Department of Electronics Engineering

Online Board of Studies Meeting of Electronics Engineering held on 03.06.2025

Agenda of the BoS Meeting

Minutes should have a summary/cover page mentioning all the significant changes made in the following given format :

Courses where revision was carried out*							
Course name	Course Code	Year/Date of introduction	Year/Date of revision	Percentage of content added or replaced	Agenda Item No.	Page No.	Link of relevant documents/minutes
Instrumentation & Sensors	14251101	11th Sept 2024	3rd June 2025	6% added	Item 6	28	Annexure V
Electronic Devices	14251103	11th Sept 2024	3rd June 2025	8% added	Item 6	32	Annexure V
Network Theory	14251104	11th Sept 2024	3rd June 2025	5% added	Item 6	34	Annexure V

New Courses added*					
Course name	Course Code	Activities/contents which have a bearing on increasing skill and employability	Agenda Item No.	Page No.	Link of relevant documents/minutes
Data Structures	14242102	Focus on mastering fundamental concepts, practicing problem-solving and building projects	Item 2	8	Annexure I
Probability and Random Processes	14242101	Understanding random experiments and probability distribution	Item 2	10	Annexure I

BoS Agenda Items	
Item 1	To confirm the minutes of previous BoS meeting held in the month of December 2024. **The minutes of previous BoS held on Dec 2024 has been finalized and confirmed.**
Item 2	To review and finalize the syllabi of all courses of UG programmes - **B. Tech. and B.Arch. III Semester** (**for batch admitted in 2024-25**) along with their COs and CO-PO/PSO matrix. **The scheme structure and syllabi of all courses of UG programmes of B.Tech. IIIrd semester-Electronics Engineering (for the batch admitted in 2024-25) under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) has been discussed and finalized.** Annexure I
Item 3	To review and finalize the **Experiment list/ Lab manual and project list under Macro Project-I** for all the Laboratory Courses to be offered in **UG programmes – B.Tech. and B.Arch. III Semester** (**for batch admitted in 2024-25**) along with their COs and CO-PO/PSO matrix. **The Experiment list/ Lab manual and project list under Macro Project-I for all the Laboratory Courses to be offered in UG programmes – B.Tech. III Semester-Electronics Engineering (for batch admitted in 2024-25) along with their COs and CO-PO/PSO matrix has been discussed and finalized. Annexure II**
Item 4	To review and finalize the courses for **Self-learning/Presentation** to be offered from SWAYAM/NPTEL/MOOC based platform for **UG programmes – B.Tech. and B.Arch., III Semester** (**for batch admitted in 2024-25**). **List of courses for Self-learning/Presentation to be offered from SWAYAM/NPTEL/MOOC based platform for UG programmes – B.Tech. III Semester-Electronics Engineering (for batch admitted in 2024-25) has been discussed and finalized. Annexure III**
Item 5	To propose the list of **professional certification platforms** and **relating certifications** with specific domain/areas of certification. {representative list to be prepared} **The propose list of professional certification platforms and relating certifications with specific domain/areas of certification for B.Tech in Electronics Engineering finalized as per the discussion with BoS members. Annexure IV**
Item 6	To review & finalize the courses and syllabi for all UG programmes - **B. Tech. and B.Arch., I Semester** (for batch - to be admitted in 2025-26) along with their COs and CO-PO/PSO matrix. **The syllabi of all courses of UG programmes of B.Tech. I semester-Electronics Engineering (for the batch admitted in 2025-26) under the Madhav Institute of Technology & Science-Deemed University (MITS-DU) in which fifth unit of each course will remain dynamic and based on current technological advancements has been discussed and finalized. Annexure V**
Item 7	To review / update and finalize the **Experiment list/ Lab manual** for all the Laboratory Courses and **Micro Project-I** to be offered in **B.Tech. and B.Arch., I semester** (for 2025-26 admitted batch) along with their COs and CO-PO/PSO matrix. **The Experiment list/ Lab manual for all the Laboratory Courses and Micro Project-I to be offered in B.Tech. I semester-Electronics Engineering (for 2025-26 admitted batch) along with their COs and CO-PO/PSO matrix has been discussed and finalized .Annexure**

	VI
Item 8	To review and finalize the syllabi of PG Programmes (MCA/MBA/MUP), III semester (admitted in 2024-25 session) along with their COs. **NA**
Item 9	To review and finalize the courses and syllabi for all courses for PG Programmes (M.E./M.Tech./MCA/MBA/MUP), I semester (2025-26 admitted batch) along with their Course Outcomes (COs). **The syllabi for all courses for PG Programme M.E CCN, I semester (2025-26 admitted batch) along with their Course Outcomes (COs) has been discussed and finalized. Annexure VIII**
Item 10	To review and finalize the syllabus/module content for **Classified Novel Engaging Courses** to be offered in PG programmes, I semester (2025-26 admitted batch). **The syllabus/module content for Classified Novel Engaging Courses to be offered in M.E. CCN, I semester (2025-26 admitted batch) has been discussed and finalized. Annexure IX**
Item 11	To review the CO attainments, identify gaps and suggest corrective measures for the improvement in CO attainment levels for the courses taught in first semester, July-December 2024 Session. **The review of the CO attainments, gaps and corrective measures for the improvement in the CO attainment for the B.Tech-Electronics Engineering I-Semester courses taught in July-Dec 2024 has been finalized as per the discussion with BoS members**. Annexure X
Item 12	To consider and review the curriculum feedback from various stakeholders, its analysis and impact report.{Curriculum offered under MITS –DU structure (i.e. 2024-25 admitted batch) to be considered} **Curricula feedback for B.Tech-Electronics Engineering from various stockholders includes Students, Faculty, Employer and Alumni has been discussed and action taken report has been finalized**. Annexure XI
Item 13	Any other Matter: **NA**

The following suggestions were provided by the external BOS members:

- To increase the admissions in PG programs, M.Tech program can be changed as per the current trends and technology.
- Stakeholder feedback has been incorporated based on suggestions provided by external members.
- Topics on BJT biasing techniques and stability have been added to the Electronic Devices course syllabus.
- An introductory dynamic unit on PLC and SCADA has been included in the Linear Control Theory syllabus
- Micro and Macro project topics have been thoroughly reviewed and finalized.
- The inclusion of 5G Communication has been proposed in the Communication Lab course.

माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA
Deemed University
(Declared under Distinct Category by Ministry of Education, Government of India)
NAAC ACCREDITED WITH A++ GRADE

The Board of Studies (BoS) meeting of the Electronics Engineering department was held on 3rd June 2025 at 4:00 PM onwards. Following external and internal members have attended online meeting through google link: https://meet.google.com/akv-srij-mkp

Following members of BoS Electronics Engineering department have attended the meeting

1. Dr. Vandana Vikas Thakare, Professor & Head (Chairperson)
2. Dr. Aditya Trivedi, Professor, Department of Information Technology, ABV-IIITM, Gwalior
3. Dr. Urmila Patil, Professor, Department of Electronics and Communication, Dr. D. Y. Patil Institute of Technology, Pune
4. Dr. P. K. Singhal, Professor, Member
5. Dr. Laxmi Shrivastava, Professor, Member
6. Dr. Karuna Markam, Associate Professor, Member
7. Dr. R. P. Narwaria, Assistant Professor, Member
8. Prof. Madhav Singh, Assistant Professor, Member
9. Prof. Pooja Sahoo, Assistant Professor, Member

Invited Members of the Department have also attended the BoS meeting

1. Prof. D. K. Parsedia, Assistant Professor
2. Dr. Vikas Mahor, Assistant Professor
3. Dr. Rahul Dubey, Assistant Professor
4. Dr. Hemant Choubey, Assistant Professor
5. Dr. Deepak Batham, Assistant Professor
6. Dr. Varun Sharma, Assistant Professor
7. Dr. Shubhi Kansal, Assistant Professor
8. Dr. Himanshu Singh, Assistant Professor
9. Dr. Varun Mishra, Assistant Professor
10. Dr. Mukesh Kumar Mishra, Assistant Professor
11. Dr. Yogesh Kumar, Assistant Professor
12. Dr. Kumar Gaurav, Assistant Professor
13. Dr. Shailendra Singh, Assistant Professor

(Prof. Pooja Sahoo)

(Prof. Madhav Singh)

(Dr. R. P. Narwaria) 3/6/25

(Dr. Karuna Markam)

(Dr. Laxmi Shrivastava)

(Dr. P. K. Singhal) 3/6/25

3/6/25
(Dr.Vandana Vikas Thakare)
H.o.D

Recommended in the BOS Meeting of Department of Electronics Engineering on 3rd June 2025

Annexure I

Item 2	To review and finalize the syllabi of all courses of UG programmes - **B. Tech. III Semester** (**for batch admitted in 2024-25**) along with their COs and CO-PO/PSO matrix.

Scheme of Evaluation

B. Tech. III Semester (Electronics Engineering) ***(for batch admitted in academic session 2024-25)***

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1.	14242101	BSC	Probability and Random Processes	25	25	20	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	14242102	DC	Data Structures	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	14242103	DC	Communication Systems	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	14242104	DC	Integrated Circuits	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	14242105	DC	Linear Control Theory	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
6.	14242106	DLC	Communication Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	14242107	DLC	Integrated Circuits Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	14242108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	14242109	PBL	Macro Project-I[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	14242110	SLP	Self-learning/Presentation[$$$] (SWAYAM/NPTEL/MOOC)	-	-	-	-	40	-	40	-	-	2	1	Mentoring	SO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**125**	**125**	**100**	**150**	**350**	**90**	**940**	**11**	**05**	**10**	**21**	-	-	-
12.	14242111	MAC	Cyber Security	25	25	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5Hrs
13.	14242112	MWS	Mandatory Workshop on Mastering Competitive Success at Department Level											GRADE	Interactive	MCQ	-
Skill Internship Program(Institute Level) (Qualifier): Minimum 30 hours duration: To be credited in IV Semester																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#] Macro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

[$$$] Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance and presentation.

HSMC	BSC	ESC	DC	DE	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	1	0	4	0	0	2	1	1	0	1	0	1	1	1

Mode of Learning					Mode of Examination					
Theory		Lab			Theory				Lab	Total Credits
Face to Face	Online	Blended	Experiential	Experimental	PP	AO	MCQ	OB	SO	
16	_	_	1	2	6	2	6	-	4	
76	-	-	4.7	9.5	28.57	9.5	28.57	-	19	Credits %

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14242102	DC	Data Structures	25	25	20	30	-	-	100	2	1	-	3

Data Structures (14242102)

Course Objectives

- To familiarize the students with the use of data structures as the foundational base for computer solutions to problems.
- To understand various techniques of searching and sorting.
- To understand basic concepts about stacks, queues, lists, trees and graphs.

Unit I: Introduction to Data Structures: Algorithms & their Characteristics, Asymptotic Notations and complexity analysis, **Array:** Representations of Array, Index to Address Translation, **Linked List:** Introduction, Implementation of Linked List, Operations, and types.

Unit II: Stack: Concepts and implementation of Stacks, Operations on Stack, Applications of Stack - Conversion of Infix to Postfix Notation, Evaluation of Postfix Expression, Recursion. Queue: Concepts and Implementation, Operations on Queues, Dequeue, Priority Queues, Circular Queues.

Unit III: Trees: Types, Terminology, Binary Tree -Representations, Traversal, Threaded Binary Tree, Binary Search Tree, Height Balanced Tree-AVL Tree.
Graph: Terminologies, Representation of Graphs- Sequential & Linked Representation, Graph Traversals- BFS, DFS, Spanning Trees.

Unit IV: Searching: Linear Search, Binary Search, Hashing and Collision Resolution Techniques; Sorting: Bubble Sort, Selection Sort, Insertion Sort.

Unit V: Introduction to Advanced Data Structures: Real-world Applications (Big Data, AI, Cloud Computing, etc.), Hashing for Large-Scale Systems, Graph-Based Data Structures in Industry, Introduction to Concurrent and Distributed Data Structures etc.

Text Books

1. Data Structures, Algorithms and Applications in C++, Sartaj Sahni, 2nd Edition.
2. An Introduction to Data Structures with Applications, Jean-Paul Tremblay, Mcgraw hill.

Reference Books

1. Data Structures & Algorithms, Aho, Hopcroft & Ullman, original edition, Pearson Publication.

Course Outcomes

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

CO1. **Analyze** algorithms using asymptotic notations & perform operations on arrays and linked lists.
CO2. **Construct** stacks and queues and use them to solve real world problems.
CO3. **Distinguish** between different types of trees and apply graph theory concepts.
CO4. **Compare** various searching, sorting and hashing techniques.
CO5. **Discover** the applications of data structure in emerging areas and real world.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	1	-	1	1	1	1	2	-	-
CO2	3	3	3	3	2	3	2	2	1	1	2	2	-	-
CO3	3	3	3	3	2	2	-	1	1	1	1	2	-	-
CO4	3	3	3	3	2	2	-	1	1	1	1	2	-	-
CO5	3	3	3	3	2	3	2	2	1	1	2	2	-	-

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14242101	BSC	Probability and Random Process	25	25	20	30	-	-	100	3	-	-	3

Probability and Random Processes

Course Objectives

- To learn central tendency, skewness and kurtosis.
- To describe probability theory and distribution
- To familiarize with correlation and regression
- To know about the hypothesis analysis
- To explore the theory of attributes and rules of association

Unit 1: Measure of Central Tendency

Measures of Averages and Standard Deviation, Moments about origin and mean, Moment Generating Function, Skewness and Kurtosis.

Unit 2: Probability & Regression

Definition of Probability: Classical and Axiomatic Approaches, Laws of Total and Compound Probability, Conditional Probability, Curve Fitting, Correlation and Regression.

Unit 3: Probability Distribution

Probability Distribution Function, Probability Density Function, Central Limit Theorem, Binomial Distribution, Poisson Distribution, Normal Distribution, Exponential Distribution, Uniform Distribution.

Unit 4: Testing of Hypothesis

Testing of Hypothesis, Chi-squared test, t-test, F-test, Z-test, Analysis of Variance: One-way and Two-way Classifications.

Unit 5: Random Variables & Processes

Concept of Random Variable, One-Dimensional Random Variable, Two-Dimensional Random Variable, Distribution Function, Joint Probability Distribution Function, Marginal Probability Distribution, Cumulative Probability Distribution, Conditional Distribution Function.

Recommended Books:

1. M Ray and H.S. Sharma: Mathematical Statistics, Ram Prasad Publications, 3rd Edition, 2017.
2. V.K. Kapoor, S.C. Gupta: Statistical Methods, S. Chand& Company, 11th Edition, 2018.
3. T. Veerarajan: Probability, Statistics and Random Processes, McGraw-Hill, 3rd Edition, 2008.
4. S. M. Rose: Introduction to Probability Models, Elsevier, 10th Edition, 2011.

Course Outcomes

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

CO1. **Gain** knowledge of measures of central tendency

CO2. **Evaluate** the skewness, kurtosis, curve fitting, correlation and regression.

CO3. **Interpret** the theory of probability and its distributions

CO4. **Examine** the test of hypothesis.

CO5. **Compute** random variables with random process

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	-	-	-	-	-	1	2	-	-
CO2	3	3	3	3	2	-	-	-	-	-	-	2	-	-
CO3	3	3	3	3	2	-	-	-	-	-	-	2	-	-
CO4	3	3	3	3	2	-	-	-	-	-	-	2	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-	2	-	-

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14242103	DC	Communication Systems	25	25	20	30	-	-	100	2	1	-	3

Communication Systems (14242103)

Course objective:

To understand the fundamental principles of communication systems, analyzing various modulation and demodulation techniques, and introduction to advanced communication technologies.

Unit I: Amplitude Modulation: Amplitude modulation and demodulation techniques, Spectral analysis, Power calculation for AM, DSB-SC & SSB-SC.

Unit II: Angle Modulation: Angle modulation and demodulation techniques, Types of FM, Carson's rule, Figure of merit of modulation techniques, Various sources of noise, types of noise, comparison of modulation scheme for noise.

Unit III: Sampling & Quantization Techniques: Sampling theorem, Quantization and Reconstruction of signals, Generation and detection of PAM, PPM, PWM, PCM, Delta and Adaptive delta modulation

Unit IV: Digital Modulation Techniques: GSOP, ASK, FSK, PSK, QPSK Modulation, 16-QAM, Demodulation, Optimum filter, Matched filter and Correlator detector, Comparison of different modulation techniques.

Unit V: Advanced Communication Technologies: Modulation techniques for 5G & 6G Communication, Software Defined Radio (SDR) & Cognitive Radio, Reconfigurable intelligence surface.

Text Books:

1. Communication System: Simon Haykins, Wiley & Sons.
2. Communication Systems - B. P. Lathi, BSP Publication
3. Singh, R.P. & Sapre, S.D, Systems: Analog & Digital Communication, Tata McGraw-Hill, 5th reprint, 2000.

Reference Books:

1. Electronic Communication System: Kennedy-Devis, Tata McGraw-Hill Education.
2. Modern Digital & Analog Communication System: B.P. Lathi ,Oxford University Press.
3. Principles of Communication System: Taub and Schilling McGraw-Hill Education.
4. Digital communications: fundamentals and applications: Sklar, Bernard, Pearson.
5. Fundamentals of 5G mobile networks: Rodriguez: Jonathan, John Wiley & Sons.
6. Software Defined Radio: Architectures Systems and Functions: Markus Dillinger, Kambiz Madani, Nancy Alonistiot, John Wiley & Sons.
7. Software defined radio using MATLAB & Simulink and the RTL-SDR: Stewart, Robert W., Kenneth W. Barlee, and Dale SW Atkinson. Strathclyde Academic Media
8. Reconfigurable Intelligent Surface-Empowered Wireless Communications: From Theory to Practice: Qingqing Wu, Yue Gao, Zhiguo Ding, Yuanwei Liu, IEEE Press/Wiley.

Course Outcomes

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

CO1: **Analyze** amplitude modulation schemes and power spectral characteristics.
CO2: **Evaluate** angle modulation techniques with respect to noise performance.
CO3: **Design** signal sampling and quantization systems for digital conversion.
CO4: **Analyze** digital modulation techniques based on performance criteria.
CO5: **Acquire** knowledge about advanced communication techniques.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	-	1	-	2	3	2
CO2	3	3	2	2	2	-	-	-	-	1	-	2	3	2
CO3	3	2	3	2	3	-	-	-	-	1	1	2	3	3
CO4	3	3	2	2	2	-	-	-	-	1	-	2	3	2
CO5	2	2	2	2	3	-	1	1	-	1	1	3	3	3

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14242104	DC	Integrated Circuits	25	25	20	30	-	-	100	2	1	-	3

Integrated Circuits (14242104)

Course objective:

Students will be able to learn the basic concepts of differential and operational amplifiers and their applications. Further, they will be acquainted with instrumentation amplifiers for different industrial applications.

Unit I: Operational Amplifiers: Differential amplifier configurations, Block diagram of Op-amp, Features of practical (IC-741) and ideal op-Amp PSRR, CMRR, Slew rate and its Effect, Input and output offset voltages, Open and Closed loop configuration of Op-amp, Inverting and non- inverting amplifier, Summing amplifier, Integrators and differentiators, Logarithmic and anti-logarithmic amplifier, Schmitt Trigger.

Unit II: **Active Filter Design**: Characteristics and classifications of filters, Magnitude and frequency response, 1st and 2nd order Low pass and High pass filters, Band pass filter, and Band reject filter.

Unit III: **Oscillators**: Phase shift oscillator, Clapp oscillator, Wien bridge oscillator, Hartley Oscillator, Colpiit's oscillator, Crystal oscillator using Op-amp.

Unit IV: **Multivibrators**: Introduction to 555 timer IC, Block diagram, Pin diagram, Astable, Monostable and Bistable Multivibrator Circuits using 555 timer IC and their applications.

Unit V: Integrated Circuits for Industrial Applications: Low noise instrumentation amplifier for Signal Processing, Integrated Circuits in AI Edge Devices, EV Electronics.

Text Books:

1. Electronics Devices and Circuits: Boylested & Nashelsky,11th Edition, Pearson Education India
2. Op-Amp and Linear Integrated Circuit: R. A. Gayakwad, 4th Edition, Prentice Hall of India.
3. Behzad Razavi, Design of Analog CMOS integrated circuits, McGraw Hill Co. Inc.

Reference Books:

1. Integrated Electronics: Millman & Halkias, 2nd Edition, McGraw Hill Education
2. Electronics Devices and Circuits: Shalivanan, 2nd Edition, Tata Mcgraw Hill Education.
3. Design with Operational Amplifiers and Analog Integrated Circuits: Sergio Franco, 3rd Edition,Mcgraw Hill Education.
4. Analog Circuit Design: A Tutorial Guide to Applications and Solutions: Bob Dobkin and Jim Williams, 1st Edition, Newnes

Course Outcomes

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

CO1. **Analyze** Op-amp configurations for various applications.
CO2. **Implement** different types of active filters.
CO3. **Design** different oscillators circuits.
CO4. **Design** multivibrator circuits using 555 timer IC.
CO5. **Compare** different integrated circuits with their industrial applications.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	1	-	1	1	2	-	2	3	2
CO2	3	3	3	3	2	2	-	1	2	2	-	2	3	2
CO3	3	2	3	2	3	2	-	1	2	2	1	2	3	2
CO4	3	2	3	2	3	3	1	1	2	2	1	2	3	2
CO5	3	2	2	2	3	3	1	1	2	2	2	2	2	3

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14242105	DC	Linear Control Theory	25	25	20	30	-	-	100	2	1	-	3

Linear Control Theory (14242105)

Course Objective:

Students will be able to learn the gain analysis techniques, stability concepts of control systems and their Industrial/real-world applications.

UNIT I: Fundamentals of Control Systems: Basic control system terminology, Open-loop and closed-loop systems, Feedback control and its significance, Modeling of physical mechanical systems, Transfer function of linear systems, Block diagram algebra and signal flow graphs, Effects of negative feedback on system behavior

UNIT II: Transient and Steady-State Response Analysis: Time response of first-order and second-order systems, Steady-state error analysis, Error constants and their significance (Type 0, 1, and 2 systems), Impact of adding poles and zeros on open and closed-loop responses

UNIT III: System Stability: Concept and importance of system stability, Stability in relation to closed-loop pole locations, Absolute and relative stability concepts, Routh-Hurwitz stability criterion and applications, Root locus plots and analysis

UNIT IV: Frequency Domain Analysis and Controllers: Bode plots, Polar plots, and Nyquist criterion, Introduction to Controllers: Proportional, Integral, Derivative, PD, PI and PID

UNIT V: Industrial Applications: Introduction to PLC, PLA, Ladder programming, SCADA and its applications in industrial Robotics.

Text Books:

1. Control System Engineering- I. J. Nagrath & M. Gopal, New Age International.
2. Modern Control Engineering –K. Ogata, Prentice Hall.
3. Control System- A. Anand Kumar, PHI
4. Control System Engineering – B.S. Manke, Khanna publications.

Reference Books:

1. Automatic Control System— B. C. Kuo,Wiley.
2. Control System Engineering- Norman Nise, John Wiley & Sons.
3. Programmable logic controllers. Newnes, Bolton, William.
4. Industrial robotics: Theory, modelling and control. Pro Literatur Verlag, Cubero, Sam.

Course Outcomes:

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

CO1. **Analyze** linear systems using Block diagram reduction and signal flow graph.
CO2. **Compute** steady-state errors and time response of linear systems.
CO3. **Examine** the stability of the control system using time and frequency domain methods.
CO4. **Design** proportional, integral, and derivative controller, PD, PI, PID controllers.
CO5. **Acquire** the knowledge of PLC, SCADA and Robotics for industrial applications. .

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	1	–	–	–	1	2	3	2
CO2	3	2	2	1	–	1	1	–	–	1	1	2	3	1
CO3	3	2	2	1	–	1	1	–	–	1	1	2	3	2
CO4	3	2	3	1	2	1	1	–	2	1	1	2	3	2
CO5	2	2	3	2	3	1	2	–	3	2	2	3	2	3

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14242111	MAC	Cyber Security	25	25	20	30	-	-	100	2	-	-	GRADE

Cyber Security (14242111)

Course Objectives

- To introduce the basic concepts of cyber security.
- To make students aware of various types of cyber threats, vulnerabilities, security policies and cyber security tools.
- To build basic skills for protecting information systems.

Unit I: Introduction to Cyber Security: Overview of Cyber Security, Goals of Cyber Security (Confidentiality, Integrity, Availability), Types of cyber attacks: Phishing, Malware, Ransomware, Social Engineering, Malicious Softwares. Hacker and its types. Real-world incidents and their impact, Cyber Ethics and Legal Aspects.

Unit II: Basics of Networking: Internetworking devices, Topologies OSI and TCP/IP models, IP address, DNS, TCP, IP, HTTP, HTTPS, Web Browser, Web Server.

Unit III: Security Mechanisms: Firewalls, Anti-virus, Intrusion Detection Systems (IDS), Intrusion Prevention Systems (IPS), Encryption and Decryption: Symmetric and Asymmetric, Cryptanalysis, Digital Signature, Authentication: Passwords, Biometrics, Multi-Factor Authentication.

Unit IV: System and Application Security: Operating System security basics. Securing mobile devices and apps. Web application vulnerabilities: SQL Injection, XSS, CSRF. Secure coding practices.
Cybercrime, Forensics, and Incident Response: Types of cybercrimes: Identity Theft, Financial Fraud, Cyberbullying. Basics of digital forensics. Cyber law and IT Act (India) overview. Incident response lifecycle and reporting.

Unit V: Cyber Security in Embedded systems: Cyber threats in microcontroller-based systems, protecting electronic devices, networks, and data from cyber threats. Hardware security, IoT Security. Jamming.

Recommended Books

1. "Cybersecurity for Beginners" by Raef Meeuwisse – Wiley
2. "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives" by Nina Godbole and Sunit Belapure – Wiley India
3. "Computer Security: Principles and Practice" by William Stallings and Lawrie Brown – Pearson
4. "Introduction to Cyber " by Chwan-Hwa (John) Wu and J. David Irwin – CRC Press
5. "Cyber security Essentials" by Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short – Wiley

Course Outcomes:

After completion of the course students will be able to:

CO1. **Describe** fundamental concepts of cyber security and identify common cyber threats and legal implications.
CO2. **Explain** basic networking concepts.
CO3. **Demonstrate** common security mechanisms used to protect digital data.
CO4. **Analyze** cybercrime scenarios and vulnerabilities in systems, and outline procedures for incident response and digital forensics.
CO5. **Discuss** Cyber Security in Embedded systems to minimize cyber risks.

CO-PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	2	1	2	-	3	-	2	-	2
CO2	3	2	-	-	2	-	-	-	-	-	-	1
CO3	3	2	2	-	3	1	1	-	-	-	-	2
CO4	3	3	-	3	3	2	1	2	-	1	-	2
CO5	2	1	-	2	2	3	2	3	2	2	1	3

1 - Slightly; 2 - Moderately; 3 – Substantially

Annexure II

Item 3	To review and finalize the **Experiment list/ Lab manual and project list under Macro Project-I** for all the Laboratory Courses to be offered in **UG programmes – B.Tech. III Semester** (**for batch admitted in 2024-25**) along with their COs and CO-PO/PSO matrix.

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14242106	DLC	Analog & Digital Communication Lab					70	30	100	-	-	2	1

Subject Name: Communication Lab
Subject Code: 14242106

Course Objective:
To provide students with a comprehensive understanding of communication systems, including their fundamental principles, design, and performance analysis.

List of Experiments

1. Perform the Amplitude Modulation and Demodulation and analyze the resultant signal.
2. Perform DSB-SC & SSB-SC Modulator and detector and analyze the resultant signal.
3. Perform Frequency modulation and Demodulation and analyze the resultant signal.
4. Perform Phase modulation and Demodulation and analyze the resultant signal.
5. Perform Sampling and reconstruction.
6. Analyze the process of Time Division Multiplexing and Demultiplexing.
7. Analyze PAM, PWM and PPM on MATLAB.
8. To generate ASK & FSK signal using MATLAB
9. To generate PSK & QPSK signal using MATLAB
10. To generate Pulse code modulation signal using MATLAB
11. Generate the signal and analyze the Signal spectrum using spectrum analyser
12. Generate the random numbers and plot the PDF and CDF using the simulation.
13. Configure and bring up the 5G Core, IMS, and gNodeB.
14. Analyze NGAP packets between gNodeB and Core Network during UE attachment.

Course Outcomes
After successful completion of lab course students will able to:

CO1. **Conduct** investigations through systematic performance of experiments.
CO2. **Demonstrate** ethical behaviour and communicate effectively during viva sessions
CO3. **Acquire** teamwork skills for working effectively in groups
CO4. **Prepare** technical report on experiments conducted in the lab.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	1	-	1	2	2
CO2	-	-	-	-	-	-	-	3	-	3	-	1	-	-
CO3	-	-	-	-	-	-	-	-	3	1	-	1	-	-
CO4	-	-	-	-	-	-	-	-	-	1	-	2	1	1

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14242107	DLC	Integrated Circuit Lab					70	30	100	-	-	2	1

Subject Name: Integrated Circuit Lab
Subject Code: 14242107

Course Objective:
This course gives the ability to the students to design and analyze various Integrated Circuits using Op-amp (IC-741), 555 timer IC, and simulation tool.

List of Experiments

1. Design of Summer and Subtractor circuits using IC 741 Op-amp.
2. Design of Inverting and Non Inverting Amplifier circuits using IC 741 Op-amp.
3. Design of Voltage follower circuit using IC 741 Op-amp.
4. Design of Comparator and Schmitt trigger circuits using IC 741 Op-amp.
5. Design of Integrator and Differentiator circuits using IC 741 Op-amp.
6. Design of the Astable Multivibrator circuit using 555 timer IC.
7. Design of the Bistable Multivibrator circuit using 555 timer IC.
8. Design of the Monostable Multivibrator circuit using 555 timer IC.
9. Design and analyze the frequency response of RC Low pass and High pass Filter.
10. Design and simulation of different types of differential amplifiers.
11. Design and simulation of low noise instrumentation amplifiers.
12. Design and simulation of high gain and small bandwidth amplifiers for industrial applications.

Course Outcomes
After successful completion of lab course students will able to:

CO1. **Conduct** investigations through systematic performance of experiments.
CO2. **Demonstrate** ethical behaviour and communicate effectively during viva sessions
CO3. **Acquire** teamwork skills for working effectively in groups
CO4. **Prepare** technical report on experiments conducted in the lab.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	-	-	-	-	-	-	-	1	-	1	2	2
CO2	-	-	-	-	-	-	-	3	-	3	-	1	-	-
CO3	-	-	-	-	-	-	-	-	3	1	-	1	-	-
CO4	-	-	-	-	-	-	-	-	-	1	-	2	1	1

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14242109	PBL	Macro Project-I					70	30	100	-	-	2	1

Subject Name: Macro Project-I
Subject Code: 14242109

Macro Project-I (14242109)

1. Digital Dice Using Logic Gates
2. Automatic Room Light Controller Using IR Sensor
3. Frequency Measurement Using Timer IC
4. Digital Thermometer Using LM35 and Seven Segment
5. LED Matrix Display Using Shift Registers
6. IR-Based Speed Detection System
7. Digital Clock Using RTC and Arduino
8. Wireless Switch Using RF Modules
9. Logic Gate Trainer Kit
10. Traffic Light Simulator Using Microcontroller
11. Digital Voltmeter Using Arduino
12. Temperature & Humidity Monitor Using DHT11 Sensor
13. Ultrasonic Distance Measurement System
14. Alcohol Detector Using MQ3 Sensor
15. Arduino-Based Voting Machine
16. Digital Attendance System Using RFID
17. Smart Parking System Using Ultrasonic Sensors
18. Heartbeat Monitoring System Using Pulse Sensor
19. Obstacle Avoiding Robot Using Arduino
20. Rain Sensing Wiper System
21. IR-Based Object Counter
22. Bluetooth Controlled Home Appliances
23. DTMF-Based Home Automation System
24. Morse Code Generator Using Arduino
25. Basic FM Transmitter Circuit
26. Voice-Controlled Robot Using Android
27. GSM-Based Device Control System
28. Two-Way Intercom System
29. Walkie-Talkie Using RF Modules
30. IR Remote Controlled Fan Speed System
31. IoT-Based Weather Monitoring System
32. Home Automation Using NodeMCU and Blynk
33. Smart Dustbin Using Ultrasonic Sensor and Servo Motor
34. Smart Door Lock System Using RFID and IoT
35. IoT-Based Fire Alert System
36. Wi-Fi Controlled LED System

37. Smart Notice Board Using Bluetooth
38. Real-Time Bus Tracker Using GPS and GSM (Prototype)
39. IoT-Based Soil Moisture Monitoring
40. Smart Energy Meter with Billing Alert
41. Smart Health Monitoring System using Biomedical Sensors
42. Wireless Sensor Network for Environmental Monitoring
43. Smart Traffic Light Control using IR and Ultrasonic Sensors
44. Smart Farming System using Soil Moisture, Rain, and Temperature Sensors
45. IoT-Based Industrial Safety System using Gas, Flame, and Temperature Sensors
46. Gesture-Based Appliance Control using MEMS Accelerometer
47. Digital Pressure and Altitude Logger using BMP280 Sensor
48. Vibration Monitoring System for Machine Health using Piezo Sensors
49. Smart City Noise Monitoring System using Sound Sensor and IoT
50. Biomedical Signal Acquisition System using EMG/ECG Sensors
51. Smart Inventory System using RFID and Load Sensors
52. Wearable Health Patch with Data Logging using ESP32
53. IoT-Enabled Flood Alert System using Water Level and Rain Sensors
54. Energy Meter with Overload Protection using Current Sensor (ACS712)
55. Wireless Fire Detection and Control System using Flame and Smoke Sensors
56. Develop a file-based student record management system in C++.
57. Create a Python-based daily expense tracker.
58. Implement a basic contact management application in C.
59. Build a command-line interface library management system in Java.
60. Design a Python-based note-taking app.
61. Construct a terminal-based mini file explorer in C++.
62. Develop a to-do list manager in Java.
63. Create a quiz application in C++.
64. Implement a simple hotel room booking system in C.
65. Build a Python-based CLI system for course registration.
66. Develop a bookstore inventory system using SQLite in Python.
67. Create an employee management system in Java using JDBC.
68. Build a Python-based hostel allotment system.
69. Develop a basic railway ticket reservation system in C++.
70. Implement a blood bank management system in Java.
71. Create an exam result processing tool in Python.
72. Design a bus pass management system in C++.
73. Build a vehicle service booking system backend in Java.
74. Develop an online movie ticket booking CLI app in Python.
75. Construct a grocery inventory manager in C++.
76. Implement a basic chat application using Java sockets.
77. Create a Python game that generates random numbers for the user to guess.
78. Build a CLI-based unit converter in Python.
79. Develop a calculator application in Java.
80. Create a calendar generator in C++.
81. Implement a file analyzer in Python.
82. Build an alarm clock in Python.
83. Develop a terminal-based messaging app in Java.
84. Create a chatbot in Python.
85. Build an anonymous feedback system in C++.
86. Design a Python backend for a digital notice board system.
87. Develop a reminder system in Java.
88. Design a PI controller for temperature control of a furnace using MATLAB/ Simulink
89. Design a PID controller for conveyor belt position control using servo motor.

90. Design a PID controller for DC motor speed control using MATLAB/ Simulink
91. Design a PID controller for cruise control system for a car using MATLAB/ Simulink
92. Design a PID controller for water level control in a tank using MATLAB/ Simulink
93. Write a ladder programme for automated lift placed in triple story mall.
94. Write a ladder programme for inventory system.
95. Write a ladder programme for object segregation system.
96. Write a ladder programme to operate two way controlled motor placed at farm house
97. Design crop protection system.
98. Design of a high current Regulated Dc Power supply circuit.
99. Light Dimmer Circuit Using Triac with BTA26 | DB3 | AC Voltage Regulator
100. Design of a audio amplifier for home using LM 386 audio amplifier with bass boost
101. Design of an Adjustable Battery Charger with Charge Protection
102. Design of a Capacitor Dropper Circuit using Transformer less Power Supply
103. Design different Oscillator using 555 timer IC
104. Design of pulse generator using 555 timer IC
105. Design of one bit memory storage element using 555 timer IC
106. Design of a fully Automatic Inverter with Smart Switch Inverter & Battery Charger.
107. Design of hardware model for electronic fuse.

Annexure III

Item 4	To review and finalize the courses for **Self-learning/Presentation** to be offered from SWAYAM/NPTEL/MOOC based platform for **UG programmes – B.Tech. III Semester** (**for batch admitted in 2024-25**).

Self learning/ Presentation to be offered from SWAYAM/NPTEL/MOOC based platform for UG programmes-III Semester (For batch admitted 2024-25)

B.Tech-Electronics Engineering

S. No	Course Name	Weeks	Mentor	Start Date	End Date
1	Basic Statistics using R (BlueSky Statistics)	8	Dr. Varun Sharma	August 18, 2025	October 10, 2025
2	Microelectronics: Devices to Circuits	12	Dr. Vikas Mahor	July 21, 2025	October 10, 2025
3	Electronic modules for industrial applications using Op-Amps	8	Dr. Varun Kumar Mishra	August 18, 2025	October 10, 2025
4	Applied Linear Algebra for Signal Processing, Data Analytics and Machine Learning	12	Dr. Madhav Singh	July 21, 2025	October 10, 2025

Annexure IV

Item 5	To propose the list of **professional certification platforms** and **relating certifications** with specific domain/areas of certification. {representative list to be prepared}

S. No.	Name of Professional Certification platform	Link for professional certification platform	Details
1	Coursera	https://www.coursera.org	All domain certification
2	EdX	https://www.edx.org/	
3	Classcentral	https://www.classcentral.com/	
4	Chipedge	https://chipedge.com/	VLSI certification
5	Exuberant solutions	https://exuberantsolutions.com/	Antenna certification
6	Knowledge Academy	https://www.theknowledgeacademy.com/	Software certification

Annexure V

Item 6	To review & finalize the courses and syllabi for all UG programmes - **B. Tech. I Semester** (for batch - to be admitted in 2025-26) along with their COs and CO-PO/PSO matrix.

Scheme of Evaluation B. Tech. I Semester (Electronics Engineering) ***(for batch admitted in academic session 2025-26)***

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Exam.	Duration of Exam.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	14251101	DC	Instrumentation & Sensors	25	25	20	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	14251102	ESC	Computer Programming	25	25	20	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
3.	14251103	DC	Electronic Devices	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	14251104	DC	Network Theory	25	25	20	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	14251105	ESC	Basic Electrical & Electronics Engineering	25	25	20	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
6.	14251106	DLC	Computer Programming Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	14251107	DLC	Electrical & Electronics Engineering Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	14241108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	14251109	PBL	Micro Project-I	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10	14251110	ESC	Engineering Chemistry Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
11	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**125**	**125**	**100**	**150**	**380**	**120**	**1000**	**11**	**03**	**10**	**19**	-	-	-
12	14251111	MAC	Universal Human Values & Professional Ethics (UHVPE)	25	25	20	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13	14251112	MWS	Mandatory Workshop on Report Writing at Department Level											GRADE	Interactive	MCQ	-
14	14251113	MWS	Mandatory Workshop on Indian Constitution and Cultural Values at Department Level											GRADE	Interactive	MCQ	-

Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.

Skill Internship Program (Soft Skill): Minimum 45 hours duration: To be Credited in II Semester.

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses.

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book [#] Micro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

HSMC	BSC	ESC	DC	DE	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	0	3	3	0	0	2	1	1	0	0	0	1	1	2

Mode of Learning					Mode of Examination					
Theory		Lab			Theory				Lab	Total Credits
Face to Face	Online	Blended	Experiential	Experimental	PP	AO	MCQ	OB	SO	
14	-	1	1	2	6	3	7	-	3	
73.6	-	5.2	5.26	10.5	31.57	15.7	36.8	-	15.78	Credits %

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14251101	DC	Instrumentation & Sensors	25	25	20	30			100	2	1		3

Instrumentation & Sensors (14251101)

Course Objectives:

To understand the significance of measurement techniques, errors in measurement, and statistical analysis process, sensors, classification, operating principles, and their practical use in Modern Communication Systems.

Unit I: Measurement Systems: Introduction, Significance of measurement, block diagram of measurement system, methods of measurements, elements and their functions of measurement systems, applications, characteristics of measurement systems-static and dynamic, Static characteristics- accuracy, precision, sensitivity, reproducibility, drift, static error, dead zone, linearity, resolution, hysteresis, loading effects, Dynamic characteristics- Speed of response, measuring lag, fidelity, dynamic error, calibration.

Unit II: Errors in Measurement and their Statistical Analysis: Types of Error- Gross, Systematic (Instrumental, Environmental, Observational error), and random error, Statistical treatment of data-measurement tests, histogram, arithmetic mean, dispersion measurement, range, deviation, average deviation, standard deviation, variance, Noise, signal to noise ratio.

Unit III: Thermal & Proximity Sensors: Introduction, Sensor Classifications, Sensors Parameters, Selection criterion of Sensors, General requirements for interfacing, Temperature sensors, Thermo resistive sensors- Resistance Temperature Detectors, Thermistor, Thermoelectric sensors- Thermocouple, Electric Sensors- Capacitive position and displacement sensors, LVDT, Proximity sensors: Inductive and Capacitive.

Unit IV: Force, Pressure, Humidity, and Moisture Sensors: Force sensor- Strain gauge**,** Semiconductor strain gauge**,** Strain gauge accelerometers, Pressure sensors- Mechanical pressure sensors, Piezoresistive pressure sensor, Capacitive pressure sensor, Resistive humidity sensor, capacitive moisture sensors, Thermal conduction moisture sensors.

Unit V: Sensors in Modern Communication Systems: Role of sensors in modern telecommunication systems (5G/6G, IoT, WSNs), Reconfigurable sensors, Terahertz and Photonic Sensors, Quantum sensors and optical sensors and its role in secure 6G communication.

Text Book:

1. A.K. Sawhney: "A Course in Electrical and Electronic Measurements and Instrumentation", 18th Edition, Dhanpat Rai Publications, 2001.
2. Nathan Ida, "Sensors, Actuators and Their Interfaces, A multidisciplinary introduction", 2nd Edition, IET Publication.

Reference Books:

1. Subhash Chanda Mukhopadhyay, "Intelligent Sensing, Instrumentation and Measurements," Springer Publication.
2. Sanjay N. Talbar, Akhilesh R. Upadhyay, Instrumentation and Measurement, Dhanpat Rai Publishing Company. Third Edition 2004.
3. Process Control Instrumentation Technology, Curtis D. Johnson, PHI
4. A Hands-On Course in Sensors Using the Arduino and Raspberry Pi, Volker Zeimann, CRC Press.
5. Jon S. Wilson: "Sensor Technology Handbook", 1st Edition, Newnes (Elsevier)

Course Outcomes

After completion of this course students will be able to:

CO1: **Analyze** the measurement systems, significance, and their characteristics.
CO2: **Evaluate** the errors in measurement systems.
CO3: **Compare** the working principles of different sensors.
CO4: **Differentiate** the operation of force, pressure, humidity & moisture sensors with their applications.
CO5: **Integrate** advanced sensors in modern communication systems.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	-	2	2	-	-	-	-	-	-	1	1	2
CO2	3	3	-	3	2	-	-	-	-	-	-	2	1	2
CO3	3	2	2	2	3	-	-	-	-	-	-	2	1	2
CO4	3	2	2	2	3	-	-	-	-	-	-	1	1	2
CO5	3	2	2	2	3	2	1	-	-	-	2	3	1	3

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14251102	DC	Computer Programming	25	25	20	30			100	2	1		3

Computer Programming (14251102)

Course Objectives:

Equip students with the skills to design and implement programming solutions in C++ using fundamental algorithms, approaches, and documentation techniques.

Unit I: Introduction to Programming: Types of computer programming languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to C++ Programming: Data Types, Constants, Keywords, variables, input/output, Operators & Expressions, Precedence of operators.

Unit II: Control Statements and Decision Making: Conditional statements: if, if-else, nested if, Switch statement with break and default, Loops: while, do-while, for, nested for, Loop control: break, continue, return, Decision making using logical operators, Real-world examples and applications of control structures.

Unit III: C++ Functions: Function Declaration and Definition, Function syntax, Parameter types and names, Return types and values, Function Types, Function Scope and Lifetime, Function Templates, Recursion, Recursive function definition.

Unit IV: Strings, Arrays and Pointers: C-style strings (character arrays), C++ string class, Declaring and initializing strings, String operations. One-dimensional and multi-dimensional arrays, Array declaration and indexing, Array-based operations: sorting, searching. C++ Pointers: Basics of Pointers & Addresses, reference variable, Pointer to Pointer, Pointer to array.

Unit V: Advanced Programming Concepts in C++: Basics of graphics libraries (SFML, SDL, OpenGL), Event-driven programming and game loops. Using C++ for performance-critical parts of ML/DL applications. Interfacing with system APIs (Linux syscalls, Windows API).

Text Books:

1. C++ How to Program, H M Deitel and P J Deitel, Prentice Hall.
2. Programming with C++, D Ravichandran, T.M.H.
3. Computing Concepts with C++ Essentials, Horstmann, John Wiley.

Reference Books:

1. The Complete Reference in C++, Herbert Schildt, TMH.
2. Object-Oriented Programming in C++, E Balagurusamy.
3. Fundamentals of Programming C++, Richard L. Halterman.
4. Quinn, R., 2020. Advanced C++ programming cookbook Packt Publishing Ltd.

Course Outcomes

After completing this, the students will be able to:

CO1: **Design** algorithms and flowchart for a given problem.
CO2: **Implement** the concepts of procedural programming with control statements.
CO3: **Develop** optimized recursive functions & templates to solve challenging computational tasks.
CO4: **Implement** the pointer concept for effective C++ programming.
CO5: **Design** OOPs based industry oriented projects in C++.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	1	1	1	3	-	1	1	1	1	3	2	2
CO2	3	2	2	2	1	2	-	2	2	1	1	3	2	2
CO3	3	2	2	2	2	2	-	2	2	1	1	3	2	2
CO4	3	2	1	1	2	3	-	2	2	1	1	3	2	2
CO5	3	2	1	1	1	2	-	1	1	1	1	3	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14251103	DC	Electronics Devices	25	25	20	30			100	2	1		3

Electronics Devices (14251103)

Course Objective:

To understand the fundamental principles and operational characteristics of electronic devices, and apply this knowledge in advanced electronic circuits and its applications.

Unit I: Semiconductors Diodes: P-N Junction Diode properties and Characteristics, Breakdown mechanism, Capacitance of junction barrier, Diode Applications: Rectifiers, Clippers, Clampers and Voltage multiplier.

Unit II: Types of P-N junction Diodes: Basic operation and characteristics of; Zener diode, Zener diode as a voltage regulator, Tunnel diode, Varactor diode, Schottky diode, Light emitting diode, Photo-diode and their applications.

Unit III: **Bipolar Junction Transistors;** Construction and operation of BJT, CB, CE and CC configuration, input and output characteristics, Early effect, Regions of operation, Transistor as an Amplifier and switch, BJT Biasing and Stability.

Unit IV: Field Effect Transistor- JFET: Construction, n-channel and p-channel, transfer and drain characteristics, parameters, Equivalent model and voltage gain, CG, CS and CD configuration. Enhancement and Depletion MOSFET drain and transfer Characteristics.

Unit V: Advance semiconductor devices: Introduction to Organic LED, Fin-FET, Tunnel FET, High Electron Mobility Transistor (HEMT) and their applications.

Text Books:

1. Electronics Devices and Circuits: Boylested & Nashelsky, 11th Edition**,** Pearson Education India
2. Electronic devices and circuits: S. Salivahanan, 2nd Edition, Tata McGraw-Hill Education, 2011.
3. Microelectronic Circuits: Theory and Application: Sedra & Smith, 7th Edition**,** Oxford University Press.
4. Integrated Electronics: Millman &Halkias, McGraw Hill Education

Reference Books:

1. Micro Electronics: Millman, & Grabel, 2nd Edition, McGraw Hill Education
2. Yuan Taur and Tak H. Ning:"Fundamentals of Modern VLSI Devices", Cambridge University Press, 2nd Edition.
3. Fundamentals of Tunnel Field-Effect Transistors: Sneh Saurabh and Mamidala Jagadesh Kumar, 1st Edition, CRC Press
4. Computational Electronics: Semiclassical and Quantum Device Modeling and Simulation: Dragica Vasileska, Stephen M. Goodnick, Gerhard Klimeck, 1st Edition, CRC Press

Course Outcomes

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

CO1. **Design** the application circuits using PN junction diode.
CO2: **Analyze** the construction, operation, and characteristics of various diodes
CO3. **Compare** Bipolar Junction Transistors (BJT) configurations.
CO4. **Differentiate** JFET and MOSFET configuration.
CO5. **Compare** advanced semiconductor devices with their potential applications.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	1	1	2	2	1	1	-	3	3	3
CO2	3	3	3	3	2	2	2	2	2	1	2	3	3	3
CO3	3	3	2	3	3	3	2	1	2	1	3	3	3	3
CO4	3	3	3	3	3	3	-	1	2	1	3	3	3	3
CO5	3	3	2	1	2	3	-	1	2	1	1	3	2	2

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14251104	**DC**	**Network Theory**	25	25	20	**30**			**100**	**2**	**1**		**3**

Network Theory (14251104)

Course Objective:

The course introduces analysis of static linear circuits using mesh, node, KVL, KCL and theorems along with transient analysis and time varying input. Also covers two-port networks and impedance matching for wireless communication applications.

Unit 1: Method of analysis: Node analysis, Node analysis using Supernode, Mesh analysis, Mesh analysis using supermesh, Graph theory.

Unit 2: Circuit Theorems: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Duality theorem, Substitution theorem.

Unit 3: Transient analysis: First order circuits, Transients in RL, RC and RLC circuits, initial conditions, time constants, Steady state analysis, Source free RC circuit, Source free RL circuit, Step response of an RL, RC, RLC circuit, Transient and Steady State analysis using Laplace transform.

Unit 4: Two port networks: Concept of Ports, Calculation of network functions for one port and two port, Two port parameters – Z, Y, hybrid and chain Parameters, Relationship between two port network parameters, T and π networks, Characteristics impedance & propagation constant.

Unit 5: Matching networks in wireless module: Impedance matching techniques, Lumped Element matching (L, C networks) Equalizer & attenuator.

Text Books:

1. Circuit Theory: Analysis and Synthesis: A. Chakrabarti, 7th Edition, Dhanpat Rai Publication.
2. Network and Systems: D. Roy Chaudhary, 2nd Edition, New Academic Science Ltd.
3. Fundamentals of Electric Circuits: Matthew N.O. Sadiku, 5th Edition, McGraw Hill edition.

Reference Books:

1. Network Analysis: M.E. Van Valkenberg, 3rd Edition, Prentice Hall of India.
2. Network Theory and Filter Design: V. K. Aatre, 2nd Edition, John Wiley & Sons.
3. Microwave Transistor Amplifiers: Analysis and Design: Guillermo Gonzalez, 1st Edition, Pearson College Div
4. RF Circuit Design: Theory and Applications: Reinhold Ludwig and Pavel Bretchko, 1st Edition, Pearson

Course Outcomes:

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

CO1: **Apply** node and mesh analysis techniques to solve electrical circuits.
CO2: **Analyze** electrical circuits using various network theorems.
CO3: **Evaluate** the transient response of first-order and second-order electrical circuits.
CO4: **Calculate** two port parameter of the electrical circuits.
CO5: **Compare** impedance matching techniques for network performance.

Course Articulation Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	1	-	2	1	-	1	-	3	3	1
CO2	3	3	3	3	2	-	2	1	-	1	-	1	3	1
CO3	3	3	3	3	3	-	-	1	-	1	-	2	3	1
CO4	3	3	3	2	3	-	-	1	-	1	-	1	3	1
CO5	3	3	3	3	3	-	-	1	-	1	2	2	3	3

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14251105	DC	Basic Electrical & Electronics Engineering	25	25	20	30			100	2	1		3

Basic Electrical & Electronics Engineering (14251105)

Course Objectives:

- Impart foundational knowledge in Electrical and Electronics Engineering.
- Enable students to analyze electric circuits, understand electrical machines, and implement digital systems.
- Explore emerging applications in industrial automation, smart grids, and renewable systems.

Unit I D.C. Circuits Analysis: Voltage and Current Sources: Dependent and independent source. Source conversion. Kirchhoff's Law, Mesh and Nodal analysis. Network theorems: Superposition theorem, Thevenin's theorem & Norton's theorem and their applications.

Unit II Single-phase AC Circuits: Generation of sinusoidal AC voltage, definitions: Average value, R.M.S. value, Form factor and Peak factor of AC quantity, Concept of Phasor, analysis of R-L, R-C, R-L-C Series and Parallel circuit, Power and importance of Power factor, Resonance in AC circuits.

Unit III Transformer & Electrical Machines: Magnetic Circuits and Electromagnetism, Transformers: Construction, principle, types, losses & efficiency, OC & SC test DC Machines: Motor and Generator working Principles, Characteristics, Introduction to Induction Motors and Synchronous Machines.

Unit IV Digital Electronics, Devices & Circuits: Number Systems, Logic Gates and Truth Tables, Diodes, Transistors (BJT, FET, MOSFET), Multiplexers, Demultiplexers, Flip-Flops, Counters.

Unit V Emerging Trends and Applications: Smart Grids and Smart Meters, Application of Motors in Industrial Automation, Electric Vehicles and Renewable Systems, Sensors and Basic IoT Applications.

Recommended Books:

1. Basic Electrical and Electronics Engineering, D.P. Kothari &I.J. Nagrath-Tata McGraw Hill
2. Basic Electrical and Electronics Engineering, V N Mittle& Arvind Mittal -Tata McGraw Hill
3. Basic Electrical and Electronics Engineering, S. K Bhattacharya -Pearson
4. Principles of Electrical Engineering- Vincdent Del Toro- Prentice Hall.
5. Basic Electrical Engineering -A,E. Fitzgerald, Higginbotham and Grabel -TMH

Course Outcomes:

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

CO1: **Apply** fundamental laws and network theorems to analyze DC circuits

CO2: **Analyze** single-phase series & parallel AC circuits for calculation of power, power factor, and resonance conditions.

CO3: **Explain** the working principles, construction, and operational characteristics of transformers, DC machines, and induction motors.

CO4: **Design** basic digital logic circuits using logic gates, flip-flops, and counters

CO5: **Discuss** the concepts of smart grids, electric vehicles, and IoT systems to emerging industrial applications in automation and renewable energy systems.

Course Articulation Matrix

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	-	-	-	-	-	-	1		
CO2	3	3	2	2	1	-	-	-	-	-	-	1		
CO3	3	2	3	2	2	1	-	-	-	-	-	2		
CO4	3	3	3	2	1	-	-	1	2	2	-	1		
CO5	3	2	3	2	3	2	2	2	-	1	1	2		

1 - Slightly; 2 - Moderately; 3 – Substantially

Annexure VI

Item 7	To review / update and finalize the **Experiment list/ Lab manual** for all the Laboratory Courses and **Micro Project-I** to be offered in **B.Tech. I semester** (for 2025-26 admitted batch) along with their COs and CO-PO/PSO matrix.

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14251106		Computer programming					70	30	100	-	-	2	1

Subject Name: Computer Programming Lab
Subject Code: 14251106

Course Objectives:

Equip students with the skills to design and implement programming solutions in C++ using fundamental algorithms, approaches, and documentation techniques.

List of Experiments

1. Write a Program to perform addition, subtraction, multiplication and division of integer and floating values.
2. Write a Program to perform swapping between two user entered values without using third variable.
3. Write a Program to take temperature from the user in Fahrenheit, then convert and display the temperature in Celsius and Kelvin.
4. Write a Program to calculate and display Simple Interest where the principle, rate and time are given by the user.
5. Write a Program to check and display whether a user entered number is divisible by 30 or not (using nested if).
6. Write a Program to find and display the greatest number among the three numbers entered by the user.
7. Write a Program to check and print whether a user entered number is negative, positive or zero.
8. Write a Program to print whether a user entered character is vowel or consonant using switch-case.
9. Write a Program to print mathematical table of a user entered number (example, 5*1=5) (for loop).
10. Write a Program to find factorial of a user entered number using while loop.
11. Write a Program to print all the numbers between 1 to 100 whose sum of the is even (do-while loop).
12. Write a Program to print the maximum and minimum element of a user entered 1D array and sort the array elements in ascending and descending order.
13. Write a Program to search an element and print its position in a user entered 2D array.
14. Write a Program for a Basic Bank Management System having customer account creation, deposit, withdrawal, and balance inquiry functionalities using OOPs in C++.
15. Write a Program for a Vehicle Rental System which allows booking, returning, and viewing available vehicles using OOPs in C++.

Course Outcomes:

After completing the lab, students will be able to:

CO1. **Conduct** investigations through systematic performance of experiments.
CO2. **Demonstrate** ethical behaviour and communicate effectively during viva sessions
CO3. **Acquire** teamwork skills for working effectively in groups
CO4. **Prepare** technical report on experiments conducted in the lab.

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3									1			2	2
CO2								3		3				
CO3									3	1				
CO4										1		2		

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14251107	DLC	Electrical & Electronics Engineering Lab	-	-	-	-	70	30	100	-	-	2	1

Subject Name: Electrical & Electronics Engineering lab
Subject Code: 14251107

Course Objectives:
This course gives the ability to the students to apply various laws and theorems to solve network circuits.

List of Experiment

1. To verify Kirchhoff's Current Law & Kirchhoff's Voltage Law.
2. To verify Superposition Theorem
3. To determine resistance & inductance of a choke coil.
4. To determine active & reactive power in a single phase A.C circuit.
5. To determine voltage ratio & current ratio of a single phase transformer.
6. To determine the polarity of a single phase transformer.
7. To perform open circuit & short circuit test on a single phase transformer.
8. To study multimeter & measure various electrical quantities
9. To study of constructional details of DC machine.
10. To determine the V-I characteristics of diode in forward bias & reverse bias condition.
11. To determine phase and line quantities in three phase star and delta connection
12. To study of effect of open and short circuits in simple circuits
13. To plot Transistor CB characteristics (Input and Output)
14. To plot Transistor CE characteristics (Input and Output)
15. Study the output characteristics of a solar PV panel under varying conditions
16. Develop a simple IoT system to monitor temperature and humidity using sensors.

Course Outcomes:
After the completion of the lab, the student will be able to –

CO1. **Demonstrate** the ability to operate lab equipment & instrument relevant to the electrical engineering field
CO2 **Collect** experimental data accurately and effectively in ethical manner
CO3 **Integrate** theoretical knowledge from coursework into practical applications and experiments
CO4 **Communicate** experimental results effectively through oral presentations and written documentation
CO5 **Demonstrate** responsibility and professionalism in the completion of lab tasks and assignments
CO6 **Show** willingness to learn new techniques, tools, or methods to enhance practical engineering skills

Course Articulation Matrix

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3	3	3	2	-	-	-	2		
CO2	2	3	2	3	2	3	2	3	-	2	-	2		
CO3	3	3	3	3	2	2	2	2	2	3	2	3		
CO4	1	2	2	3	-	2	2	3	3	3	2	2		
CO5	-	-	1	2	-	3	3	3	3	3	2	3		
CO6	2	2	2	2	3	3	3	2	3	3	2	3		

1 - Slightly; 2 - Moderately; 3 – Substantially

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr./week			Total Credits
			Minor valuation I	Minor valuation II	Quiz/ Assignment Marks	Major Evaluation	Continuous Evaluation/Lab work & Sessional	Major Evaluation		L	T	P	
14251109	DLC	Micro Project-I					70	30	100	-	-	2	1

Micro Project-I (14251109)

Subject Name: Micro Project-I
Subject Code: 14251109

List of Micro-projects

1. Automatic Street Light controller Using LDR
2. Burglar Alarm and smoke detector System
3. Digital Dice Using 555 Timer
4. Fire Alarm Using Thermistor
5. Touch-Activated Light Switch
6. IR-Based visitor counters
7. Fan Speed Controller Using Thermistor
11. Traffic Signal Controller Using Arduino
12. Line Follower Robot (Basic)
13. Temperature Display Using LM35 and Arduino
14. Automatic Hand Sanitizer Dispenser
15. Smart Dustbin Using Ultrasonic Sensor
16. Light Intensity Meter Using LDR and Arduino
17. Automatic Plant Watering System
18. Password-Based Door Lock System
19. Heartbeat Monitor Using Arduino
20. IR Remote Controlled Home Appliances
21. Simple FM Receiver
22. Morse Code Encoder and Decoder
23. IR Communication Between Two Microcontrollers
24. Bluetooth-Based LED Control
25. Walkie-Talkie Using Simple RF Modules
26. Voice-Controlled LED System Using Android App
27. Wireless Power Transfer (Inductive Coupling)
28. GSM-Based Location Tracker (Basic Concept)
29. RF-Based Wireless Switch
30. Basic Intercom System Using Op-Amps
31. Solar Mobile Charger
32. Solar-Powered LED Lighting System
33. Wind-Powered Battery Charger
34. Power Bank Using 18650 Cells
35. Automatic Night Lamp Using Solar Panel
36. Mini Inverter Circuit

37. Energy Saver for Room Lighting
38. Solar Tracker Using LDR
39. Bicycle Dynamo Charger
40. Emergency Light Using Rechargeable Battery
41. Design Half-Wave and Full-Wave Rectifier Circuits
42. Design and Implementation of Clipper and Clamper Circuits
43. 555 Timer-Based Flashing Lamps
44. Design of a 5V Regulated DC Power Supply
45. Light Detection Circuit Using LDR
46. Automatic Night Lamp Using LDR and Transistor
47. Flasher Circuit Using Transistors or 555 Timer
48. Rain Alarm Using Conductive Plates and Buzzer
49. Fire Alarm Using Thermistor or Temperature Sensor
50. Cleaning and wiping robots
51. Laser-Based Security Alarm System
52. Visitor Counter Using IR Sensors and 7-Segment Display
53. Water Level Indicator Using Probes and LEDs
54. Battery Charger Circuit Using Diodes and Voltage Regulator
55. Touch-Activated Switch Using BJT
56. Simple LED Blinker Using 555 Timer
57. Automatic Night Light Using Op-Amp Comparator
58. Temperature-Based Fire Detection Circuit
59. Electronic Dice Simulator Using LEDs
60. Temperature-Controlled Fan Using LM35 or Thermistor
61. LED cube for light show.
62. Create a weather information fetcher in Python.
63. Develop a C-based file transfer tool over TCP/IP.
64. Build a Python tool that fetches and displays a random quote of the day.
65. Create a simple login server in Java.
66. Develop a login system in C++.
67. Build a user sign-up and login backend in Python using JSON.
68. Design a Java application that locks personal notes behind a PIN.
69. Create a simple OTP-based validation system in Python.
70. Build a multi-user login system in C.
71. Develop a result analyzer in Java.
72. Create an attendance tracking system in Python.
73. Build an electricity billing system in C++.
74. Implement a fee management system in Java.
75. Create a mess billing software in Python.
76. Design a CLI-based Tic Tac Toe game in C++.
77. Build a Snake game in Python using the curses module.
78. Develop a Rock Paper Scissors tournament system in Java.
79. Construct a quiz game in C.
80. Library Book Management System using C++.

Annexure VII

Item 8	To review and finalize the syllabi of PG Programmes (M.E. - CCN), III semester (admitted in 2024-25 session) along with their COs. - **NA**

Annexure VIII

Item 9	To review and finalize the courses and syllabi for all courses for PG Programmes (M.E. - CCN), I semester (2025-26 admitted batch) along with their Course Outcomes (COs).

Scheme of Evaluation

M. Tech. I Semester *(Communication Control and Networking)* *(for batch admitted in academic session 2025-26)*

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation.	Duration of Major Evaluation.
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1	60251101	DC	Computational Techniques	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hour
2	60251102	DC	Computer Communication Networks	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hour
3	60251103	DC	Communication System Design and Applications	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hour
4	602511XX	DE	Departmental Elective (DE-1)	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hour
5	60251104	SC	Specialization Course (SC-1)	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hour
6	60251105	DLC	Project Lab-I[#](Wireless Adhoc Network Lab)	-	-	-	-	70	30	100	-	-	4	2	Experiential	SO	-
7	60251106	DLC	Seminar/Presentation[$]	-	-	-	-	70	30	100	-	-	4	2	Blended	SO	-
8	60251107	NEC	Classified Novel Engaging Course (Activity Based Learning)	-	-	-	-	-	50	50	-	1	-	1	Interactive	SO	-
Total				100	100	150	150	140	110	750	13	03	08	20	-	-	-

MCQ: Multiple Choice Question **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#]During lab, students have to perform practical/assignments/minor projects related to the courses of respective semester using recent technologies / languages / tools etc.

[$]Seminar/Presentation through SWAYAM / NPTEL (Registration in a course will be compulsory for students but assessment will be based on internal seminar presentation).

DE-1		
S. No.	Course Code	Course Name
1.	60251108	Communication Protocols
2.	60251109	RADAR Signal Processing
3.	60251110	Adaptive Control System

SC-1 (RF Engineering Track)	MIMO Wireless Communication (60251104)

Mode of Learning						Mode of Examination				Total Credits
Theory			Lab			Theory			Lab	
Face to Face	Online	Blended	Experiential	Interactive	Experimental	PP	MCQ	OB	SO	
15	0	2	2	1	0	15	0	0	5	20
75%	0%	10%	10%	5%	0%	75%	0%	0%	15%	Credits %

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/Assignment Marks	Major Evaluation	Continuous Evaluation/lab work & Sessional	Major Evaluation		L	T	P	
60251102	DC	Computer Communication Networks	20	20	30	30	-	-	100	2	1	-	3

Computer Communication Networks (60251102)

Course Objectives:

To develop an understanding of computer networking basics and different components of computer networks, various protocols, modern architectures and their applications.

Unit I: Computer Networks and its Standards: Computer Network, Types of Computer Networks, Network Addressing, Routing, Reliability, Interoperability and Security, Network Standards.

Unit II: **Network Models**: Protocol Layering: Scenarios, Principles, Logical Connections, TCP/IP Protocol Suite: Layered Architecture, Layers in TCP/IP suite, OSI VersusTCP/IP.

Unit III: **Data-Link Layer**: Introduction: Nodes and Links, Services, Categories of link, Sublayers, Link Layer addressing: Types of addresses, ARP, Data Link Control (DLC) services: Framing, Flow and Error Control, Data Link Layer Protocols: Simple Protocol, Stop and Wait protocol.

Unit IV: **Media Access Control**: Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA. Controlled Access: Reservation, Polling, Token Passing.

Unit V: **Advanced Communication Network Architectures and Applications**: Intelligent Protocol Design and Network Security, Modern Wireless, Software-Defined Networking (SDN) and Network Function Virtualization (NFV), Internet of Things (IoT) Networking Architectures and Protocols, Network Security Mechanisms: Firewalls, VPNs, and Intrusion Detection Systems (IDS)

Text Books:

1. James F. Kurose, Keith W. Ross, "Computer Networking, A Top-Down Approach Featuring the Internet", Fifth Edition, Pearson Education,2009.
2. Nader. F. Mir, "Computer and Communication Networks", Pearson Prentice Hall Publishers,2010.
3. Computer Networks by Andrew S. Tanenbaum (Fifth Edition), Pearson Education.

Reference Books:

1. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, "Computer Networks: An Open Source Approach", Mc Graw Hill Publisher,2011.
2. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGraw Hill,2011.

Course Outcomes:

After the completion of the course, student will able to:

CO1. **Analyze** various Computer Networks

CO2. **Describe** Network model and their Architectures.

CO3. **Describe** Data link layer and its protocols.

CO4. **Illustrate** Media Access Control Systems.

CO5. **Analyze** modern wireless architectures and their applications.

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/Assignment Marks	Major Evaluation	Continuous Evaluation/lab work & Sessional	Major Evaluation		L	T	P	
60251103	DC	Communication System Design And Applications	20	20	30	30	-	-	100	2	1	-	3

Communication System Design and Applications (60251103)

Course Objectives:

To understand and analyze the concepts of digital communication system design techniques and their applications.

Unit I: **Random Variables and Random Process:** Random Variables, Discrete and Continuous random variable, PDF, CDF, properties of PDF and CDF, Joint CDF, Cauchy PDF, Rayleigh PDF, Centre limit theorem, Random process, Stationary and Non stationary random processes, Wide Sense Stationary process, Ergodic process, Gaussian process.

Unit II: **Digital Transmission Techniques:** Geometric Representation of Signal Waveforms, Gram-Schmidt Orthogonalization procedure, BPSK ,BFSK, QPSK, DPSK, , Matched-Filter receiver, Correlation Receiver.

Unit III: **Communication Through Band Limited Linear Filter Channels:** Baseband binary data transmission system, Power Spectrum of the Baseband Signal, Optimum Receiver for Channels with ISI and AWGN Linear Equalization, Minimum Mean Square Error Equalizer, Adaptive Equalizer, Decision Feedback Equalization.

Unit IV: **Spread Spectrum Signals & Multicarrier Communication:** Principle of Spread spectrum, Pseudo noise sequence, direct sequence spread spectrum signals, Frequency hopped spread spectrum signals, Synchronization, Generation and detection of OFDM, Cyclic prefix, Orthogonality, Difference between FDM and OFDM.

Unit V: **Advanced Wireless Communication System Design:** Adaptive Equalization in Broadband Networks, Spread Spectrum for Secure Military and IoT Communication, OFDM in 5G and Broadband Systems, Communication Systems in Autonomous Vehicles, Smart Grid Communication Networks

Text Books:

1. John G. Proakis and Masoud Salehi, Digital Communications, Tata McGraw-Hill, 5th Edition, 2014.
2. Simon Haykin, Digital Communications, John Wiley India Pvt., Ltd,2008.

Reference Books:

1. Richard Van Nee & Ramjee Prasad, 'OFDM for Multimedia Communications' Artech House Publication,2001
2. Bernard Sklar, Digital communication, Pearson education,2009.

Course Outcomes:

After the completion of the course, student will able to:

CO1. **Analyze** random variables and random processes.
CO2. **Explain** base band transmission and reception schemes.
CO3. **Illustrate** communication through band limited linear filter channels.
CO4. **Discuss** spread spectrum signals and multicarrier communication.
CO5. **Discuss** advanced wireless communication systems.

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/Assignment Marks	Major Evaluation	Continuous Evaluation/lab work & Sessional	Major Evaluation		L	T	P	
60251108	DE	Communication Protocols	20	20	30	30	-	-	100	2	1	-	3

Communication Protocols (60251108)

Course Objectives:

The students will be able to understand the wireless network fundamentals, including WLAN and MAN standards, and will be equipped to design and implement advanced wireless communication technologies.

Unit I: **Overview of Wireless Communication:** Cellular Communication, Different generations and standards in Cellular Communication Systems. Wireless Network Architecture: Logical Architecture OSI Network Model, Network Layer Technologies, Data Link Layer Technologies, Physical Layer Technologies, Physical Architecture: Wireless Network Topologies, Wireless Devices.

Unit II: **Wireless LAN Standards:** 802.11 WLAN Standards, 802.11 MAC Layer Standard, 802.11 PHY Layer, Implementing Wireless LANs: Evaluating Wireless LAN Requirements, Planning and Designing the Wireless LAN.

Unit III: **Wireless MAN Standards:** Bluetooth (IEEE 802.15.1), Wireless USB, ZigBee (IEEE 802.15.4), IrDA, Near Field Communication. Wireless MAN Standards: IEEE 802.16 Wireless MAN Standard (WiMAX). Implementing Wireless MAN: Technical Planning.

Unit IV: **Ad-hoc Wireless Networks:** Design Challenges in Ad-hoc wireless networks, concept of cross layer design, security in wireless networks, Energy constrained networks, MANET and WSN, Wireless Mobile Network Layer Protocol (Mobile IP, IPv6, Dynamic Host Configuration Protocol), Mobile Transport Layer Protocol (Traditional TCP, Classical TCP improvements).

Unit V: **Latest Wireless Communication Technologies:** multicarrier modulation for 6G, OFDM, MIMO system, diversity multiplexing trade-off, MIMO-OFDM system, Smart-antenna, Beamforming and MIMO, Cognitive radio, Software defined radio, Communication relays, Spectrum sharing.

Text Books:

1. Andrea Goldsmith, “Wireless Communications”, Cambridge University Press,2005.
2. Steve Rackley, “Wireless Networking Technologies: From Principles to Successful Implementation”, Newness Publication,2007.
3. Sanjay Kumar, “Wireless Communication the Fundamental and Advanced Concepts” River Publishers, Denmark, 2015 (Indian reprint).

Reference Books:

1. Vijay K Garg, “Wireless Communications and Networks”, Morgan Kaufmann Publishers an Imprint of Elsevier, USA 2009 (Indianreprint)
2. J. Schiller, “Mobile Communication”, Pearson Education,2012.
3. Iti Saha Misra, “Wireless Communication and Networks: 3G and Beyond”, McGraw Hill Education (India) Private Ltd, New Delhi,2013.

Course Outcomes:

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

CO1. **Explain** the evolution and architecture of wireless communication systems.
CO2. **Implement** wireless LAN for corresponding protocols.
CO3. **Analyse** wireless MAN standards like Bluetooth and WiMAX
CO4. **Compare** ad-hoc network and mobile network technology.
CO5. **Acquire the knowledge** about advanced wireless communication technologies

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/Assignment Marks	Major Evaluation	Continuous Evaluation/lab work & Sessional	Major Evaluation		L	T	P	
60251109	DE	Radar Signal Processing	20	20	30	30	-	-	100	2	1	-	3

Radar Signal Processing (60251109)

Course Objectives:

To understand and analyze the concepts of Radar signal processing which includes Radar signals and Networks, Pulse Compression, Range Resolution, Detection, Measurements with industrial applications.

Unit I:Radar Signals and Networks: Real Radar Signals, Complex Radar Signals, Analytic Radar Signals, Duration Frequency and Bandwidth of signal, Transmission of signal through Networks, Match Filter for Non white Noise, Match filter for white noise, Ambiguity Function.

Unit II: Pulse Compression with Radar Signals: Liner FM Pulse, Mismatch Filter for Sidelobe Control, Signal Design for Low Sidelobes, Example Signal Designs, Other Pulse Compression Waveforms, Pulse Compression by Costas FM, Pulse Compression by Binary Coding.

Unit III: Radar Resolution: Range Resolution, Doppler Frequency Resolution, Simultaneous Rang and Doppler Resolution, Resolution and RMS Uncertainty, Overall Radar and Angle Resolution.

Unit IV: Radar Detection & Range Measurement: Bayes's Concepts, Detection Criteria for Several Target Models, Detection of Steady Target with Random Initial Phase, Detection of Steady Target with N Pulse having Random Phases, Detection of Targets with Pulse-to-Pulse Fluctuation, Binary Detection, Detection in Clutter, Parameter Estimation, Limiting Accuracies of Radar Measurements, Range from Delay Measurements.

Unit V: Industry Oriented Radar Signal Processing: Autonomous Vehicle Radar Systems, Airborne Surveillance and Target Tracking, Weather Monitoring with Doppler Radar, Synthetic Aperture Radar for Terrain Imaging, UAV-Based Battlefield Radar

Text Books:

1. Peyton Z. Peebles Jr, "Radar Principles", John Wiley,2004.
2. Mark. A. Richards, "Fundamentals of Radar Signal Processing", TMH,2005.

Reference Books:

1. Fred E. Nathanson, "Radar Design Principles: Signal Processing and the Environment", 2nd ed., PHI,1999.
2. Mark. A. Richards, "Fundamentals of Radar Signal Processing", TMH,2005.
3. R. Nitzberg, "Radar Signal Processing and Adaptive Systems", Artech House, 1999.
4. M.I. Skolnik, "Introduction to Radar Systems", 3rd ed., TMH,2001.

Course Outcomes:

After the completion of the course, student will able to:

CO1. **Analyze** the Radar Signals and Networks**.**

CO2. **Describe** the Pulse Compression in Radar Signals Processing.

CO3. **Apply** the concept **of** Radar Resolution.

CO4. **Analyse** the Radar target detection Process and Radar range measurement.

CO5. **Discuss** Radar Signal Processing for industrial application.

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/Assignment Marks	Major Evaluation	Continuous Evaluation/lab work & Sessional	Major Evaluation		L	T	P	
60251110	DE	Adaptive Control System	20	20	30	30	-	-	100	2	1	-	3

Adaptive Control System (60251110)

Course Objectives:

To understand and apply adaptive controls in practical and industrial applications.

Unit I: **State Space Analysis:** Concepts of State, State variables, State Model of Linear Systems, State Space Representation using Physical Variables, State Space Representation using Phase Variables, Decomposition of Transfer Function, Diagonalization.

Unit II: **Solution of State Equation:** State Transition Matrix and State Transition Equation, Computation of the State Transition Matrix, Transfer Function from the State Model, Stability, Controllability and Observability of Linear Systems.

Unit III: **Adaptive Control:** Linear Feedback, Effects of Process Variations, Adaptive Schemes- Gain Scheduling, Model Reference Adaptive Systems, Self Tuning Regulators, Dual Control, Applications of Adaptive Control.

Unit IV: **Real Time Parameter Estimation:** Least Squares and Regression Models, Estimating Parameters in Dynamical Systems, Experimental conditions, Simulation of Recursive Estimation, Prior information.

Unit V: Industry-Oriented Adaptive Control and Automation: Process Control in Smart Manufacturing, Adaptive Cruise Control System in Autonomous Vehicles, Smart HVAC Systems for Energy Optimization, Adaptive Robotics, Aerospace Systems.

Text Books:

1. Katsuhiko Ogata, “Modern Control Engineering” 5th Edition, Prentice Hall,2010
2. M. Gopal, “Modern Control System Theory” Revised 2nd Edition New Age International Publishers,2005
3. Karl J. Astron and Bjorn Wittenmark, “ Adaptive Control” 2nd Edition, Dover Publications,2008
4. Katsuhiko Ogata “ Discrete Time Control Systems” 2nd Edition Pearson Education,2002

Reference Books:

1. H. K. Khalil, “Nonlinear Systems”, Pearson India,2019
2. Gang Tao, “Adaptive Control Design and Analysis” Wiley,2003
3. G. Feng and R. Lozano, “Adaptive Control Systems” Oxford University Press, 1999.

Course Outcomes:

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

CO1. **Apply** the State Space Techniques in Control Systems.

CO2. **Examine** a system for its stability, controllability, and observability.

CO3. **Demonstrate** the behaviour of Adaptive Control System.

CO4. **Describe** the real time parameter estimation methods for adaptive control systems.

CO5. **Explain** adaptive control and automation for industrial applications.

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/Assignment Marks	Major Evaluation	Continuous Evaluation/lab work & Sessional	Major Evaluation		L	T	P	
60251104	SC-1	Mimo Wireless Communication	20	20	30	30	-	-	100	2	1	-	3

MIMO Wireless Communication (60251104)

Course Objectives:

To provide a comprehensive coverage of coding techniques for multiple-input, multiple-output (MIMO) communication systems

Unit I Fading Channels and Diversity Techniques: Wireless channels, Error/Outage probability over fading channels, Diversity techniques, Channel coding as a means of time diversity, Multiple antennas in wireless communications.

Unit II Capacity and Information Rates of MIMO Channels : Capacity and Information rates of noisy, AWGN and fading channels, Capacity of MIMO channels, Capacity of non-coherent MIMO channels, Constrained signaling for MIMO communications, Matlab exercise.

Unit III Space-Time Block and Trellis Codes : Transmit diversity with two antennas: The Alamouti scheme, Orthogonal and Quasi-orthogonal space-time block codes, Linear dispersion codes, Generic space-time trellis codes, Basic space-time code design principles, Representation of space-time trellis codes for PSK constellation, Performance analysis for space-time trellis codes, Comparison of space-time block and trellis codes, Matlab exercise.

Unit IV Concatenated Codes and Iterative Decoding : Development of concatenated codes, Concatenated codes for AWGN and MIMO channels, Turbo coded modulation for MIMO channels, Concatenated space-time block coding. Matlab exercise.

Unit V Advanced Space-Time Coding Techniques: MIMO frequency-selective channels, Capacity and Information rates of MIMO FS fading channels, Space-time coding and Channel detection for MIMO FS channels, MIMO systems with advance applications.

Text Books:

1. Tolga M. Duman and Ali Ghrayeb, “Coding for MIMO Communication systems”, John Wiley & Sons, West Sussex, England, 2007.
2. A.B. Gershman and N.D. Sidiropoulus, “Space-time processing for MIMO communications”, Wiley, Hoboken, NJ, USA, 2005.

Reference Books:

1. E.G. Larsson and P. Stoica, “Space-time block coding for Wireless ommunications”, Cambridge University Press, 2003
2. M. Janakiraman, “Space-time codes and MIMO systems”, Artech House, 2004.
3. H. Jafarkhani, “Space-time coding: Theory & Practice”, Cambridge University Press, 2005.

Course Outcomes:

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

CO1. **Analyze** Wireless Channels and Mitigate Fading Effects

CO2. **Evaluate** Capacity and Information Rates in MIMO Channels.

CO3. **Develop** the Space-Time Coding Techniques.

CO4. **Optimize** Concatenated Coding and Iterative Decoding.

CO5. **Describe** Space-Time Coding in Frequency-Selective Fading Channels.

Subject Code	Category Code	Subject Name	Theory Slot				Practical Slot		Total Marks	Contact Hr/week			Total Credits
			Minor Evaluation I	Minor Evaluation II	Quiz/Assignment Marks	Major Evaluation	Continuous Evaluation/lab work & Sessional	Major Evaluation		L	T	P	
60251105	DC	Project Lab - I	-	-	-	-	70	30	100	-	-	4	2

PROJECT LAB-I (60251105)

Wireless Adhoc Networks Lab

Course Objectives:

Equip students with the skills to design and implement wireless topology and Ad-hoc network using simulation tool. Also evaluate the performance of routing protocol.

Tools Required: Network Simulator and QualNet

List of Experiments

1. Create a sample wireless topology using Simulation Tool.
2. Create a mobile Ad-hoc networks using Simulation Tool.
3. Implement an Ad-hoc On-demand Distance Vector protocol using Simulation Tool.
4. Implement a Transmission Control Protocol using Simulation Tool.
5. Implement an User Datagram Protocol using Simulation Tool.
6. Simulate a three-node point-to-point network with a duplex link between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
7. Performance evaluation of AODV, DSR, DSDV etc. Routing protocols using Simulation tool.

Course Outcomes:

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

CO1 **Design** a network using NS2 or QualNet.

CO2. **Evaluate** performance of Routing Protocols.

CO3.**Design** simple wireless topology and Ad-hoc networks using simulation tool

Annexure IX

Item 10	To review and finalize the syllabus/module content for **Classified Novel Engaging Courses** to be offered in PG programmes M.E.- CCN, I semester (2025-26 admitted batch).

CNEC PROPOSAL

Name of Faculty Mentor	**Dr. Vandana Vikas Thakare**
Novel Engaging Course Title	**RF and Microwave CAD**
Objectives of Course	To make students understand about the application of Neural Network techniques for RF circuits modelling
Content	Modelling and Optimization for RF Design: The Design Process, Anatomy of the Design Process, Conventional Design Procedures, CAD Approach, Knowledge-Aided Design (KAD) Approach, RF and Microwave Circuit CAD, Modelling of Circuit Components, Computer-Aided Analysis Techniques , Circuit Optimization, CAD for Printed RF and Microwave Antennas, Role of ANN's in RF and Microwave CAD.
Contact Hours	30
Mode of Delivery	Hybrid
Outcomes of Course	Students will be able to model microwave circuits using soft computing techniques and validate the same with proper hardware design
External Mentors / Collaborations	NA

Name of Faculty Mentor	Dr. **Varun Mishra**
Novel Engaging Course Title	**Modeling of Semiconductor Devices using MATLAB**
Objectives of Course	To gain knowledge and skills related to analytical modeling of semiconductor devices.
Content	• Introduction: Basic of PN-junction diode, MOSFET, and novel semiconductor device like Tunnel FET. • Analytical modeling: Derivations of current expression for diode, MOSFET, and Tunnel FET. • Implementation in MATLAB: Basic equations representations and

	derived current expression of semiconductor devices.
Contact Hours	30
Mode of Delivery	Hybrid
Outcomes of Course	After completion of this course, the students will be able to: 1. Analyze MOS-based devices. 2. Develop analytical/compact models for MOS devices. Implementation of analytical models using MATLAB.
External Mentors / Collaborations	NA

Name of Faculty Mentor	**Dr. Mukesh Kumar Mishra**
Novel Engaging Course Title	**Stochastic Geometry Modeling for Wireless Networks**
Objectives of Course	This course introduces stochastic geometry as a powerful mathematical tool for modeling and analyzing the spatial configurations of wireless networks. It covers the principles, techniques, and applications of stochastic geometry in the context of wireless communication systems.
Content	Introduction to Stochastic Geometry, Poisson Point Processes (PPP), Definition and properties of PPP, Applications of PPP in wireless networks, Modeling interference using PPP, SINR modeling using stochastic geometry, Analysis of outage probability and coverage, Techniques for SINR improvement.
Contact Hours	30
Mode of Delivery	Hybrid
Outcomes of Course	• Understand the basic principles of stochastic geometry and its application in modeling wireless networks. • Apply tools of stochastic geometry to solve practical problems of wireless communication. • Develop skills to critically review and contribute to the existing literature of stochastic geometry and wireless networks.
External Mentors /Collaborations	NA

Name of Faculty	**Dr. Himanshu Singh**

Course Name/Code	**Stochastic Modelling and Queueing Theory**
Objectives	To provide a thorough understanding of the mathematical foundations of telecommunication and computer communication networks To understand the applications of Markov Process and queuing theory, to analyze the performance and address designing of circuit switching and packet switching networks.
Content	• Review of Probability and Random Variables, moment generating function, Laplace-Stieljes transform (LST) of random variables; Stochastic Processes - stationarity, ergodicity, independence, correlation. • Stationary Increment and Independent Increment Processes - Bernoulli trials, Poisson processes, Gaussian processes; Markov Processes - discrete time Markov chains (DTMCs), continuous time Markov chains (CTMCs), recurrence, transience, stability; Renewal Processes and Markov Renewal Processes. • Queuing Theory - common queuing models, vacation models, loss networks and delay networks, multiclass queuing models with priority, open and closed networks of queues; Fluid and Gaussian approximations.
Contact hrs. per semester	30
Mode of Delivery	Hybrid
Outcomes	After completion of this course, the students will be able to: • Acquire the skill of mapping frequently occurring scenarios in telecommunication and computer networking into standard stochastic models, i.e., they will develop the ability of constructing mathematical models from the physical description of the problems. • Be able to identify appropriate solution methods in each case and physically interpret the mathematical results.
External Mentors / Collaborations	NA

Annexure X

Item 11	To review the CO attainments, identify gaps and suggest corrective measures for the improvement in CO attainment levels for the courses taught in first semester, July-December 2024 Session.

CO attainments, identify gaps and suggest corrective measures for the improvement in CO attainment levels for the courses taught in first semester, July-December 2024 Session.

Department of Electronics Engineering

CO attainments for all the courses during July-Dec 2024 (1st year EL)

Level 1:-50%, Level 2:-60% and Level 3:-70%

Sem.	Name & Code of the Course	CO Statements	Target level	Direct Attainment in levels	Indirect Attainment in levels	Total Attainment in levels	Gap	Action Taken
I	Instrumentation & Sensors (14241101)	CO1. Examine the measurement systems, significance, and their characteristics.	2.5	2.8	3	2.8	0.3	Conducted interactive sessions on the importance of measurement systems in industries.
		CO2. Evaluate the errors in measurement systems.	2.5	2.9	3	2.9	0.4	Assigned analytical tasks using real sensor data to quantify and classify errors.
		CO3: Analyse the selection criteria and parameters for various sensors.	2.5	2.4	3	2.5	-	Target achieved, Target revision will be in Next BoS
		CO4: Describe the working of force, pressure, humidity and moisture sensors.	2.2	3	2.7	2.9	0.7	Included project work requiring students to select and justify sensors for a practical IoT system.
		CO5: Differentiate sensors based on their applications.	2.2	2.4	3	2.5	0.3	Included a case study where students need to research and categorize sensors used in sectors like agriculture, automotive, and healthcare.
	Computer Programming (14241102)	CO1: Design algorithms and flowchart for a given problem.	2.5	2.4	2.5	2.4	-0.1	Target achieved, Target revision will be in Next BoS
		CO2: Implement the concepts of	2.5	2.4	3	2.5	-	Target achieved, Target revision will be in Next

		procedural programming with control statement.						BoS
		CO3: Develop optimized recursive functions and function templates to solve challenging computational tasks.	2.5	2.4	3	2.5	-	Target achieved, Target revision will be in Next BoS
		CO4: Implement the pointer concept for effective C++ programming.	2.5	2.4	2.18	2.3	-0.2	Provided additional tutorial sessions, supplementary learning materials
		CO5: Design object-oriented programs that effectively model real-world scenarios with encapsulation and abstraction.	2.2	1.7	3	1.9	-0.3	Included more OOPs based projects in the curriculum for more clarity on topic
	Electronic Devices (14241103)	CO1. Explain the semiconductor materials with their importance.	2.5	2.5	3	2.6	0.1	More numerals were added in tutorial
		CO2. Design the circuits using diodes.	2.5	2.4	3	2.5	-	Target achieved, Target revision will be in Next BoS
		CO3. Analyze the construction, operation, and characteristics of various diodes.	2.5	2.2	2.93	2.3	-0.2	More assignments and tutorials were added
		CO4. Compare the characteristics of Bipolar Junction Transistors (BJT) and Field Effect Transistors (FET).	2.5	2.7	3	2.7	0.2	More numericals were added in tutorial

		CO5. Explain the working and characteristics of power electronics devices.	2.5	2.7	3	2.7	0.2	Target achieved, Target revision will be in Next BoS
	Network Theory (14241104)	CO1.Analyze the circuits using Kirchoff"s laws.	2.5	2.4	3	2.5	-	Target achieved, Target revision will be in Next BoS
		CO2. Apply Network theorems for the simplification of circuits.	2.5	1.7	3	1.9	-0.6	More assignments and tutorials will be added
		CO3. Apply the Laplace transform to linear circuits and systems.	2.5	2.4	2.8	2.4	-0.1	Target achieved, Target revision will be in Next BoS
		CO4. Evaluate transient response and steady state response.	2.5	1.7	2.98	1.9	-0.6	More assignments and tutorials were added
		CO5.Determine ABCD, Z,Y and h parameters of an electrical circuit.	2.5	2.4	3	2.5	-	Target achieved, Target revision will be in Next BoS
	Basic Electrical & Electronics Engineering (14241105)	CO 1. Solve dc circuits by applying fundamental laws & theorems.	2.2	2.8	2.32	2.7	0.5	Target achieved, Target revision will be in Next BoS
		CO 2. Analyze AC series and parallel circuits by determining impedance, voltage, current, and power factor, and validate findings using phasor diagrams.	2.2	2.27	2.25	2.2	-	Target achieved, Target revision will be in Next BoS
		CO 3. Evaluate magnetic circuits and resonance characteristics of ac electric	2.2	2.14	2.29	2.4	+0.2	More numericals were added in tutorial and assignments

		circuits.						
		CO 4. Describe the working principle, construction, performance & applications of single phase transformer & rotating electrical machines	2.2	2.8	2.27	2.5	+0.3	More numericals were added in tutorial
		CO 5.Apply the fundamentals of digital & analog electronics in converting number system and understanding the characteristics of Diode and Transistor	2.2	2.4	2.17	2.2	-	Target achieved, Target revision will be in Next BoS

Annexure XI

Item 12	To consider and review the curriculum feedback from various stakeholders, its analysis and impact report.{Curriculum offered under MITS–DU structure (i.e. 2024-25 admitted batch) to be considered}

Alumni Feedback

https://docs.google.com/document/d/1qlYsvVcEhXkOgZcbp_IerIvea-T7_jlR/edit?usp=sharing&ouid=101619927645802630196&rtpof=true&sd=true

Curriculum Gap Analysis

https://docs.google.com/document/d/1eLBjm7mqMgnxMyUNWvEuc7Irkh2Kqia_/edit?usp=sharing&ouid=101619927645802630196&rtpof=true&sd=true

Teacher Course Curriculum Feedback

https://docs.google.com/document/d/1fGYf4wQoA4SbbS-Rl6wXhZ53QxG1_4aJ/edit?usp=sharing&ouid=101619927645802630196&rtpof=true&sd=true

Student Course Curriculum Feedback

https://docs.google.com/document/d/1dMS9t2SEphBMja2THlExRpppCrthsgXX/edit?usp=sharing&ouid=101619927645802630196&rtpof=true&sd=true

Employer Feedback

https://docs.google.com/document/d/1-xKD_ECH_Rt-e1KH8qfTsNC9dHMDmjdL/edit?usp=sharing&ouid=101619927645802630196&rtpof=true&sd=true