors Paper- I Electronics equipment Integration and prototype building Lab	01		2	-	-	-	-	-	25	25

S. Y. B. Tech. Curriculum

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 equip students with design and analysis of single-stage amplifiers using BJT and MOSFETs.
2	To illustrate the design and analysis of feedback amplifiers.
3	To provide skills to design and analyze multivibrators and oscillators.
4	To introduce design power amplifiers.

Course Outcomes (COs):

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

23ETCU4P01.1	Analyze and design BJT and MOSFET-based single-stage amplifiers.
23ETCU4P01.2	Design and implement feedback amplifiers.
23ETCU4P01.3	Design and evaluate multivibrators and oscillators ensuring compliance with Barkhausen's criteria.
23ETCU4P01.4	Analyze and design power amplifiers.

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	PSO1	PSO2	BTL
23ETCU4P01.1	3	3	3	2	2	-	-	-	-	-	-	-			IV
23ETCU4P01.2	3	3	3	2	2	-	-	-	-	-	-	-			IV
23ETCU4P01.3	3	3	3	2	2	-	-	-	-	-	-	-			IV
23ETCU4P01.4	3	3	3	2	2	-	-	-	-	-	-	-			IV

Content	Hrs.
Unit 1: BJT 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: 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
Unit 3: 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 4: Multivibrators Transistor as a switch, different transistor switching parameters, classification of multivibrators, Analysis and design of Astable, Monostable, Bistable multivibrator and Schmitt trigger using BJT. Design of triggering circuits for Multivibrators	7

Unit 5: Oscillators Barkhausen's criteria, Frequency and amplitude stability, Classification, RC oscillators : RC phase shift &Wein bridge oscillator analysis & design using BJT, LC oscillators: Colpit's & Hartely's oscillators analysis and design using BJT, Crystal oscillator.	7
Unit 6: 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

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

S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

Course Title: Signal 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 Transform and FourierTransform.
4	Explain Analysis and Characterization of the DT systems through Z Transform.

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-III

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**														II
23ETCU4P02.2	**3**	**2**	1												III
23ETCU4P02.3	**3**	**2**	1												III
23ETCU4P02.4	**3**	**2**	1												III
23ETCU4P02.5	**3**	**2**	1												III

Content	Hrs.
Unit 1: Introduction to Signals: Signals, CT &DT , Standard test signals, Basic Operation on Signals , Classification of signals, - Periodic & aperiodic, even & odd, energy and power signals, Classification of Systems	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
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,	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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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

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:

23ETCU4P03.1	Analyze and identify the instrument suitable for specific measurements.
23ETCU4P03.2	Use and identify the basic principles of Transducers & Sensors.
23ETCU4P03.3	Analyze and identify open loop & closed loop control systems.
23ETCU4P03.4	Analyze the LTI system in time domain and frequency domain.
23ETCU4P03.5	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
23ETCU4P03.1	3	3	3	2	2	2	-	-		-	-	2			IV
23ETCU4P03.2	3	2	2	2	2	1	-	-		-	-	1			II
23ETCU4P03.3	3	2	2	2	2	-	-	-		-	-	1			IV
23ETCU4P03.4	3	2	2	2	2	-	-	-		-	-	1			III
23ETCU4P03.5	3	2	2	2	2	-	-	-		-	-	1			III

Contents	Hours
Unit 1: Virtual Instrumentation: Introduction to virtual instrumentation, Role of Software in Virtual Instrumentation, Virtual Instrumentation with Lab VIEW, Components of Lab VIEW applications.	7
Unit 2: 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	9
Unit 3: 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.	8
Unit 4: 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.	6

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 Virtual Instrumentation.	1
2	Theoretical tutorial on Virtual Instrumentation.	1
3	Theoretical tutorial on dual trace Oscilloscope.	2
4	Theoretical tutorial on Spectrum Analyzer, Wave Analyzer.	2
5	Numerical on Transfer function.	3
6	Numerical on Block diagram algebra, and Signal flow graphs.	3
7	Numerical on Time response of first and second order systems for standard test inputs.	3
8	Numerical on Bode plots.	4
9	Numerical on relative stability–Gain Margin and Phase Margin.	4
10	Numerical on stability analysis by Hurwitz criterion and Routh array,	4

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S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

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 impart knowledge on analyzing the characteristics of single-stage RC-coupled amplifiers using BJTs and MOSFETs.
2	To develop the ability to design, implement, and analyze various feedback amplifiers and multivibrator circuits.
3	To provide hands-on experience in designing oscillator circuits.
4	To explore the design of Power amplifiers.

Course Outcomes (COs):

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

23ETCU4P04.1	Analyze and determine the h-parameters and frequency response of single-stage RC-coupled amplifiers.
23ETCU4P04.2	Design MOSFET Amplifier and observe it's characteristics.
23ETCU4P04.3	Design and implement various feedback amplifiers and oscillators.
23ETCU4P04.4	Design and implement multivibrators and power amplifiers.

Course Articulation Matrix: Mapping of Course Outcomes (COs) 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
23ETCU4P04.1	3	3	3	2	2	-	-	2	2	2	-	1			II
23ETCU4P04.2	3	3	3	2	2	-	-	2	2	2	-	1			III
23ETCU4P04.3	3	3	3	2	3	-	-	2	2	2	-	1			III
23ETCU4P04.4	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 study the behavior of single stage RC coupled Amplifier for Square Wave input.	O	2
4	To observe and plot the characteristics of MOSFET using Simulator	O	2
5	Design Common Source MOSFET Amplifier	O	2
6	To design of voltage series feedback Amplifier and determine its bandwidth from frequency response without and with feedback	O	2
7	To Design of Astable Multivibrators	S	2
8	To Design of Monostable Multivibrators	O	2
9	To Design of Bistable Multivibrators	S	2
10	To Design of RC phase shift oscillators using BJT/ FET.	S	2
11	To Design of Wein bridge oscillator using BJT.	O	2
12	To Design of Collpitt's oscillators using BJT	O	2

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13	To Design of Hartly oscillators using BJT	O	2
14	To Study and design of power amplifiers	O	2
15	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
3. Electronic devices &circuit theory, Robert L. Boylsted, Louis Nashelsky, Pearson Education

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S. Y. B. Tech. Curriculum

w.e.f. 2023-2024

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.

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			2										II
23ETCU4P05.2	3	2			2										IV
23ETCU4P05.3	3	2			2										III
23ETCU4P05.4	3	2			1										III

List of Experiments			
Expt. No.	**Name of Experiment**	**Type Hours**	**Type Hours**
1	Introduction to simulation tools (MATLAB) for Signal Processing Lab	O	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.

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:

23ETCU4M06.1	Identify features of 8051 microcontroller
23ETCU4M06.2	Write assembly language programs for given application
23ETCU4M06.3	Interface microcontroller with hardware for given application
23ETCU4M06.4	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)

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
23ETCU4M06.1	3	3	3	2	2	1	1	2	2	1	-	2			II
23ETCU4M06.2	3	3	3	2	2	1	1	2	2	1	-	2			II
23ETCU4M06.3	3	3	3	2	2	1	1	2	2	1	-	2			III
23ETCU4M06.4	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

w. e. f. 2024-2025

Course Title: Environmental Studies	
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:

23ETCU4V07.1	Understand the scope and importance of Environmental awareness and Sustainable development
23ETCU4V07.2	Understand various Environmental issues due to development
23ETCU4V07.3	Understand various modes of Environmental management through technoly and legislation
23ETCU4V07.4	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):

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COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
23ETCU4V07.1	-	-	-	-	-	3	3	2	2	2	1	2	-	-	II
23ETCU4V07.2	-	-	-	-	-	3	3	2	2	2	1	2	-	-	II
23ETCU4V07.3	-	-	-	-	-	3	3	2	2	2	1	2	-	-	III
23ETCU4V07.4	-	-	-	-	-	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) **Urbanization and Environmental health (2):** Urban problems, Solid waste- Effects of MSW, Plastic waste, Hazardous waste, E- waste	**9**
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

w.e.f. 2024-2025

Course Name: Industrial Management and Start-ups	
Course Code: 23ETCU4H08	**Semester: IV**
Teaching Scheme: L-T-P :2-0-0	**Credits: 2**
Evaluation Scheme: ISE + MSE Marks: NA	**INT Marks: 50**

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.

Course Outcomes (COs):

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

23ETCU4H08.1	Explain the fundamental principles of management and effectively analyze and apply these principles within an organizational setting.
23ETCU4H08.2	Design electronic products that meet high standards of quality and reliability while considering factors like cost, manufacturability, and environmental impact.
23ETCU4H08.3	Assess business opportunities, create viable business models, and develop

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	strategies for launching and managing successful entrepreneurial ventures.
23ETCU4H08.4	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
23ETCU4H08.1	1	2	2	1	1	2	1	2	2	2	2	2	1	1	III
23ETCU4H08.2	3	3	3	2	2	2	3	2	2	2	2	2	3	3	V
23ETCU4H08.3	2	3	3	2	2	2	2	2	2	2	3	2	1	1	IV
23ETCU4H08.4	2	3	3	2	2	2	2	2	2	2	3	2	1	1	III

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

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

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S. Y. B. Tech. Curriculum

w. e. f. 2024-2025

Course Title: Electronics Workshop (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:

23ETCU4A09.1	Illustrate the different types of Electronics tools and their application.
23ETCU4A09.2	Analyze the working of semiconductor devices and their application.
23ETCU4A09.3	Integrate the knowledge of basic Sensors and digital electronics.
23ETCU4A09.4	Enable the Students to develop application-based micro-projects and estimate

Prerequisite:	Basics of digital electronics

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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	PSO1	PSO2	BTL
23ETCU4A09.1	3	2	2	2	3	-	-	-						1	IV
23ETCU4A09.2	3	3	3	2	2	-	-	-						1	IV
23ETCU4A09.3	3	3	3	2	2	-	-	-						1	IV
23ETCU4A09.4	3	3	3	3	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

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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, Willey 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:

23ETCU4O10.1	Apply the concept and analyze the importance and application of Arduino
23ETCU4O10.2	Describe different types of sensors and basic fundamentals of robot used in electronic automation modelling to design digital circuits
23ETCU4O10.3	Demonstrate the PLC program for an automatic control system and its application design digital circuits
23ETCU4O10.4	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
23ETCU4O10.1	3	3	3	2	3										III
23ETCU4O10.2	3	3	3	2	2										III
23ETCU4O10.3	3	3	3	2	3										IV
23ETCU4O10.4	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:

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Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Programmable Logic Controllers		John Webb	Prentice Hall of India	
2	Distributed Computer Control for Industrial Automation	2nd Edition	Popovik -Bhatkar	Dekkar	

Reference Books:

Sr. No	Title	Edition	Author(s)	Publisher	Year
1	Robotics and Industrial automation		R.K.Rajput		
2	Automation and advanced manufacturing systemsn,		Dr..K.C.JAIN and Sanjay jain		

Web Resources:

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

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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:

23ETCU4N11.1	An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.
23ETCU4N11.2	An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs
23ETCU4N11.3	An ability to develop and conduct appropriate experimentation, analyze and
23ETCU4N11.4	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
23ETCU4N11.1	3	2	1	1	3	1							2	2	III
23ETCU4N11.2	2	2	1	1	3	1							2	2	III
23ETCU4N11.3	2	2	1	1	3	1							2	2	III
23ETCU4N11.4	2	2	2	1	3	1							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 and colours, Matrix generation: Entering a vector, Entering a matrix, Matrix indexing,	4

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 operations on variables, vectors, arrays, Matrix Creation and Indexing.	O	2
3	Plotting Basic Graphs.	O	2
4	Control Flow with Loops (For and While loops)	O	2
5	Control Flow with Conditional Statements (If-else)	O	2
6	Simulation of Single-Phase Half-Wave Rectifier	O	2
7	Simulation of Single-Phase Full-Wave Bridge Rectifier	O	2
8	Implement and plot signals for Amplitude Shift Keying (ASK)	O	2

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9	Implement and plot signals for Frequency Shift Keying (FSK)	O	2
10	Implement and plot signals for Phase Shift Keying (PSK)	O	2
11	Implement and plot signals for Quadrature Amplitude Modulation (QAM)	O	2
12	Modelling and Simulation of First-Order Systems	O	2
13	Time Response Analysis of Second-Order Systems	O	2
14	Mini Project based on MATLAB Simulation	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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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: (Honors –I) Electronics equipment integration and Prototype building	
Course Code: 23ETCU4Z01	**Semester : IV**
Teaching Scheme : L-T-P : 3-0-0	**Credit: 3**
Evaluation Scheme : ISE Marks : 20+30	**ESE : 50**

Course Description:

This is a hands-on, application-oriented course designed for S.Y. E&TC students to bridge the gap between theoretical knowledge and practical implementation of electronic systems. This course emphasizes the process of designing, integrating, and building prototypes by combining hardware and software components. Students will explore the fundamentals of system integration, starting from basic electronic circuits to fully functional prototypes. Through practical experiments, they will learn to design circuits, interface sensors and actuators, develop embedded systems, and utilize modern tools for debugging, testing, and fabrication.

Course Objectives:

1.	To provide foundational knowledge of prototyping concepts
2.	To familiarize students with electronic components and modules
3.	To develop circuit design and simulation skills

Course Outcomes (COs):

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

23ETCU4Z01.1	Understand Fundamentals of Prototyping and Integration
23ETCU4Z01.2	Design and Analyze Circuits
23ETCU4Z01.3	Develop Embedded Systems for Integration
23ETCU4Z01.4	Integrate and Debug Electronic Systems
23ETCU4Z01.5	Apply Testing and Optimization Techniques
23ETCU4Z01.6	Create PCB Designs for Prototypes

Prerequisite:	Basic knowledge of electronics, Fundamentals of Electrical Circuits

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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
23ETCU4Z01.1	3	2	1	1	3	1							2	2	III
23ETCU4Z01.2	2	2	1	1	3	1							2	2	III
23ETCU4Z01.3	2	2	1	1	3	1							2	2	III
23ETCU4Z01.4	2	2	2	1	3	1							2	2	III

Course Contents	**Hrs.**
Unit-1 **Introduction to Prototyping** Importance of prototyping in product development, Overview of prototype development lifecycle, Types of prototypes: Functional, visual, and proof-of-concept.	7
Unit-2 **Fundamentals of Electronics Equipment** Overview of basic electronic components: Resistors, capacitors, inductors, diodes, transistors. Introduction to sensors, actuators, and communication modules. Power supply units and voltage regulation.	7

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Unit-3 **Circuit Design and PCB Layout** Basics of circuit design and analysis. Introduction to PCB design software (e.g., KiCad, Eagle, Altium Designer). Designing and fabricating PCBs for prototypes	7
Unit-4 **Microcontroller and Embedded Systems Integration** Selection of microcontrollers for prototype building (e.g., Arduino, Raspberry Pi, ESP32). Interfacing sensors and actuators with microcontrollers. Serial communication protocols: UART, SPI, I2C, and wireless communication (Bluetooth, Wi-Fi).	7
Unit- 5 **System Integration Techniques** Integration of multiple hardware modules (e.g., display, communication, input devices). Managing power distribution in integrated systems. Troubleshooting and resolving compatibility issues.	8
Unit- 6. **Testing and Debugging Prototypes** Testing methodologies for electronic prototypes. Tools for debugging: Multimeter, oscilloscope, logic analyzer. Ensuring functionality, reliability, and safety.	8

Text Book:

1. "**The Art of Electronics**" by Paul Horowitz and Winfield Hill
2. **Electronics Devices and Circuit Theory"** by Robert L. Boylestad and Louis Nashelsky
3. **"Introduction to Embedded Systems"** by Shibu K.V.

Reference Books:

1. **Embedded Systems:** Real-Time Interfacing to Arm Cortex-M Microcontrollers" by Jonathan W. Valvano
2. **"Fundamentals of Microcontrollers and Applications in Embedded Systems"** by Ramesh Gaonkar
3. **"Building Electronic Circuits"** by Dale Wheat

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Course Title: (Honors –I) Electronics equipment integration and Prototype building Lab	
Course Code: 23ETCU4Z02	**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 key concepts in printed circuit board (PCB) design, wireless communication, and real-time data acquisition, enabling students to create reliable and efficient prototypes.

Course Objectives:

1	To provide foundational knowledge of prototyping concepts
2	To familiarize students with electronic components and modules
3	To develop circuit design and simulation skills
4	To provide foundational knowledge of prototyping concepts

Course Outcomes (COs):

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

23ETCU4Z02.1	Understand Fundamentals of Prototyping and Integration
23ETCU4Z02.2	Design and Analyze Circuits
23ETCU4Z02.3	Develop Embedded Systems for Integration
23ETCU4Z02.4	Integrate and Debug Electronic Systems

Prerequisite	Basic knowledge of electronics, Fundamentals of Electrical Circuits

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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	PSO1	PSO2	BTL
23ETCU4Z02.1	3	3			2										II
23ETCU4Z02.2	3	2			2										IV
23ETCU4Z02.3	3	2			2										III
23ETCU4Z02.4	3	2			1										III

Expt. No.	Name of Experiment	Type Hours
1	Assemble a simple LED blinking circuit on a breadboard.	2
2	Design and test a regulated power supply using a step-down transformer, rectifier, and voltage regulator (e.g., LM7805).	2
3	Interface a temperature sensor (e.g., LM35/DHT11) with a microcontroller (e.g., Arduino) and display the temperature on an LCD or serial monitor.	2
4	Control a DC motor or servo motor using a microcontroller and a motor driver (e.g., L293D).	2
5	Build a wireless data transmission system using Bluetooth (HC-05) or Wi-Fi (ESP8266/ESP32).	2
6	Design a simple PCB for a voltage regulator circuit using PCB design software (e.g., KiCad, Eagle) and get it fabricated.	2
7	Build an IoT-based prototype that collects data from a sensor (e.g., gas, temperature) and uploads it to a cloud platform.	2
8	Use a multimeter and oscilloscope to debug and test a given faulty circuit.	2

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9	Design a signal conditioning circuit using an op-amp for a sensor (e.g., amplify the signal from an LDR or thermistor).	2
10	Interface a 7-segment display or OLED with a microcontroller to display sensor data.	2
11	Mini Project	2

Text Book:

1. "**The Art of Electronics**" by Paul Horowitz and Winfield Hill
2. **Electronics Devices and Circuit Theory"** by Robert L. Boylestad and Louis Nashelsky
3. **"Introduction to Embedded Systems"** by Shibu K.V.

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1. **Embedded Systems:** Real-Time Interfacing to Arm Cortex-M Microcontrollers" by Jonathan W. Valvano
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