D. Y. Patil College of Engineering and Technology

Kasaba Bawada, Kolhapur

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D Y PATIL
COLLEGE of
ENGINEERING & TECHNOLOGY
(AN AUTONOMOUS INSTITUTE)
KASABA BAWADA, KOLHAPUR

Structure and Syllabus

(As per NEP 2020)

for

Second Year B. Tech in Electronics & Telecommunication Engineering

Department of Electronics & Telecommunication Engineering

w. e. f. 2024-25

Teaching and Evaluation Scheme from Year 2024-25 (as per NEP-2020)

SEMESTER-III

Course Code	Course Name	Teaching Scheme				Theory			Practical		Total Marks
		Credits	Contact Hrs.								
			L	P	T	ISE	MSE	ESE	INT	OE/PoE	
231ETPCCL201	Electronics Circuit Analysis and Design – I	3	3	-	-	20	30	50	-	-	100
231ETPCCL202	Analog and Digital Communication	3	3	-	-	20	30	50	-	-	100
231ETPCCL203	Network Analysis	2	2	-	-	-		50	-	-	50
231ETPCCP201	Electronics Circuit Analysis and Design Lab	1	-	2	-	-	-	-	25	25	50
231ETPCCP202	Analog and Digital Communication Lab	1	-	2	-	-	-	-	25	25	50
231ETPCEP201	Society based Mini-Project	2	-	4	-		-	-	50	-	50
231ETMDML201	Digital Electronics	2	2	-	-	20	-	30	-	-	50
231ETVECL201	Personal Values and Ethics	2	2	-	-	20	30	-	-	-	50
231ETOECL201	Sensors & Actuator (ODL Only)	4	2	-	-	20	30	50	25	-	125
231ETOECL202	Basics of Arduino (ODL Only)		2		-						
231ETHSSML201	Financial Management	1	1		-	25	-	-		-	25
231ETHSSMP201	Financial Management Lab.	1		2	-		-	-	25	-	25
231ETMCL201	Finishing School Training III	Audit	3*	-	-	50	-	-	-	-	Grade
231ETCCAL201	Liberal Learning-I	-	2*	-	-	50	-	-	-	-	Grade
231ETCCAL202	Liberal Learning-II		2*								
231ETCCAL203	Liberal Learning-III		2*								
	Total	**22**	**17**	**10**		**275**	**120**	**230**	**100**	**50**	**675**

$ - Contact hours for online courses * - Values not included in total **Min. Marks for Passing**: 40% of total marks of individual course

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Teaching and Evaluation Scheme from Year 2024-25 (as per NEP-2020)

SEMESTER-IV

Course Code	Course Type	Course Name	Teaching Scheme				Theory			Practical		Total Marks
			Credits	L	P	T	ISE	MSE	ESE	INT	OE/PoE	
231ETPCCL204	PCC	Electronics Circuits Analysis & Design – II	3	3	-	-	20	30	50	-	-	100
231ETPCCL205		Digital System Design using Verilog	3	3	-	-	20	30	50	-	-	100
231ETPCCL206		Instrumentation & Control Systems	2	2	-	-	-	-	50	-	-	50
231ETPCCP204		Electronics Circuits Analysis & Design Lab. II	1	-	2	-	-	-	-	25	25	50
231ETPCCP205		Digital System Design using Verilog Lab.	1	-	2	-	-	-	-	25	25	50
231ETMDML202	MDM-2	Microcontrollers (CISC)	2	2	-	-	20	-	30	-	-	50
231ETVECL202	VEC (Environmental Study)	Environmental Study	2	2	-	-	-	-	50	-	-	50
231ETHSSML202	Entrepreneurship/Economics/ Management course	Industrial Management & Startups	2	2	-	-	25	-	-	25	-	50
231ETAECP201	AEC	Electronics Workshop Practice	2	1	2	-	-	-	-	25	25	50
231ETOECL203	OEC-II	Electronic Instrumentation	2	2	-	-	-	-	50	-	-	50
231ETOECL204		Electronic Automation		2								
231ETVSECP201	VSEC	Model Based Programming & Simulation	2	1	2	-	25	-	-	25	-	50
231ETMCL202	MC	Finishing School Training IV	Audit	2*	-	-	50	-	-	-	-	Grade
231ETCCAL204	CCA	Liberal Learning-I	-	2*	-	-	50	-	-	-	-	Grade
231ETCCAL205		Liberal Learning-II		2*								
231ETCCAL206		Liberal Learning-III		2*								
		Total	**22**	**20**	**8**	**-**	**160**	**60**	**330**	**125**	**75**	**650**

S - Contact hours for online courses * - Values not included in total **Min. Marks for Passing**: 40% of total marks of individual course

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Course Type Definition	Course Type Definition
PCC	Professional Core Course
CEP/FP	Comm. Engg. Project (CEP)/Field Project (FP)
MDM	Multidisciplinary Minor
VEC	Value Education Course
OEC	Open Elective Course
HSSM	Humanities Social Science and Management
MC	Mandatory Course
CCA	Co-Curricular Activities
AEC	Ability Enhancement course
VSEC	Vocational Skills Enhancement Course

Abbreviations:

ISE: In Semester Evaluation,

MSE: Mid semester Examination

ESE: End Semester Examination

INT: Internal Evaluation

POE: Practical / Oral Examination

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Department of Electronics & Telecommunication Engineering

S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Electronics Circuits Analysis & Design - I	
Course Code: 231ETPCCL201	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. To apply the design techniques of analog electronic circuits using diodes and to develop analytical skills.
2. To apply the design techniques of analog electronic circuits using transistors to develop analytical skills.
3. To analyse the wave shaping circuits using analog components.
4. To 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:

PCCL201.1	analyse and design unregulated & regulated DC Power supply.
PCCL201.2	analyse and design IC regulators
PCCL201.3	apply the knowledge of electronic component basics to linear & non-linear wave shaping circuits
PCCL201.4	analyse and design biasing circuits of Bipolar Junction Transistor & Field Effect Transistor

Prerequisite:	Physics, Fundamentals of Electrical & Electronics Engg.

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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	PSO 1	PSO 2	BTL
PCCL201.1	2	2	1	-	-	-	-	-	-	-	-	-	2	2	IV
PCCL201.2	2	2	1	-	-	-	-	-	-	-	-	-	2	2	IV
PCCL201.3	2	2	1	-	-	-	-	-	-	-	-	-	2	2	III
PCCL201.4	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: Vdc, Idc, 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	6

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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.	
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 : 231ETPCCL202	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:

PCCL202.1	explain different modulation schemes
PCCL202.2	explain different demodulation schemes
PCCL202.3	describe different types of noise and their Classification
PCCL202.4	Understand the baseband transmission and Reception.

Prerequisite:	**Basic Electronics**

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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	PSO 1	PSO 2	BTL
PCCL202.1	3	1	1	-	-	-	-	-	-	-	-	-	1	1	III
PCCL202.2	3	1	1	-	-	-	-	-	-	-	-	-	2	2	III
PCCL202.3	3	1	1	-	-	-	-	-	-	-	-	-	1	1	III
PCCL202.4	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.	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.	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, Delta Modulation.	7
Unit 4. Noise Noise sources and types. Quantization noise, Signal to quantization noise ratio.	6

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Unit 5. Baseband transmission & reception Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester Baseband pulse Shaping, M-array Signaling, eye diagram,	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.	8

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

Course Title: Network Analysis	
Course Code: 231ETPCCL203	Semester : III
Teaching Scheme : L-T-P :2-0-0	Credit: 2
Evaluation Scheme : ISE + MSE Marks : NA	ESE Marks : 50

Course Description: This course is aimed to study & analyses different types of basic circuits & filters.

Course Objectives:

1. To learn a number of powerful engineering circuit analysis techniques such as nodal analysis, mesh analysis, theorems, source transformation and several methods of simplifying networks.
2. To understand S-domain techniques (Laplace transform) to analyze the behavior of linear circuits.
3. To learn the concept of resonance, calculate the resonant frequency of RLC circuit.
4. To analyze various types of simple two-port circuits.

Course Outcomes (COs):

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

PCCL203.1	apply the knowledge of basic circuital laws and simplify the dc and ac networks using reduction techniques.
PCCL203.2	apply the knowledge of basic circuit law to simplify the networks using network theorems.
PCCL203.3	analyze the series and parallel resonant circuits.
PCCL203.4	determine the various parameters such as Z, Y, ABCD & h parameters of the two port network
PCCL203.5	apply the knowledge of network functions for one port & two port networks and determine stability

Prerequisite:	Basic Electrical Technology

HOD

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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	PSO 1	PSO 2	BTL
PCCL203.1	3	2	2	1	-	-	-	-	-	-	-	-	-	-	III
PCCL203.2	3	2	2	2	-	-	-	-	-	-	-	-	-	-	III
PCCL203.3	3	2	1	1	-	-	-	-	-	-	-	-	-	-	IV
PCCL203.4	3	2	1	1	-	-	-	-	-	-	-	-	-	-	II
PCCL203.5	3	2	1	1	-	-	-	-	-	-	-	-	-	-	III

Content	Hrs.
Unit 1 – Network Fundamentals & Network Theorems **Network Fundamentals**: Network Elements & its types, Energy sources. Combination of energy sources, Current Division & Voltage division, source transformation, Star- Delta transformation, Mesh analysis, Node analysis. **Network Theorems:** Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem	7
Unit 2- Resonance: Definition, Types: series & parallel resonance, Series resonance-resonant frequency, variation of impedance, admittance, current & voltage across L & C with respect to. Frequency, Effect of resistance on frequency response, Parallel resonance–Anti resonance circuit, Resonant frequency for a tank circuit, variation of impedance &admittance with frequency,	7
Unit 3- Two Port Network: Two port network: Z, Y, ABCD & h parameters,	7

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Interrelation of Z &ABCD parameters,	
Unit 4- Network Functions: Network functions for one port & two port networks, driving point impedance and admittance of one port network, Driving point impedance & admittance function, Transfer function, significance of poles & zeros. Stability of circuit using Routh criterion.	7

Text Book:

1. A. Sudhakar, Shyammohan S.Palli 'Circuit & Network – Analysis & Synthesis' IIIrd Edition – Tata McGraw Hill Publication
2. Ravish Singh, "Networks Analysis & Synthesis" Tata McGraw Hill Publication
3. A. Chakrabarti 'Circuit Theory (Analysis & Synthesis)' - IIIrd Edition Dhanpat Rai & co

Reference Books:

1. D. Roy Choudhury 'Networks & Systems' - New Age International Publisher
2. Soni Gupta 'Electrical Circuit Analysis' Dhanpat Rai& Co.
3. Boylestad 'Introductory Circuit Analysis – Universal book stall, New Delhi
4. M.E. Van Valkenburg 'Network Analysis' – IIIrd Edition, Pearson Education / PHI

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Electronics Circuits Analysis & Design – I Lab	
Course Code: 231ETPCCP201	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 To 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:

PCCP201.1	design unregulated and regulated power to meet the required parameters
PCCP201.2	determine the line & load regulation of IC regulators
PCCP201.3	observe the performance of linear & non-linear Wave shaping Circuits
PCCP201.4	analyse the performance of biasing circuits using BJT or FET

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

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
PCCP201.1	2	2	1	-	2	-	-	-	-	-	-	-	2	2	IV
PCCP201.2	2	2	1	-	2	-	-	-	-	-	-	-	2	2	IV
PCCP201.3	2	2	1	-	2	-	-	-	-	-	-	-	2	2	II
PCCP201.4	2	2	1	-	2	-	-	-	-	-	-	-	2	2	III

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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
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 incharge should conduct any of the 10 experiments listed

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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 : 231ETPCCP202	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.

Course Outcomes (COs):

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

PCCP202.1	apply knowledge related to Analog modulation & demodulation.
PCCP202.2	apply the theory of Digital Modulation & demodulation.

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Course Articulation Matrix: Mapping of Laboratory Outcomes (LOs) 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
PCCP202.1	3	1	-	-	1	-	-	-	-	-	-	1	1	1	III
PCCP202.2	3	1	-	-	1	-	-	-	-	-	-	1	2	2	III

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

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15	Study of quantization noise measurement.	O	2

S-Study, O-Operational,

Note: Subject in charge should conduct any 10 experiments from above list.

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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Department of Electronics & Telecommunication Engineering

S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Society based Mini Project	
Course Code: 231ETPCEP201	Semester : III
Teaching Scheme : L-T-P : 0-0-4	Credits: 2
Evaluation Scheme : ISE- 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:

PCEP201.1	apply the fundamental concepts and working principles of electronics devices to design electronics circuits to solve Societal problems.
PCEP201. 2	analyse datasheets and select appropriate components and devices.
PCEP201 .3	demonstrate simulation using software's.
PCEP201. 4	analyse application-based projects and estimate project cost.

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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	BTL
PCEP201.1	3	-	-	-	-	-	-	-	-	-	-	1	III
PCEP201. 2	3	1	-	-	1	-	-	-	-	-	-	1	III
PCEP201 .3	3	2	3	-	3	-	-	-	-	-	-	1	III
PCEP201. 4	3	2	3	-	3	-	-	-	3	-	-	1	VI

Sr. No.	Mini project work should consist of following steps
1	Students should propose societal problem based project ideas with a group of maximum four students & 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.

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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: 231ETMDML201	Semester : III
Teaching Scheme : L-T-P : 2-0-0	Credit: 2
Evaluation Scheme : ISE Marks : 20	ESE Marks : 30

Course Description: This course provides a comprehensive introduction to digital electronics, covering the essential concepts and applications of digital logic. It is designed to equip students with a solid understanding of number systems, logic gates, Boolean algebra, combinational and sequential logic circuits. By the end of the course, students will have the knowledge and skills required to design and analyze basic digital circuits.

Course Objectives:

1. To familiarize numbering system in digital electronics and interpret logic expression.
2. To implement universal and derived gates from logic gates.
3. To understand the combinational logic circuits
4. To understand the sequential logic circuits

Course Outcomes (COs):

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

MDML201. 1	solve various number conversion
MDML201. 2	implement universal and derived gates from basic logic gates.
MDML201. 3	understand the combinational circuits.
MDML201. 4	understand the sequential logic circuits.

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
MDML201. 1	2	2	1	1	-	-	-	-	-	-	-	-	1	2	II
MDML201. 2	2	2	1	1	-	-	-	-	-	-	-	-	-	-	III
MDML201. 3	1	1	1	1	-	-	-	-	-	-	-	-	1	1	II
MDML201. 4	2	2	2	1	-	-	-	-	-	-	-	-	1	2	II

Course Contents	Hrs
Unit No-1. Number Systems- Base/Radix, Most significant bit (MSB), Least significant bit (LSB), Bit, Nibble, Byte. Types of Number Systems-Binary, Octal, Decimal, Hexadecimal-Conversion between Number systems. Binary addition and subtraction-1's and 2's complement representation. Binary Codes: Weighted Binary Codes, Non-Weighted Binary Codes, ASCII codes.	7
Unit No-2. Logic Gates and Boolean Algebra: Logic Gates -Basic logic circuits: AND, OR, NOT and their truth tables. Derived logic gates-NAND, NOR, Ex-OR, Ex-NOR. NAND and NOR as Universal gate- Derivation of basic gates using NAND and NOR. Boolean Algebra -Laws of Boolean algebra, De-Morgan's theorem, Min term, Max term, POS, SOP, and K-Map up to 4 variables .	7
Unit No-3. Combinational Logic Circuits: Code-Converters, Half and Full Adders, Binary Parallel Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, 4 bit Arithmetic and logic unit	7
Unit No-4 : Sequential Logic Circuits: Flip Flops and latches -SR, JK, T, D and master-slave FF, ripple and synchronous counters, shift registers.	7

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Text Book:

1. Fundamentals of Digital Circuits, Anand Kumar, PHI
2. Digital Design, 5th edition, M. Moris Mano and Michael D Ciletti, Pearson pub, 2012

Reference Books:

1. An Engineering Approach to Digital Design, Willim I. Fletcher, PHI/ Pearson
2. Modern Digital Electronics, 4th edition, Jain R P, Mc Graw Hill, 2009

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Personal Values and Ethics	
Course Code: 231ETVECL201	Semester : III
Teaching Scheme : L-T-P :2-0-0	Credits:2
Evaluation Scheme : ISE + MSE Marks : 20 + 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. To understand the importance of professional ethics in engineering.
2. To apply ethical decision-making frameworks to engineering scenarios.
3. To analyze case studies related to ethical dilemmas in E & TC engineering.
4. To 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:

VECL201.1	identify and analyze ethical issues in electronics engineering practices.
VECL201.2	apply ethical theories and principles to resolve ethical dilemmas.
VECL201.3	evaluate the social and environmental impact of electronic technologies.
VECL201.4	demonstrate awareness of professional codes of conduct and responsibilities.

Prerequisite:	Personal Communication

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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	PSO 1	PSO 2	BTL
VECL201.1	2	3	1	-	-	3	-	3	-	1	-	-	1	1	IV
VECL201.2	2	3	1	-	-	3	-	3	-	1	-	-	1	1	III
VECL201.3	2	3	2	-	-	3	3	3	-	1	-	-	1	1	V
VECL201.4	2	3	1	-	-	3	3	3	1	2	-	2	1	1	III

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 incharge should conduct any of the activities listed

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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 (Sensors & Actuator) ODL	
Course Code: 231ETOECL201	Semester : III
Teaching Scheme : L-T-P : 2-0-0	Credit: 4
Evaluation Scheme : ISE + MSE Marks : 20 + 30, ESE Marks : 50	INT:25

Course Description:

This course is designed with an aim of educating students in micro technology and its use to fabricate sensors and systems. The students will have an exposure to sensors and its importance in the real world. Students will have an exposure towards how to fabricate the sensors and its application in real world as well as an understanding on modern day micro sensors and micro actuators.

Course Objectives:

1. To understand basics of sensors, actuators and their operating principle.
2. To provide the knowledge on different types of micro-fabrication techniques for designing and developing sensors.
3. To explain working of various types of electrochemical sensors and actuators.
4. To provide information about interfacing of sensors and signal conditioning circuits to establish any control system or monitoring system.
5. To provide knowledge about simulation & characterization of different sensors.
6. To provide an understanding on characteristic parameters to evaluate sensor performance.

Course Outcomes (COs):

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

OECL201.1	apply the basics of sensors, actuators and their operating principle.
OECL201.2	understand different types of micro-fabrication techniques for designing and developing sensors.
OECL201.3	explain working of various types of electrochemical sensors and actuators.
OECL201.4	understand the interfacing of sensors and signal conditioning circuits to establish any control system or monitoring system.

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OECL201.5	demonstrate the knowledge about simulation & characterization of different sensors.
OECL201.6	understand the characteristics & parameters to evaluate sensor performance.

Prerequisite:	knowledge of Basic Electronics & Semiconductor Physics

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
OECL201.1	2	2	1	1	-	-	-	-	-	-	-	-	1	2	III
OECL201.2	2	2	1	1	-	-	-	-	-	-	-	-	-	-	II
OECL201.3	1	1	1	1	-	-	-	-	-	-	-	-	1	1	II
OECL201.4	2	2	2	1	-	-	-	-	-	-	-	-	1	2	II
OECL201.5	1	1	2	2	-	-	-	-	-	-	-	-	-	-	III
OECL201.6	2	1	1	1	-	-	-	-	-	-	-	-	-	-	II

Course Contents	Hrs
Unit -1 Basics of Energy Transformation: Transducers, Sensors and Actuators, Understanding of thin film physics: Application in MOSFET and its variants.	7
Unit -2 Thin Film Deposition Techniques: Chemical Vapor Deposition (APCVD, LPCVD, UHVCVD, PECVD, ALCVD, HPCVD, MOCVD),Thin Film Deposition Techniques: Physical Vapour Deposition (Thermal Deposition, E-beam Evaporation, Sputtering, Pulsed Laser Deposition)	7
Unit -3 Basics understanding of Photolithography for pattering layer Detailed overview of Etching methods. Understanding various gas sensors: Optical gas sensor, Metal oxide semiconductor gas sensor, Field effect transistor gas sensor, Piezoelectric gas sensor, Polymer gas sensor, Nano-structured based gas sensors.	7

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Unit -4 : Design and fabrication process of Microsensors: Force Sensors, Pressure Sensors, Strain gauges and practical applications Explain working principles of Actuators. Piezoelectric and Piezoresistive actuators, micropumps and micro actuators with practical applications	7
Unit -5 Understanding basics of microfluidics Understanding basics of microfluidics to assist Photomask design using Clewin Software, pattern transfer techniques, PDMS moulding and degassing, device bonding techniques. Simulation, Optimization and characterization of various sensors using COMSOL Multiphysics	7
Unit -6 Understanding of Sensor Interfacing Understanding of Sensor Interfacing with Microprocessor to build electronic system. Static and Dynamic Characteristic Parameters for Sensors and Actuators, Calibration of Sensor based electronics systems.	7

Text Book:

1. Sensors and Signal Conditioning, Jacob Fraden, Wiley-Blackwell, 2008
2. Sensors, Actuators, and their Interfaces: A Multidisciplinary Introduction, Nathan Ida, First edition , SciTech Publishing, an imprint of IET 2014

Reference Books:

1. Handbook of modern sensors, Stefan Johann Rupitsch, Springer
2. Piezoelectric Sensors and Actuators: Fundamentals and Applications, Senturia S. D.Springer 2018
3. Microsystem Design ,J.D. Plummer, M.D. Deal, P.G. Griffin , Kluwer Academic Publisher 2001
4. Silicon VLSI Technology,S.M. Sze (Ed) Pearson Education 2001
5. VLSI Technology ,Second Edition Madou McGraw Hill 1988

Web Resources (NPTEL Link):-

https://onlinecourses.nptel.ac.in/noc21_ee32/preview

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Open Elective Course -I (Basics of Arduino) ODL	
Course Code: 231ET OECL202	Semester : III
Teaching Scheme : L-T-P : 2-0-0	Credit: 4
Evaluation Scheme : ISE + MSE Marks : 20 + 30, ESE Marks : 50	INT: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 introduce fundamental electronic components and Arduino basics.
2. To teach basic programming concepts and demonstrate interfacing with LEDs, push buttons, and LCDs using Arduino.
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.

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Course Outcomes (COs):

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

OECL202.1	identify and explain basic electronic components; Understand the capabilities and types of Arduino boards.
OECL202.2	write and upload basic Arduino programs; Successfully interface LEDs, push buttons, and LCDs, demonstrating control and interaction.
OECL202.3	implement PWM for controlling devices like motors; Use ADC to convert analog signals to digital; Display information using seven-segment displays.
OECL202.4	integrate wireless modules (e.g., ESP8266) with Arduino; Establish wireless communication and control using smartphones or other devices.
OECL202.5	write and integrate assembly and C code into Arduino projects; Optimize performance and utilize advanced features.
OECL 202.6	develop and present a functional Arduino project; Demonstrate creativity, problem-solving, and practical application of Arduino skills.

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
OECL 202.1	2	2	2	2	2	-	-	2	-	-	2	2	2	2	II
OECL 202.2	2	2	2	2	2	-	-	2	-	-	2	2	2	2	III
OECL 202.3	2	2	2	2	2	-	-	2	-	-	2	2	2	2	IV
OECL 202.4	2	2	2	2	2	-	-	2	-	-	2	2	2	2	IV
OECL 202.5	2	2	2	2	2	-	-	2	-	-	2	2	2	2	IV
OECL 202.6	2	2	2	2	2	-	-	2	-	-	2	2	2	2	VI

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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 LiquidCrystal 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

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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: 231ETHSSML201	Semester : IV
Teaching Scheme : L-T-P :1-0-2	Credits: - Audit
Evaluation Scheme : ISE:50	ESE Marks : Grade

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:

HSSML201.1	understand Indian finance system and Financial Markets.
HSSML201.2	evaluate of Time Value of Money, returns and risks.
HSSML201.3	apply the knowledge of Corporate Finance & Capital Budgeting, NPV, MIRR, IRR
HSSML201.4	develop the knowledge about sources of finance & capital structure.

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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
HSSML201.1	2	2	1	1	1	-	-	-	-	-	1	-	1	1	II
HSSML201.2	1	1	1	1	1	-	-	-	-	-	2	-	1	1	III
HSSML201.3	2	2	1	1	1	-	-	-	-	-	2	-	1	1	II
HSSML201.4	2	2	2	2	2	-	-	-	-	-	2	-	1	1	IV

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	3

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Annuity. Continuous Compounding and Continuous Discounting.	
Unit -3 **Overview of Corporate Finance:** Objectives of Corporate Finance.Financial Ratio Analysis: Overview of Financial Statements— Balance Sheet, Profit and Loss Account, and Cash Flow Statement. **Capital Budgeting:** Accounting Rate of Return, Payback Period, Discounted Payback Period, Net Present Value(NPV), Profitability Index, Internal Rate of Return (IRR), and Modified Internal Rate of Return (MIRR)	4
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 businesses.	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

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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 HillEducation, 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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LLC B. Tech. Curriculum

w.e.f. 2024-2025

Course Title : Liberal Learning-I (Garuda club) Drone Manufacturing & Assembly	
Course Code : 231ETCCAL201	Semester : III
Teaching Scheme : L-T-P : 2-0-0	Credits :
Evaluation Scheme : 50	ESE Marks : Grade

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 check 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.

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Club 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

Club Outcomes (COs):

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

CCAL301.1	to Understanding the components, operational basics of a Drone
CCAL301.2	to Understanding Flying principles with a Drone flight Simulator
CCAL301.3	to Performing Manufacture, Assembly, Testing and Quality check of the Drone

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 bootcamps 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.

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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

Course Title: Liberal Learning Course-II (Robotics Club)	
Course Code: 231ETCCAL202	Semester : III
Teaching Scheme : L-T-P : 2-0-0	Credit: Audit
Evaluation Scheme : ISE : 50	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.

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.

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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.

Outcomes (COs):

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

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

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

Club Contents	Hrs
• Seminars • Workshops • Short courses • Certifications • Hackathons • Project competitions • Industrial Projects • Research and Development	30

Evaluation Guidelines

- Attendance: Regular attendance in Expert lectures, workshops, and club meetings.

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- Engagement: Active participation in discussions, Q&A sessions, and group activities.
- Teamwork: Collaboration with peers on projects and challenges.
- Technical Proficiency: Ability to operate IoT 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:

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- 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
- Publish a Research Article in Journal or Conference

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Liberal Learning Course-III (IoT Club)	
Course Code: 231ETCCAL203	Semester : III
Teaching Scheme : L-T-P : 2-0-0	Credit: Audit
Evaluation Scheme : ISE : 50	ESE Marks : Grade

Course Description:

The club has vision to provide a platform for learning, networking, staying updated on the latest advancements in IoT technology and explore, innovate, and collaborate on IoT-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 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 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 development.

Club Objectives:

1.	To better understand IoT 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.

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3.	Encourage members to collaborate on IoT 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 solutions.
5.	Create a supportive community where members can share knowledge, seek advice, and collaborate on various IoT-related endeavors.

Club Outcomes (COs):

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

CCAL203.1	Understand IoT Technologies and their applications.
CCAL203.2	Implement the technical skills relevant to IoT
CCAL203.3	Analyze and solve the real world problem with innovative thinking
CCAL203.4	Create the systems by contributing and work as team member

Prerequisite: Basic knowledge of analog and digital communication

Club Contents	Hrs
• Seminars • Workshops • Short courses • Certifications • Hackathons • Project competitions • Industrial Projects • Research and Development	30

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.

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- Technical Proficiency: Ability to operate IoT 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 bootcamps and workshops.
- Complete a basic IoT project (e.g., designing and implementing simple projects).
- Demonstrate understanding of basic IoT concepts and operations.

2. Intermediate Level Certification:

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

3. Advanced Level Certification:

- Lead a team in a major IoT project or competition.
- Find and work on industrial consultancy

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- Organize or contribute significantly to a club event or workshop.
- Conduct a presentation or seminar on a specialized IoT topic.
- Publish a Research Article in Journal or Conference

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Electronics Circuits Analysis & Design – II	
Course Code: 231ETPCCL204	Semester: IV
Teaching Scheme: L-T-P :3-0-0	Credit: 3
Evaluation Scheme: ISE + MSE Marks: 20 + 30	ESE Marks: 50

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

Course Objectives:

1 To develop h parameter model of amplifier along with its design

2 To study the behavior of amplifier at various frequencies

3 To analyze & design various types of amplifiers

4 To provide the basic knowledge of MOSFET to design Amplifier

Course Outcomes (COs):

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

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

Prerequisite:	Physics, EEE

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

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
PCCL204.1	2	2	1	-	-	-	-	-	-	-	-	-	2	2	IV
PCCL204.2	2	2	1	-	-	-	-	-	-	-	-	-	2	2	IV
PCCL204.3	2	2	1	-	-	-	-	-	-	-	-	-	2	2	IV
PCCL204.4	2	2	1	-	-	-	-	-	-	-	-	-	2	2	IV

Content	Hrs.
Unit 1 –BJT and FET Amplifiers BJT: H-Parameters, Hybrid model for transistor and their approximate model (CE, CB & CC configuration), Study & Design of single stage RC coupled BJT.	7
Unit 2 - Frequency Response Amplifiers **Low Frequency:** BJT (Common Emitter) Amplifier, Effect of coupling and bypass capacitors. **High Frequency:** Effect of Internal Transistor Capacitances, Common Emitter	7

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Hybrid π model, Common Emitter Short Circuit and resistive Current Gain, Gain Bandwidth Product,	
Unit 3 - Multistage Amplifiers Need of Cascading, Parameter evaluation such as Ri , R0, Av, Ai & Bandwidth for General Multistage Amplifier, Different Types of Coupling, Analysis of direct coupled & transformer coupled Amplifier	7
Unit 4 - Feedback Amplifiers General theory of feedback, reasons for negative feedback. Types of negative feedbacks in transistor circuits: Voltage series, Current series, Voltage shunt, Current shunt feedback amplifiers, Darlington pair, Darlington amplifier using bootstrapping principle, Design of Voltage series feedback amplifier	7
Unit 5 -Analysis of Power Amplifiers Need of Power amplifier, classification of power amplifier, Power considerations, Distortion in power amplifiers: Phase, Frequency, amplitude/ harmonic / nonlinear distortion, Class A single ended transformer coupled amplifier& class A Push pull amplifiers analysis, Class B amplifier & class B push pull amplifier analysis, crossover distortion.	7
Unit 6 – MOSFETS Construction, working and Characteristics of MOSFET, Small-Signal Equivalent Model, Analysis of Common Source (CS) amplifier. Design of Common Source (CS) single stage MOSFET Amplifier,	7

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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

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Digital System Design using Verilog	
Course Code: 231ETPCCL205	Semester : IV
Teaching Scheme : L-T-P : 3-0-0	Credits: 3
Evaluation Scheme : ISE + MSE Marks : 20 + 30	ESE Marks : 50

Course Description: This course provides a comprehensive introduction to digital system design using Verilog HDL (Hardware Description Language). The curriculum covers fundamental concepts of digital systems, combinational and sequential logic design, finite state machines, and system-level design. Students will learn to model, simulate, and synthesize digital circuits using Verilog, gaining practical experience through laboratory exercises.

Course Objectives:

1. To learn basic techniques for the design of combinational logic circuits
2. To learn basic techniques for the design of sequential logic circuits
3. To learn basic techniques for the design of counters and finite state machines
4. To design and verify the digital circuits by means Verilog HDL and EDA tools.
5. To create Finite State Machines (FSMs) and User Defined Primitives (UDP)
6. To evaluate different types of PLDs

Course Outcomes (COs):

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

PCCL205.1	analyze and design combinational circuits
PCCL205.2	analyze and design sequential circuits
PCCL205.3	analyze and design counters and finite state machines
PCCL205.4	design and simulate Digital Logic using Verilog HDL and EDA tools.
PCCL205.5	analyze and implement designs on Programmable Logic Devices (PLDs)

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
PCCL205.1	2	2	1	1	-	-	-	-	-	-	-	-	1	2	III
PCCL205.2	2	2	1	1	-	-	-	-	-	-	-	-	-	-	III
PCCL205.3	1	1	1	1	-	-	-	-	-	-	-	-	1	1	III
PCCL205.4	2	2	2	1	-	-	-	-	-	-	-	-	1	2	III
PCCL205.5	1	1	2	2	-	-	-	-	-	-	-	-	-	-	III

Course Contents	Hrs
Unit No-1. Combinational Logic Design:- Code-Converters, Half and Full Adders, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Mux/Demux, 8 bit Arithmetic and logic unit, Parity Generator/Checker, Seven Segment display decoder	7
Unit No-2. Sequential Logic Design: Latches, flip-flops: S-R, D, JK and Master-Slave JK FF, Edge triggered FF, Flip Flop conversion, Use of preset and clear, Excitation Table and characteristic equations for flip flops, and Conversion of flip flops, Timing parameters of FF, Shift registers (SISO, SIPO, PIPO, and PISO).	7
Unit No-3 . Counters and Finite State Machines: Counter –ripple counters, synchronous counters , Up/down counters, Ring counters, Johnson Counter, MOD-N counter, FSM, Moore/Mealy machines, state diagram, state table, state assignment and state reduction, Sequence detector.	7
Unit No-4 . Introduction to Verilog: Structure of Verilog module, Operators, Data Types, Styles of Description. Verilog Data flow description: Highlights of Data flow description, Structure of Data flow description. Combinational logic circuit design using Verilog data flow description	7
Unit No -5. Verilog Behavioral and Structural description: Behavioral description Structure: Variable Assignment Statement, Sequential Statements, Loop statements Verilog Structural description: Highlights of Structural description, Behavioral and Structural description of Combinational logic and Sequential	7

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circuits	
Unit No- 6. Programmable Logic Devices (PLDs) Overview of PLDs: PROM, PLA, PAL, GAL, CPLD, FPGA.FPGA Architecture and Design Flow: From specification to bitstream. Tool for FPGA Design: Xilinx ISE, Implementing Digital Systems on FPGA/CPLD : Synthesis, place and route, bitstream generation.	7

Text Book:

1. Digital Design, 5th Edition M. Morris Mano and Michael D. Ciletti, Pearson 2013
2. Verilog HDL: A Guide to Digital Design and Synthesis, Samir Palnitkar, Pearson Education
3. Fundamentals of Logic design with Verilog, 2nd Edition, Stephen Brown and Zvonko Vranesic McGrawHill publication, 2010

Reference Books:

1. Verilog Digital System Design, 2nd Edition, Zainalabdien Navabi, TMH
2. Modern Digital Electronics, 4th Edition R.P.Jain, Tata McGraw-Hill Education

Web Resources :

https:/nptel.ac.in/courses/106/105/106105165/

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title : **Instrumentation & Control System**	
Course Code : 231ETPCCL206	Semester : III
Teaching Scheme : L-T-P : 2-0-0	Credits : 4
Evaluation Scheme : ISE + MSE Marks : NA	ESE Marks : 50

Course Description:

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

Course Objectives:

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

Course Outcomes (COs):

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

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

Prerequisites:	Students should know the differential mathematics, Laplace transform

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

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

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

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

Text Books:

1. Sawhney A.K., Electrical and Electronics Measurements and Instruments, DhanpatRai&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.andM.Gopal,"Control Systems Engineering",6th edition, New Age international

Reference Books:

1. Hewlett Packard, Tektronics, Advantest,Aplab,"Application Notes on Measurement".
2. BouwensA.J.,'Digital Instrumentation, McGraw-Hill, second edition
3. Control System engineering,Ramesh, Babu,R.Ananda.Natarajan,SCITECH Publications.

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Electronics Circuits Analysis & Design – II Lab.	
Course Code: 231ETPCCP204	Semester: IV
Teaching Scheme: L-T-P :0-0-2	Credit: 1
Evaluation Scheme : ISE + MSE Marks : NA	INT:25, POE: 25

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

Course Objectives:

1 To determine h parameters from the characteristics of CE amplifier

2 To observe the behavior of single stage amplifier at various frequencies

3 To make the students aware of the applications of electronic components such as Transistor and MOSFET

4 To develop the practical skills to study the performance of various amplifiers, their analysis & design

Course Outcomes (COs):

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

PCCP204.1	determine the h parameters from the characteristics of CE Amplifier
PCCP204.2	apply the knowledge of transistor to observe the frequency response of single stage Amplifier
PCCP204.3	design various amplifiers in simulators and using hardware.
PCCP204.4	design MOSFET Amplifier and observe its characteristics

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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
PCCP204.1	2	2			1								2	2	L2
PCCP204.2	2	2			1								2	2	L3
PCCP204.3	2	2			1								2	2	L3
PCCP204.4	2	2			1								2	2	L3

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List of Experiments			
Expt. No.	**Name of Experiment**	**Type Hours**	**Type Hours**
1	To determine h-parameters of single stage RC coupled amplifier from its characteristics using Simulator	S	2
2	To study frequency response of single stage RC coupled amplifier.	O	2
3	To design of single stage RC coupled Amplifier and determine	O	2
	its bandwidth from frequency response for Sinusoidal input		
4	To study the behavior of single stage RC coupled Amplifier for Square Wave input	O	2
5	To observe effect of Negative feedback on gain and Bandwidth of single stage RC coupled amplifiers.	O	2
6	To design two stage RC coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input	O	2
7	To design direct coupled Amplifier and determine its bandwidth from frequency response for Sinusoidal input with the help of Simulator	S	2
8	To design of voltage series feedback Amplifier and determine its bandwidth from frequency response without and with feedback	O	2
9	To simulate the Class A power amplifier and calculate the efficiency	S	2
10	To simulate the Class B Complementary Symmetry Amplifier and calculate the efficiency	S	2
11	To observe and plot the characteristics of MOSFET using Simulator	O	2
12	Design Common Source MOSFET Amplifier	O	2
13	Mini project based on Transistor application	O	6

S: indicates Study type, O: Operational type.

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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: Digital System Design using Verilog -Lab	
Course Code: 231ETPCCP205	Semester : IV
Teaching Scheme : L-T-P :0-0-2	Credit: 1
Evaluation Scheme : ISE + MSE Marks : NA	INT:25, POE: 25

Lab Course Description: This lab-oriented course covers the design and simulation of digital systems using Verilog.

Course Objectives:

1 To explain the analytical methods for combinational and sequential logic design

2 To study semiconductor memories and PLDs.

3 To develop the methodology for digital design using Verilog

4 To verify and design the digital circuit by means of Computer Aided Engineering tools which involves in programming with the help of Verilog HDL.

Course Outcomes (COs):

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

PCCP205.1	derive and analyse logic expressions and circuits using Boolean laws and K-map.
PCCP205.2	analyse and Design combinational and sequential circuits
PCCP205.3	describe architecture and internal components semiconductor memories and PLDs
PCCP205.4	design and simulate digital logic using Verilog HDL and EDA tools

HOD

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
PCCP205.1	3	3	2	-	-	-	-	-	-	-	-	-	-	2	III
PCCP205.2	3	2	3	2	-	-	-	-	-	-	-	-	-	2	IV
PCCP205.3	2		2	-	-	-	-	-	-	-	-	-	-	-	II
PCCP205.4	-	-	3	2	2	-	1	-	-	-	-	-	-	-	IV

List of Experiments		
Expt. No.	**Name of Experiment**	**Hrs.**
1	To design and simulate the Verilog code for basic logic gates	2
2	To design and simulate the Verilog code for half adders, full adders	2
3	To design and simulate the Verilog code for half aubtractor, full subtractor	2
4	To design and simulate the Verilog code for Multiplexers	2
5	To design and simulate the Verilog code for De-multiplexer	2
6	To design and simulate the Verilog code for Decoder	2
7	To design and simulate the Verilog code for 4 - Bit binary to gray code converter & 4 - Bit gray to binary code converter	2
8	To design and simulate the Verilog code for Comparator	2

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9	To design and simulate the Verilog code for D, T flip flops	2
10	To design and simulate the Verilog code for Binary counter	2
11	To design and simulate the Verilog code for shift register	2
12	To design and simulate the Verilog code for state machines to detect the given sequence of bits.	2
13	Varilog based Mini project	6

References:

1. Fundamentals of Digital Logic with Verilog Design - Stephen Brown, Zvonkoc Vranesic, TMH, 2nd Edition.
2. Zainalabdien Navabi, Verliog Digital System Design, TMH, 2nd Edition.
3. Verilog HDL - Samir Palnitkar, 2nd Edition, Pearson Education, 2009.

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Microcontrollers (CISC) (MDM-2)	
Course Code: 231ETMDML202	Semester : III
Teaching Scheme : L-T-P : 2-0-0	Credit: 2
Evaluation Scheme : ISE Marks : 20	ESE Marks : 30

Course Description: This course covers the 8051 microcontroller's architecture, instruction set, and practical interfacing techniques. Students will learn assembly programming, working with stacks, subroutines, and interfacing with switches and LEDs. It also includes timer operations and basic serial communication programming.

Course Objectives:

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

Course Outcomes (COs):

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

MDML202.1	identify features of 8051 microcontroller
MDML202.2	write assembly language programs for given application
MDML202.3	interface microcontroller with hardware for given application
MDML202.4	configure and program the timers, counters, serial communication interfaces of the 8051 microcontroller for various applications.

Prerequisite:	Basics of digital electronics

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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
MDM202.1	2	2	2	1	-	-	-	-	-	-	-	-	1	2	II
MDM202.2	2	2	1	2	-	-	-	-	-	-	-	-	2	1	II
MDM202.3	3	1	3	1	-	-	-	-	-	-	-	-	1	1	III
MDM202.4	2	2	2	1	-	-	-	-	-	-	-	-	1	2	III

Course Contents	Hrs
Unit No-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 No-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 No-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 No-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

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Text Book:

1. The 8051 Microcontroller and Embedded Systems – using assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay Pearson, 2006
2. The 8051 Microcontroller, 3rd Edition Kenneth J. Ayala, Thomson/Cengage Learning

Reference Books:

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

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title : Environmental Studies	
Course Code : 231ETVECL202	Semester : III /VI
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. To understand the scope and importance of Environmental Studies and sustainable development
2. To understand connection between environmental health and developmental activities
3. To understand the importance of Environmental Management for its protection through technical and legislative point of view
4. To acquire problem solving skills through visits to different locations, identifying the Environmental problems and proposing solution for societal benefits

Course Outcomes (COs):

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

VECL202.1	understand the scope and importance of Environmental awareness and Sustainable development
VECL202.2	understand various Environmental issues due to development
VECL202.3	understand various modes of Environmental management through technoly and legislation
VECL202.4	acquire problem solving attitude through actual field experience, reporting it in the form of Field project work.

Prerequisite:	Understanding of Environmental Education course

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

COs	POs												PSOs		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
VECL202.1	-	-	-	-	-	1	3	2	-	-	-	2	-	-	II
VECL202.2	-	-	-	-	-	1	3	1	-	-	-	2	-	-	II
VECL202.3	-	-	-	-	-	1	3	1	-	-	-	2	-	-	III
VECL202.4	-	-	-	-	-	2	3	1	-	1	1	2	-	-	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.	05
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)	

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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)	**05**

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

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B. Tech. Curriculum

w.e.f. 2024-2025

Course Name: Industrial Management and Start-ups	
Course Code: 231ETHSSML202	Semester : IV
Teaching Scheme: L-T-P :2-0-0	Credits: 2
Evaluation Scheme: ISE Marks: 25	INT Marks: 25

Course Description:

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

Course Objectives:

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

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Course Outcomes (COs):

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

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

Prerequisite:	Commercial aspects

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

Course Outcomes (COs) / Program Outcomes (POs)	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2	BTL
HSSML202.1	-	-	-	2	-	2	2	2	1	1	2	2	1	1	III
HSSML202.2	-	-	-	2	-	2	2	2	1	1	2	2	3	3	V
HSSML202.3	-	-	-	2	-	2	2	2	1	1	2	2	1	1	IV
HSSML202.4	-	-	-	2	-	2	2	2	1	1	2	2	1	1	III

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Content	Hrs
Unit 1: Fundamentals of management History of industrial development, Introduction, Definition of management, characteristics of management, functions of management, Principles of Management, Administration and management, Nature and levels of management, managerial skills, managerial roles, Forms of Organization. Forms of ownerships introduction to Globalisation	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	

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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 Practice(Ability Enhancement Course)	
Course Code: 231ETAECP201	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 analogy and digital electronics.
4. To enable students to design & fabricate their own Hardware.

Course Outcomes (COs):

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

AECP201.1	illustrate the different types of Electronics tools and their application.
AECP201.2	analyse the working of semiconductor devices and their application.
AECP201.3	integrate the knowledge of basic Sensors and digital electronics.
AECP201.4	enable the Students to develop application-based micro-projects and estimate project

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
AECP201.1	3	-	-	-	-	-	-	-	-	-	-	1	2	1	IV
AECP201.2	3	-	-	-	-	-	-	-	-	-	-	1	2	1	IV
AECP201.3	3	2	-	-	-	-	-	-	-	-	-	1	2	1	IV
AECP201.4	3	2	1	-	-	-	-	-	1	-	-	1	2	1	IV

Course Contents	Hrs
Unit – I: Safety Measures: Familiarization/Identification of electronic components with specification (Functionality, type, size, colour coding, package, symbol, cost etc. [Active, Passive, Electrical, Electronic, Electro-mechanical, Wires, Cables, Connectors, Fuses, Switches, Relays, Crystals	2
Unit - II :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 – III: Applications of Diode and Transistor: To familiarise 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 No-IV : Applications of Sensor: To familiarise with Sensors like IR Digital Sensor , Colour IR Sensor, Light Sensor ,Sound Sensor, Ultrasonic sensor, moisture sensor etc ,	2
Unit No –V: PCB Design , Soldering and Circuit Simulation: PCB Design using CAD, Types of soldering, Circuit Simulation using CAD.	2
Unit No- VI: 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 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 Instrumentation	
Course Code : 231ETOECL203	Semester : IV
Teaching Scheme : L-T-P : 2-0-0	Credits : 2
Evaluation Scheme : ISE+MSE Marks:NA	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. Understand fundamental measurement and instrumentation concepts.
2. Learn about analog and digital measuring instruments.
3. Study different sensors and transducers and their applications.
4. Understand virtual instrumentation and LabVIEW software.

Course Outcomes (COs):

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

OECL203.1	explain key concepts, identify errors, and analyze instrument performance.
OECL203.2	describe operation, interpret block diagrams, and perform measurements.
OECL203.3	classify sensors, understand principles, and select appropriate transducers.
OECL203.4	use virtual instruments, integrate components, and develop LabVIEW applications.

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

Course Outcomes (COs)	PO												PSO		BTL
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
OECL203.1	3	-	-	-	-	-	-	-	-	-	-	1	1	-	III
OECL203.2	3	1	-	-	1	-	-	-	-	-	-	1	1	-	III
OECL203.3	3	2	1	-	2	-	-	-	-	-	-	1	1	-	IV
OECL203.4	3	2	1	-	2	-	-	-	1	1	-	1	1	-	IV

Contents	Hours
Unit 1. Introduction to Measurement & Instrumentation Introduction, definition of measurement, definition of instrumentation, generalized block diagram of measurement system, different sources of errors in measurement, statistical analysis, calibration of instruments, performance characteristics of instruments – static characteristics, dynamic characteristics, and analysis of dynamic behavior of system, factors affecting on the selection of instrument for measurement.	8
Unit 2. Testing & Measuring Instruments Analogue Instruments- Introduction, types of analog instruments, PMMC, MI, solid state electronic instruments, ohmmeter. Digital Instruments Digital Voltmeter- ramp type DVM, integrating type DVM, successive approximation type DVM, DMM, Digital Tachometer, Digital Storage Oscilloscope Block diagram of oscilloscope, CRO measurement-measurement of electrical parameter-voltage, multi-input oscilloscope-dual beam oscilloscope, dual trace oscilloscope Spectrum analyzer block diagram, applications & Wave analyzer block diagram, applications	7

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Unit 3. Sensors and Transducers Definition and Classification of sensors/Transducers, Characteristics and Choice of Transducers, Potentiometer, Strain Gauges, RTD, Thermister, Thermocouple, LVDT, Capacitive Transducer, Piezo-Electric Transducer, Photo Emissive Cell, Photoconductive Cell, Photovoltaic Cell, Photo Diode, Photo Transistor PH sensors & their signal conditioning.	7
Unit 4. Virtual Instrumentation: Introduction to virtual instrumentation, Role of Software in Virtual Instrumentation, Virtual Instrumentation with Lab VIEW, Components of Lab VIEW application	6

Text Books:

1. A.D. Helfik , W. N. cooper, "Modern Electronic Instrumentation & Measurement Techniques", person education
2. A.K. Sawhney. "A Course In Electrical & Electronics Measurements & Instruments", Dhanpat Rai & sons publication. Sawhney
3. W. D. Cooper & A. D. Helfrick, Electronic Instrumentation and Measurement Techniques", PHI, 4the/d,1987.
4. David Bell ," Electronic Instrumentation and Measurements",PHI,2e/d

Reference Books:

1. H.S.Kalsi, "Electronics instrumentation", second edition, Tata McGraw Hill publication.
2. AlokBarua, "Fundamentals of industrial instrumentation", Wiley India publication.
3. David A.Bell, "Electronics instrumentation & measurements", 3rd edition Oxford publication.
4. Hewlett Packard, Tektronics, Advantest, Aplab,"Application Noteson Measurement".
5. BouwensA.J.,,,Digital Instrumentation, McGraw-Hill, second edition

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S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Electronic Automation (Open Elective-II)	
Course Code: 231ETOECL204	Semester : IV
Teaching Scheme : L-T-P : 2-0-0	Credit: 2
Evaluation Scheme : Theory-ISE + MSE Marks : 20 + 30	

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. To understand the fundamentals and importance of Arduino
2. To analyze different types of sensors and basic fundamentals of robots used in electronic automation
3. To analyze to develop a PLC program for an automatic control system and its applications
4. To 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:

OECL204.1	apply the concept and analyze the importance and application of Arduino
OECL204.2	describe different types of sensors and basic fundamentals of robot used in electronic automation modelling to design digital circuits
OECL204.3	demonstrate the PLC program for an automatic control system and its application design digital circuits
OECL204.4	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
OECL204.1	2	2	1	1	-	-	-	-	-	-	-	-	1	2	III
OECL204.2	2	2	1	1	-	-	-	-	-	-	-	-	1	2	III
OECL204.3	2	1	1	1	-	-	-	-	-	-	-	-	1	1	IV
OECL204.4	2	2	2	1	-	-	-	-	-	-	-	-	1	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 No.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 No.3: PLC Programming: PLC programming: Development of Relay Logic Ladder Diagram, Introduction to PLC Programming, Programming devices .	7
Unit No.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

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Text Books:

1. Programmable Logic Controllers, John Web, Prentice Hall of India
2. Distributed Computer Control for Industrial Automation, 2nd Edition, Popovik –Bhatkar Dekkar

Reference Books:

1. Robotics and Industrial automation, R.K.Rajput
2. Automation and advanced manufacturing systems, 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: 231ETVSECP201	Semester : IV
Teaching Scheme : L-T-P : 1-0-2	Credit: 2
Evaluation Scheme : ISE Marks : 25	POE 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. To write simple computer programs in MATLAB
2. To apply the skills to evaluate scientific problems
3. To provide a foundation in programming for engineering problem solving using the MATLAB

Course Outcomes (COs):

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

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

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

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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
VSECP201.1	3	2	1	1	3	1	2	1	1	1	1	3	2	2	III
VSECP201.2	2	2	1	1	3	1	2	1	1	1	1	3	2	2	III
VSECP201.3	2	2	1	1	3	1	2	1	1	1	1	3	2	2	III
VSECP201.4	2	2	2	1	3	1	2	1	1	1	1	3	2	2	III

Course Contents	Hrs
Unit 1 – Introduction to MATLAB Basic features, A minimum MATLAB session , Starting MATLAB, Using MATLAB as a calculator, Quitting MATLAB, Getting started : Creating MATLAB variables, Overwriting variable, Error messages, Making corrections, Controlling the hierarchy of operations or precedence, Controlling the appearance of floating point number, Managing the workspace, Keeping track of your work session, Entering multiple statements per line, Miscellaneous commands, Getting help	4
Unit 2 –MATLAB functions Mathematical functions, Basic plotting: overview, Creating simple plots, Adding titles, axis labels, and annotations, Multiple data sets in one plot, Specifying line styles and colours, Matrix generation: Entering a vector, Entering a matrix, Matrix indexing, Colon operator, Linear spacing, Colon operator in a matrix, Creating a sub-matrix, Deleting row or column , Dimension, Continuation, Transposing a matrix, Concatenating matrices, Matrix generators, Special matrices, Arra operations and Linear equations:: Matrix arithmetic operations, Array arithmetic operations, Matrix functions, Matrix inverse	4

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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

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List of Experiment			
Experiment No.	**Name of Experiment**	**S/O**	**Hours**
1	Introduction to MATLAB Software	S	2
2	Modelling and Simulation of First-Order Systems	O	2
3	Time Response Analysis of Second-Order Systems	O	2
4	Frequency Response Analysis using Bode Plots	O	2
5	Design and Analysis of PID Controllers	O	2
6	State Space Modelling and Simulation of Control Systems	O	2
7	Stability Analysis using Root Locus and Nyquist Plots	O	2
8	Simulation of Single-Phase Half-Wave Rectifier	O	2
9	Simulation of Single-Phase Full-Wave Bridge Rectifier	O	2
10	Modelling and Simulation of DC-DC Buck Converter	O	2
11	Modelling and Simulation of DC-DC Boost Converter	O	2
12	Simulation of Single-Phase Inverter with PWM Control	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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Department of Electronics & Telecommunication Engineering

S.Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title : Liberal Learning Course- I (Garuda Club) Drone Manufacturing & Assembly	
Course Code : 231ETCCAL204	Semester : IV
Teaching Scheme : L-T-P : 2-0-0	Credits : Grade
Evaluation Scheme : 50	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 check 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.

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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

Course Outcomes (COs):

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

CCAL204.1	to Understanding the components, operational basics of a Drone
CCAL204.2	to Understanding Flying principles with a Drone flight Simulator
CCAL204.3	to Performing Manufacture, Assembly, Testing and Quality check of the Drone

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 bootcamps 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.

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- 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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w.e.f. 2024-2025

Course Title: Liberal Learning Course-II (Robotics Club)	
Course Code: 231ETCCAL205	Semester : IV
Teaching Scheme : L-T-P : 2-0-0	Credit: Audit
Evaluation Scheme : ISE : 50	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.

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

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5. Create connections with industry professionals and academic experts to enhance learning.
6. Acknowledge outstanding achievements in various robotics challenges.

Outcomes (COs):

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

CCAL205.1	Apply foundational knowledge in robotics, programming, and electronics to design and build functional robotic systems.
CCAL205.2	Analyze and solve complex problems through hands-on projects and challenges in robotics.
CCAL205.3	Collaborate effectively with team members, enhancing their communication and teamwork skills through group projects and competitions.
CCAL205.4	Innovative and unique robotic solutions, contributing to advancements in the field.

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

Club Contents	Hrs
• Seminars • Workshops • Short courses • Certifications • Hackathons • Project competitions • Industrial Projects • Research and Development	30

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.

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- Technical Proficiency: Ability to operate IoT 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.

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- Conduct a presentation or seminar on a specialized robotics topic.
- Publish a research article in a journal or conference
- Publish a Research Article in Journal or Conference

S. Y. B. Tech. Curriculum

w.e.f. 2024-2025

Course Title: Liberal Learning Course-III (IoT Club)	
Course Code: 231ETCCAL206	Semester : IV
Teaching Scheme : L-T-P : 2-0-0	Credit: Audit
Evaluation Scheme : ISE : 50	ESE Marks :- Grade

The club has vision to provide a platform for learning, networking, staying updated on the latest advancements in IoT technology and explore, innovate, and collaborate on IoT-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 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 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 development.

Club Objectives:

1. To better understand IoT 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 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 solutions.
5. Create a supportive community where members can share knowledge, seek advice, and collaborate on various IoT-related endeavors.

Club Outcomes (COs):

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

CCAL206.1	Understand IoT Technologies and their applications.
CCAL206.2	Implement the technical skills relevant to IoT
CCAL206.3	Analyze and solve the real world problem with innovative thinking
CCAL206.4	Create the systems by contributing and work as team member

Prerequisite: Basic knowledge of analog and digital communication

Club Contents	Hrs
• Seminars • Workshops • Short courses • Certifications • Hackathons • Project competitions • Industrial Projects • Research and Development	30

Evaluation Guidelines

- Attendance: Regular attendance in Expert lectures, workshops, and club meetings.
- Engagement: Active participation in discussions, Q&A sessions, and group activities.

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- Teamwork: Collaboration with peers on projects and challenges.
- Technical Proficiency: Ability to operate IoT 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 bootcamps and workshops.
- Complete a basic IoT project (e.g., designing and implementing simple projects).
- Demonstrate understanding of basic IoT concepts and operations.

2. Intermediate Level Certification:

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

3. Advanced Level Certification:

- Lead a team in a major IoT project or competition.
- Find and work on industrial consultancy

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- Organize or contribute significantly to a club event or workshop.
- Conduct a presentation or seminar on a specialized IoT topic.
- Publish a Research Article in Journal or Conference

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