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MAHARASHTRA INSTITUTE OF TECHNOLOGY, AURANGABAD

An Autonomous Institute Affiliated to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, Maharashtra (India)

Third Year B. Tech. Syllabus (Electronics and Computer Engineering) 2023-24

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T.Y.B.Tech. (ECE) Syllabus Structure w.e.f.2023-24 (Pattern2021-2022)

Electronics and Computer Engineering

Semester-V

Sr. No	Course Category	Course Code	Course Title	L	T	P	Contact Hr/Wk	Credits	MSE-I	MSE-II	CIE	TA	ESE/Oral	Total
			Orientation Program (1Day)											
1.1	HSMC	HSM301	Engineering Economics, Finance and Costing	3	-	-	3	3	15	15	10	10	50	100
1.2	PC	ECE302	Digital Signal Processing	3	-	-	3	3	15	15	10	10	50	100
1.3	PC	ECE303	Embedded Systems and VLSI Design	3	-	-	3	3	15	15	10	10	50	100
1.4	PC	ECE304	Data Analysis	3	-	-	3	3	15	15	10	10	50	100
1.5	PC	ECE305	Operating System	3	-	-	3	3	15	15	10	10	50	100
1.6	PC	ECE321	Lab-I: Digital Signal Processing	-	-	2	2	1	-	-	-	25	-	25
1.7	PC	ECE322	Lab-II: Embedded Systems and VLSI Design	-	-	2	2	1	-	-	-	-	25	25
1.8	PC	ECE323	Lab-III: Data Analysis	-	-	2	2	1	-	-	-	-	25	25
1.9	PRO	ECE324	Lab-IV: Seminar	-	-	2	2	1	-	-	-	-	25	25
1.10	PRO	ECE325	Lab-V: Experience Based Learning	-	-	2	2	1	-	-	-	25	-	25
1.11	PC	ECE326	Lab-VI: Development of Skills (Computational) - MATLAB	-	-	2	2	1	-	-	-	25		25
S5				**15**	**0**	**12**	**27**	**21**	**75**	**75**	**50**	**125**	**325**	**650**

Semester-VI

Sr. No	Course Category	Course Code	Course Title	L	T	P	Contact Hr/Wk	Credits	MSE-I	MSE-II	CIE	TA	ESE/Oral	Total
2.1	PC	ECE351	Computer Network & Security	3	-	-	3	3	15	15	10	10	50	100
2.2	PC	ECE352	Industrial IOT	3	-	-	3	3	15	15	10	10	50	100
2.3	PC	ECE353	Software Engineering	3	-	-	3	3	15	15	10	10	50	100
2.4	PC	ECE354	Cloud Computing	3	-	-	3	3	15	15	10	10	50	100
2.5	OE-III	******	Open Elective-III	3	-	-	3	3	15	15	10	10	50	100
2.6	PC	ECE371	Lab-I: Computer Network & Security	-	-	2	2	1	-	-	-	25	-	25
2.7	PC	ECE372	Lab-II: Industrial IOT	-	-	2	2	1	-	-	-	25	-	25
2.8	PC	ECE373	Lab-III: Software Engineering	-	-	2	2	1	-	-	-	-	25	25
2.9	PC	ECE374	Lab-IV:Cloud Computing	-	-	2	2	1	-	-	-	-	25	25
2.10	PRO	ECE375	Lab-V: Major Project-I	-	-	4	4	2	-	-	-	25	25	50
S6				**15**	**0**	**12**	**27**	**21**	**75**	**75**	**50**	**125**	**325**	**650**

L-Lecture, T-Tutorial, P- Practical, MSE- Mid Semester Exam, CIE-Continuous Internal Evaluation, TA-Teacher Assessment, ESE-EndSemesterExamination

Semester-VI

TY OPEN ELECTIVE-III (ALL)

DEPARTMENT OFFERED	COURSE CODE	COURSE TITLE
Agricultural Engineering	AED391	Fundamentals of Bioenergy
Civil Engineering	CED391	Solid Waste Management
Computer Science and Engineering	CSE391	RHCSA (RedHat Certified System Administration)
Computer Science and Engineering	CSE392	Digital Marketing
Electronics and Computer Engineering	ECE391	Data Science
Electronics and Computer Engineering	ECE392	Control Systems
Electrical Engineering	EED391	Special Purpose Electric Machines
Emerging Science and Technology	AID391	Business Intelligence
Mechanical Engineering	MED391	Industry 4.0
Mechanical Engineering	MED392	Operations Research
Plastic and Polymer Engineering	PPE391	Waste Management and Circular Economy

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V

Course Code: HSM-301 Course: **Engineering Economics, Finance and Costing** **Teaching Scheme:** Lectures: 03 Hrs./ Week Tutorial:-- Hr./ Week	Credits:3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II:15 Marks Teacher Assessment:10Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50Marks End Semester Examination (Duration):02Hrs.

Prerequisites	Basic knowledge of concepts of economics
Objectives	The objectives of the course are • Understanding the principles of economics. • Analyzing cost-benefit analysis. • Recognizing the role of markets and competition. • Understand decision making in uncertainty. • Getting introduced to Indian taxing system.
Course Outcomes	After successfully completing this course, students will be able to 1. Define the basic terminologies in context to engineering economics. 2. Apply cost, investment and rate analysis techniques in financial matters. 3. Describe the concepts in context to decision making under risk and uncertainty. 4. Describe the managerial aspects in personal and business oriented economics.
Unit-I	**Introduction to Engineering Economics:** Introduction to Economics, Importance and scope of economics in engineering, Economic analysis and its role in project management, Overview of economic principles and concepts relevant to engineering, Micro - and macro- economics, economics of growth and development, Demand and supply analysis. **(6 Hrs.)**
Unit-II	**Cash Flow and Time Value of Money** Interest rates, compounding, and discounting, Present value and future value analysis, Equivalent annual cost analysis. Cash Flow – Diagrams, Categories & Computation, Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis, Calculating Rate of Return, Incremental Analysis. **(6 Hrs.)**
Unit-III	**Elements of Managerial Economics** Cost &Cost Control –Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation, Time value of money (present and future worth of cash-flows). Business Forecasting – Elementary techniques. **(6 Hrs.)**

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Unit-IV	**Rate analysis and Tendering** Rate analysis - Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity. **(3 Hrs)** Tendering - Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification, general and special conditions, termination of contracts, penalty and liquidated charges, Settlement of disputes. Bid conditions, alternative specifications, Alternative Bids, Bid process management. **(3 Hrs)**
Unit-V	**Decision-making under Risk and Uncertainty** Probability and risk assessment in engineering projects, Sensitivity analysis and scenario analysis, Decision trees and expected value analysis, Real options analysis. **(3 Hrs)** **Depreciation** Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types of Property, Depreciation Calculation Fundamentals, Depreciation and Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation **(6 Hrs.)**
Unit-VI	**Personal Financial Management** Insurance, Investment, Insurance Vs investment, Investment types, Equity and debt, Investment options, lumpsum, SIP, STP, Compounding effects of investment, Investment analysis, Introduction to Stock market, fundamental and technical analysis, Derivatives, Types of derivatives, Trading awareness **(6 Hrs.)** Indian Taxing System, Types of tax: Direct and indirect taxation in India, Excise duty, GST, Income tax introduction, Income Tax calculations, example **(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Economics for Engineers	James L.Riggs, David D. Bedworth, Sabah U. Randhawa	McGraw-Hill	Fourth
2.	Engineering Economics Analysis	Donald Newnan, Ted Eschembach, Jerome Lavelle	OUP	Eleventh
3.	Principle of Engineering Economic Analysis	John A. White, Kenneth E.Case, DavidB.Pratt	John Wiley	Six
4.	Engineering Economics	R.Paneerseelvam	PHI	First
5.	Engineering Economics Analysis	Michael R Lindeburg	Professional Pub	First
6.	Managerial Economics	V. Mote, S. Paul, G. Gupta	Tata McGraw Hill	2004
7.	Principles of Economics	Mankiw Gregory N.	Thompson Asia	2002

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V

Course Code: ECE302 Course: **Digital Signal Processing** **Teaching Scheme:** Lectures: 03 Hrs./ Week Tutorial: -- Hr./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Knowledge of basic Mathematics & transform techniques.
Objectives	The objectives of the course are • To understand the concept of Signals & Systems. • To know transform technique to analyse DTS. • To design digital filters.
Course Outcomes	After successfully completing this course, students will be able to 1. Classify CT & DT signals and systems. 2. Apply time domain analysis techniques to LTI systems. 3. Analyze Signals using DFT and FFT algorithms. 4. Design FIR and IIR filter.
Unit-I	**Introduction to Signals:** Definitions of Signals, Continuous-time signals & discrete time, Analog & Digital signals, Basic CT & DT signals: unit impulse, unit step, unit ramp, complex exponential & sinusoidal, sinc, rectangular, triangular and signum, Operations on signals: Time Scaling and Folding, Time Shifting, Amplitude Scaling, Addition, Multiplication, Classification of Signals: even & odd signals, periodic & non-periodic, energy & power, deterministic & non-deterministic. **(6 Hrs)**
Unit-II	**Introduction to Systems:** Definitions of Systems, System Representation, continuous time Systems & discrete Systems, system with and without memory (static and dynamic), causal and non-causal system, linear and non- linear system, Time-invariant and time-variant system, Stable and Unstable system, Invertible Systems. **(6 Hrs)**
Unit-III	**Convolution and Correlation** **Convolution:** Linear time-invariant systems: The representation of signals in terms of impulses, discrete-time LTI systems, properties of DT-LTI systems, Convolution: Convolution sum & its properties, Systems described by differential, difference equations, block diagram representation of LTI systems described by differential-difference equations. **Correlation:** Autocorrelation and Cross-correlation of DT signals, Correlation properties, Energy Spectral Density (ESD), Power Spectral Density (PSD), ESD and PSD Properties, Relation of ESD and PSD to Autocorrelation. **(6 Hrs)**

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Unit-IV	**Discrete Fourier Transform & Fast Fourier Transform** DFT, Properties of DFT, Circular Convolution and Circular Co-relation using DFT and IDFT, Analysis of LTI System using Circular Convolution, Linear Convolution using Circular Convolution, Fast Convolution: Overlap Save and Overlap add algorithm. Relationship between DTFT, DFT and ZT. FFT Algorithms – Radix 2: DIT-FFT and Radix 2: DIF. **(6 Hrs)**
Unit-V	**IIR Filter Design:** Introduction to IIR Filters, IIR Filter Designing by using Approximation of Derivatives, Impulse Invariance Method and Bilinear Z Transformation method, Matched Z Transform Method, Design of Low pass digital Butterworth filter, Comparison of FIR & IIR Filters. **(6 Hrs)**
Unit-VI	**FIR Filter Design:** Characteristics of FIR Filters. Properties of FIR Filters. FIR Design using Windowing Technique Rectangular Window, Hamming Window and Hanning Window, Kaiser Window. **(6 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Digital Signal Processing: Principles, Algorithms and Applications	John G. Proakis and D.G. Manolakis	Pearson Education publication	4th Edition
2.	Digital Signal Processing	Salivahanam, A Vallavaraj, C. Guanapriya	Tata MC Graw Hill	2nd Edition
3.	Digital Signal Processing	P. Ramesh Babu,	Scitech publication	4th Edition
4.	Digital Signal Processing – A Computer Based Approach	Sanjeet Mitra	Tata Mc Graw Hill	2nd Edition

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V

Course Code: ECE303 Course: **Embedded Systems and VLSI Design** **Teaching Scheme:** Lectures: 03 Hrs./ Week Tutorial: -- Hr./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Fundamentals of design of combinational and sequential digital systems.
Objectives	The objectives of the course are • To get students familiar with microcontroller and embedded system. • To get students familiar with different real-world peripherals such as sensors, displays. • To prepare a student to understand the VHDL language features to realize the complex digital systems. • To design sequential and concurrent techniques in VHDL.
Course Outcomes	At the end of the course the student will be able to 1. Understand embedded system, architecture and instruction set of 8051 microcontrollers. 2. Develop various applications by interfacing various modules to 8051. 3. Understand and use of major syntactic elements of VHDL such as entity, architecture, common concurrent and common sequential statements. 4. Design different logic circuits in different types of modeling.
Unit-I	**Introduction to Embedded system**: Difference between Microprocessor and Microcontroller, Von-Neuman and Harvard architecture, RISC and CISC processor, Embedded system definition, Difference between General computing system and Embedded system, Classification of Embedded system, Embedded system life cycle, Core of Embedded System, Examples of Embedded Systems **(6 Hrs.)**
Unit-II	**Introduction to 8051 Micro Controller:** Overview of 8051 Micro Controller – Architecture– Register set–I/O ports and Memory Organization, Instruction set, Interrupts–Timers and Counters–Serial Communication. **(6 Hrs.)**
Unit-III	**Interfacing and Applications of 8051**: LEDs and Push buttons Interfacing, Relays and Keyboard interfacing, Seven Segment display interfacing, A/D and D/A converter interfacing **(6 Hrs.)**

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Unit-IV	**Introduction to VLSI:** Introduction to Integrated Circuit Technology, The Integrated Circuit era, Moore's Law, VLSI Design Flow **Hardware Description Languages:** Comparison of various Hardware Description Languages, VHDL Entity and Architecture: Modeling styles: Behavioral modeling, DataFlow modeling, Structural modeling **(6 Hrs.)**
Unit-V	**VHDL:** VHDL Design Units, Identifiers, Data Objects, Data Types, Functions, Procedures, Attributes, Packages and Libraries, Generics and Configurations **(6 Hrs.)**
Unit-VI	**Circuit Design Using VHDL:** Modelling in VHDL for Combinational and Sequential Circuits: Counters, Shift Registers, Multiplexers, De-multiplexers etc., Test benches, Statements in Behavioural, Dataflow and Structural Modelling**(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Embedded Systems: Architecture, Programming And Design	Raj Kamal	Mc-Graw Hill Education	Second Edition
2.	The 8051 microcontroller	Kenneth. J. Ayala	Cengage learning	3rd Edition 2010
3.	The 8051 microcontroller and Embedded systems	Muhammad Ali Mazid, Janice Gillispie Mazid and Rolin D Mckinaly	Pearson	2nd Edition
4.	A VHDL Primer	Jayaram Bhaskar	Addison Wesley Longman	1999
5.	CMOS VLSI Design	Neil H. E. Waste, David Harris, Ayan Banerjee	Pearson	Third Edition
6.	VHDL Programming by Example	Douglas Perry	Mc-Graw Hill Education	Fourth Edition

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V

Course Code: ECE304 Course: **Data Analysis** **Teaching Scheme:** Lectures: 3 Hrs./ Week Tutorial: -- Hr./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Programming Skills, Mathematics and Statistics, Database Concepts,
Objectives	The objectives of the course are • To obtain a Comprehensive knowledge of various tools and techniques for Data • transformation and visualization • To learn the probability and probabilistic models of data science. • To learn the basic statistics and testing hypothesis for specific problems. • To learn about the prediction models. • To give a hands-on experience with real-world data analysis
Course Outcomes	At the end of the course the student will be able to 1. Apply preprocessing techniques to convert raw data so as to enable further analysis. 2. Apply exploratory data analysis and create insightful visualizations to identify patterns 3. Perform statistical analysis and interpret the results. 4. Implement and evaluate machine learning algorithms for data prediction and classification.
Unit-I	**Introduction to Data Analytics:** Overview of data analytics and its importance in engineering, Data types and data sources, Data preprocessing techniques: data cleaning, integration, transformation, and reduction, Exploratory Data Analysis. **(6Hrs)**
Unit-II	**Statistical Analysis:** Descriptive statistics: measures of central tendency and dispersion, Probability distributions and hypothesis testing, Correlation and regression analysis. **(6Hrs)**
Unit-III	**Advanced statistics:** Data transformation and standardization, Classical Tests and Contingency Tables, Analysis of Variance and Covariance. **(6Hrs)**
Unit-IV	**Introduction to machine learning algorithms:** Supervised learning, Unsupervised learning, Data Visualization: Principles of data visualization, Text mining and natural language processing, Big data analytics: concepts and challenges. **(6Hrs)**
Unit-V	**Implementation of data analysis using programming languages:** Available tools and programming languages, libraries for Data Analysis. Practical examples of Data Analysis using python and R language. **(6Hrs)**

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Unit-VI	Application of Data Analytics in Engineering: Case studies and applications of data analysis, Hands-on projects using real-world datasets, Ethical considerations in data analytics. **(6Hrs)**				
References	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1.	Data Science for Engineers	Xiang Li and Chaoqun Li	Springer	1st
	2.	Python for Data Analysis	Wes McKinney	O'Reilly Media	2nd
	3.	Hands-On Machine Learning with Scikit-Learn and TensorFlow	Aurélien Géron	O'Reilly Media	2nd
	4.	Data Analytics: A Practical Guide	Kimball, Ross, Thornthwaite, Mundy	Wiley	1st

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V

Course Code: ECE 305 Course: **Operating System** Teaching Scheme: Lectures: 3 Hrs./ Week Tutorial: -- Hrs./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment (TA) : 10 Marks Continues Internal Evaluation (CIE)- 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Concepts of Computer Hardware/Memory & Computer Organization
Objectives	The objectives of the course are • To introduce students with the basic concepts of Operating System, its functions and services. • To familiarize the students with various views and management policies adopted by Operating system as pertaining with processes, Deadlock, memory, File and I/O operations. • To brief the students about functionality of various OS like UNIX, Linux and • Windows XP as pertaining to resource management. • To provide the knowledge of basic concepts towards process synchronization and related issues.
Course Outcomes	At the end of the course the student will be able to 1. Identify the role of an operating system as system software. 2. Explain use of given operating system tool. 3. Execute Process commands to performed process management operations. 4. Apply File Management Techniques
Unit-I	**Introduction to OS:** An Operating system, Layered Architecture, Objectives and function, Types of OS's, Evolution of OS, OS as a resource Manager, Concept of Kernel, OS as an interface. Case Study: Types of OSs along with their Versions- Windows, Unix, Linux, DOS, Macintosh etc. with basic shell commands **(6Hrs)**
Unit-II	**The Process:** Process concept, operations on process, Process scheduling: basic concepts, scheduling criteria, Scheduling algorithms: Pre-emptive, Non-pre-emptive, FCFS, SJF, SRTF, Priority based, Round Robin, Multilevel Queue scheduling. Case Study: Classical problems of Synchronization: The Producer Consumer Problem: Readers writers problem, Semaphores, Dinning Philosopher Problem. **(6Hrs)**
Unit-III	**Process Synchronization:** Background, the critical section problem, Peterson's Solution, Synchronization Hardware, Semaphores. Deadlock: The Problem, Deadlock Characterization, Deadlock necessary Conditions, Resource Allocation Graph, Deadlock Prevention. Deadlock avoidance, Deadlock recovery, Deadlock Detection. Case Study: Banker's algorithm for single & multiple resources. **(6Hrs)**

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Unit-IV	**Memory Management:** Memory management strategies: background, swapping, contiguous Memory allocation Techniques- First fit, Best fit, Worst fit, paging, structure of page tables , segmentation. **(6Hrs)**
Unit-V	**Virtual memory management:** Paging and Segmentation, Demand paging, copy on write, Page replacement policies: FIFO, Optimal, LRU, LRU Approximation, Counting Based, Allocation of frames, Thrashing. **(6Hrs)**
Unit-VI	**File Management:** File Management Subsystem Need, File and Directory structures, blocks and fragments, directory tree, i-nodes, file descriptors. Case Study: UNIX file structure & Windows File Structure. **(6Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1	Operating Systems Concepts	Silberschatz , Galvin	Jon Willey and Sons	9th Edition
2	Operating Systems	Godbole, Achyut S	TMH	2015
3	Operating Systems: Internals and Design Principle	William , Stallings	Pearson	8th Edition 2015
4	Unix Concept and Programming	Das, Sumitabha	McGraw Hill Education	2015

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Course Code: ECE321 Course: **Lab-I: Digital Signal Processing** **Teaching Scheme:** Practical : 02 Hrs./ Week	Credits: 0 – 0 – 1 Teacher Assessment (TA): 25 Marks
Prerequisites	Knowledge of Signals and Systems, Basic knowledge of MATLAB
Objectives	The objectives of the course are • The students will use these software tools MATLAB/SCILAB to analyze signals & systems. • The students will use these software tools MATLAB/SCILAB to Design & analyze FIR and IIR filters.
Course Outcomes	At the end of the course the student will be able to 1. Generate and analyze Discrete-Time Signals. 2. Design and analyze IIR and FIR filters.
List of Experiments	1. Write a program to plot various continuous-time and discrete-time signals. 2. Write a program to perform addition, subtraction, and multiplication of signals. 3. Write a program to find even and odd parts of the Signals. 4. Write a program to find convolution of two DT signals using ' conv ' command. 5. Write a program to calculate autocorrelation and cross-correlation. 6. Write a program to find N point DFT & IDFT. 7. Write a program to calculate circular convolution. 8. Write a program to design & implementation of IIR filter using the bilinear transformation method. 9. Write a program to design & implementation of IIR filter using the impulse invariance method. 10. Write a program to design FIR filter using Rectangular Window, Hamming Window, Hanning Window, and Kaiser Window.

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V

Course Code: ECE322 Course: **Lab-II: Embedded Systems and VLSI Design** **Teaching Scheme:** Practical: 02 Hrs./ Week	Credits: 0 – 0 – 1 ESE/Oral: 25 Marks
Prerequisites	Fundamentals of design of combinational and sequential digital systems.
Objectives	The objectives of the course are • To write assembly language programs for the microcontroller. • To Simulate and make a synthesis of digital system, designs using VHDL and FPGA.
Course Outcomes	At the end of the course the student will be able to 1. Develop assembly language programs for microcontroller 8051 and its interfacing. 2. Use modern development tool to design complex digital circuits.
List of Experiments	Minimum 10 experiments to be performed from the given list of experiments. • Data transfer – Program for block data movement, sorting, exchanging, finding largest element in an array using 8051. • Arithmetic instructions: Addition, subtraction, multiplication and division using 8051. • Code conversion programs using microcontroller 8051. • Sorting (Ascending/Descending) of data using microcontroller 8051. • LED interfacing using microcontroller 8051. • ADC interfacing using microcontroller 8051. • DAC interfacing with wave form generation using microcontroller 8051. • Design and simulate logic gates in VHDL with data flow modelling. • Design and simulate A] Multiplexer (4:1) B] Decoder (2:4) C] ALU D] Half Adder E] Full Adder in VHDL with data flow modelling. • Design and simulate A] D Flip Flop B] JK Flip Flop in VHDL with data flow modelling. • Design and simulate A] Shift register b] Up/Down counter in VHDL with behavioral modelling • Design and simulate A] BCD to 7 Segment Encoder B] Gray to Binary Converter C] Binary to Gray Converter in VHDL. • Design and simulate 4 Bit adder in VHDL with structural modelling.

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Faculty of Science and Technology Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V	
Course Code: ECE323 Course: **Lab-III: Data Analysis** **Teaching Scheme:** Practical : 02 Hrs./ Week	Credits: 0 – 0 – 1 ESE/Oral: 25 Marks
Prerequisites	Programming skills, understanding of data types, structures and Statistics.
Objectives	The objectives of the course are • Gain hands-on experience in applying these techniques to extract insights, draw meaningful conclusions, and make informed decisions. • Enhance problem-solving skills data analytics approaches.
Course Outcomes	At the end of the course the student will be able to 1. Develop a strong foundation in data preprocessing, statistical analysis, and visualization. 2. Enhance their problem-solving skills by addressing real-world engineering problems through data analytics approaches.
List of Experiments	1. Collect data from various sources and perform data cleaning for analysis. 2. Explore and visualize the dataset to gain insights and identify patterns. 3. Perform hypothesis testing and draw conclusions based on statistical analysis. 4. Build a linear regression model for continuous target variable prediction. 5. Build a logistic regression model for binary classification tasks. 6. Build a decision tree classifier and analyze its performance. 7. Apply K-means clustering to group data points and evaluate results. 8. Perform dimensionality reduction using PCA and visualize data. 9. Build ARIMA models for time series forecasting and evaluate performance. 10. Apply NLP techniques for sentiment analysis and sentiment classification.

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Faculty of Science and Technology Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V	
Course Code: ECE324 Course: **Lab-IV: Seminar** **Teaching Scheme:** Practical: 02 Hrs/week	Credits: 0 – 0 – 1 ESE/Oral: 25 Marks
Objectives	• To encourage the students to study advanced engineering developments. • To develop skills in doing literature survey, technical presentation and report preparation. • To prepare and present technical reports. • To encourage the students to use various teaching aids such as power point presentation and demonstrative models.
Guidelines	Each student shall identify a topic of current relevance in his/her branch of engineering, get approval of faculty concerned. To encourage and motivate the students to read and collect recent and reliable information about their area of interest confined to the relevant discipline, from technical publications including peer reviewed journals, conferences, books, project reports etc., prepare a report based on a central theme and present it before a peer audience. Each student shall present the seminar for about 20 minutes duration on the selected topic. The report and the presentation shall be evaluated by a team of faculty members comprising Academic coordinator for that program, seminar coordinator and seminar guide based on style of presentation, technical content, adequacy of references, depth of knowledge and overall quality of the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
Evaluation	Distribution of marks for the seminar is as follows: i. Topic Selection and Technical Contents: 30 % ii. Presentation: 20% , iii. Ability to answer questions: 20% & iv. Report: 30%). Evaluation is based on rubrics prepared based on above guidelines.

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Faculty of Science and Technology Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V	
Course Code: ECE325 Course: **Lab-V: Experience Based Learning** **Teaching Scheme:** Practical: 02Hrs/week	Credits: 0 – 0 – 1 Teacher's Assessment: 25 Marks
Objectives	1. To promote professional skills and knowledge through hands on experience. 2. To inculcate independent learning by problem solving with social context.
Attributes	The following attributes are necessary in some combination, • The goal of experience-based learning involves something personally significant or meaningful to the students. • Students should be personally engaged. • Reflective thought and opportunities for students to write or discuss their experiences should be ongoing throughout the process. • The whole person is involved, meaning not just their intellect but also their senses, their feelings and their personalities. • Students should be recognised for prior learning they bring into the process.
Guidelines	**4 Stages of Experiential Learning Cycle** **1. Concrete Experience:** It describes the hands-on experiences that it is learn from. It's here that to try new things, face problems and step out of our comfort zone. **2. Reflective Observation** Next, it is needed to reflect to learn from the experiences. The 'reflective observation' phase of the experiential learning cycle is all about reflection on the experiences which include both action and feelings. It is a stage get to reflect on what went right and what could be improved? It's also a chance to observe how it could have been done differently and to learn from each other. **3. Abstract Conceptualization** Once it has been identified and understood the defining characteristics of an experience, it can decide on what can be done differently next time. This is a time for planning and brainstorming steps for success. **4. Active Experimentation**

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4. Active Experimentation

The active experimentation phase of the learning cycle is where the experimentation with the ideas is done. It's time to put the plan of action to the test in the real world. The active experimentation phase of the learning cycle is where there is need to experiment with the ideas. It's time to put plan of action to the test in the real world. Following activities may be performed under experience-based learning.

- Role Play
- Case Studies
- Field Visits
- Undergraduate Research
- Question generating activity
- Fishbowl
- Make a Mnemonic
- Peer Group Learning
- Group 'Change' Projects
- Creative Problem-Solving

Assessment:

Assessment will be done through following ways.

- Creating a reflective journal or a portfolio
- Essay, report, or presentation (could be arts-based, multimedia or oral) on what has been learnt
- Short answers to questions of a 'why' or 'explain' nature
- One-on-one oral assessments with the instructor
- A project that develops ideas further (individually or in small groups)
- Self-evaluation and/or group evaluation of a task performed

Rubrics shall be prepared for the activities in which the performance is to be evaluated. During process of monitoring and continuous assessment and evaluation the individual and team performance is to be measured. EBL is monitored and continuous assessment is done by mentor and authorities.

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-V

Course Code: ECE326 Course: **Lab-VI: Development of Skills (Computational) - MATLAB** **Teaching Scheme:** Practical : 02 Hrs./ Week	Credits: 0 – 0 – 1 Teacher Assessment (TA): 25 Marks

Prerequisites	Basic knowledge of mathematical concepts such as calculus, linear algebra, and differential equations.
Objectives	The objectives of the course are • To introduce students to MATLAB as a powerful computational tool for solving engineering problems. • To develop students' proficiency in utilizing MATLAB for data analysis, numerical computations, and simulation tasks relevant to Electronics and Computer Engineering.
Course Outcomes	At the end of the course the student will be able to 1. Demonstrate an understanding of MATLAB's fundamental concepts and syntax, enabling them to write efficient and error-free MATLAB code. 2. Apply MATLAB to solve engineering problems, perform data analysis, and create simulations relevant to Electronics and Computer Engineering.
List of Experiments	The Development of Skills (Computational) - MATLAB course will cover the minimum 10 experiments on following topics: 1. Introduction to MATLAB: Understanding the significance of MATLAB in engineering applications. Familiarizing with the MATLAB environment. 2. MATLAB Basics: MATLAB syntax, data types, and variables. Operators and expressions in MATLAB. 3. Input and Output Operations: Reading data from external files. Writing data to external files. Interacting with users through input/output commands. 4. Control Statements: Conditional statements (if-else, switch-case). Looping statements (for, while). 5. Functions and Scripting: Creating user-defined functions in MATLAB. Developing MATLAB scripts to automate tasks. 6. Data Visualization: Generating 2D and 3D plots using MATLAB plotting functions. Customizing plots for better visualization. 7. Numerical Computing: Solving algebraic equations and systems of linear equations. Numerical integration and differentiation. 8. Symbolic Computing: Performing symbolic computations using MATLAB's Symbolic Math Toolbox. Symbolic algebra, calculus, and simplifications. 9. Data Analysis and Visualization: Importing and preprocessing data for analysis. Exploratory data analysis using MATLAB. 10. Simulation and Model Building: Developing simulations for engineering systems and models. Analyzing system behavior using simulation results.

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-VI

Course Code: ECE351 Course: **Computer Network and Security** **Teaching Scheme:** Lectures: 3 Hrs./ Week Tutorial: --- Hrs./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Communication Engineering, Programming Skills
Objectives	The objectives of the course are • To interpret the layering concepts in computer networks. • To understand different protocols used in networking. • To study different security techniques & its algorithm
Course Outcomes	At the end of the course the student will be able to 1. Describe Computer network topologies and network architecture. 2. Interpret the various layers of reference models. 3. Elaborate different protocols and their features. 4. Illustrate different security techniques.
Unit-I	**Introduction to Computer Networks :** Components of Computer Networks, topologies, Types of networks, network architectures. Overview of network model: ISO - OSI and TCP/IP. Network design issues, service primitives and relationships of services to protocols. **(6 Hrs.)**
Unit-II	**Physical Layer & Data Link Layer :** Communication Media: Twisted pair, coaxial cables, fiber optic cables, Wireless Communication. circuit switching, message switching, packet switching network, framing, error detection and correction, CRC, Elementary protocols – stop and wait, stop and wait ARQ, Sliding window- Go-Back-N ARQ, selective repeat. **(6 Hrs.)**
Unit-III	**Networks ,Transport Layer, Application layer :** Virtual circuits, and datagram networks, Routing algorithms, Congestion control, Quality of Services, Transport layer services and principles. FTP, DNS, Voice over IP, Video on demand, HTTP. **(6 Hrs.)**
Unit-IV	**TCP/IP Protocol Suite :** Layered Architecture, Protocol Stack., IP Addressing: Classes, static, dynamic (DHCP), Ipv4 v/s Ipv6, SNMP, ARP, RARP, ICMP, IGMP. **(6 Hrs.)**

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Unit-V	**Overview of Network Security:** Fundamentals, security services, Threats and Vulnerabilities, Types of Attacks overview of cryptography, Substitution ciphers, transposition ciphers, Authentication protocols, Authentication based on a shared secret key, Diffie Hellman key exchange, Authentication based on KDC, Authentication using Kerberos. **(6 Hrs.)**
Unit-VI	**Digital signatures & IP security :** Certificates, symmetric key signatures, public key signatures, message digests, MD-5,SHA-1,public key infrastructures IPSec protocols, firewalls and IDS.**(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Computer Networks	A.S.Tanenbaum	PHI	IV
2.	Data Communications & Networking	Behrouz Forouzan	TMH	IV
3.	Data & Computer Communication	William Stalling	Pearson	V
4.	Cryptography & Network Security	William Stalling	Pearson	IV

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Course Code: ECE352 Course: **Industrial IoT** **Teaching Scheme:** Lectures: 03 Hrs./ Week Tutorial: --- Hr./.Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Basic knowledge of Electronics and programming
Objectives	The objectives of the course are • Understand the fundamental concepts of Industrial IoT (IIoT). • Explore the implementation systems for IIoT, including sensors, actuators, embedded systems, and wireless communication, to design and deploy IIoT solutions.
Course Outcomes	At the end of the course the student will be able to 1. Understand the concept and key components of Industrial IoT (IIoT) 2. Identify sensors, actuators, and microcontrollers to implement IIoT systems. 3. Describe the data monitoring, control and the cyber physical system. 4. Apply IIoT principles to develop healthcare, power plant, inventory management, and facility management applications.
Unit-I	**Introduction to Industrial IoT (IIoT)** Definition, scope, and applications of IIoT, The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, Smart Factories. **(6 Hrs.)**
Unit-II	**Implementation systems for IIoT:** Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with Bluetooth, WiFi **(6 Hrs.)**
Unit-III	**IIoT Data Monitoring & Control:** IoT Gate way, IoT Edge Systems and It's Programming, Cloud computing, Real Time Dashboard for Data Monitoring, Data Analytics and Predictive Maintenance with IIoT technology. **(6 Hrs.)**
Unit-IV	**Cyber Physical Systems:** Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis. **(6 Hrs.)**
Unit-V	**Industrial IoT- Applications:** Healthcare, Power Plants, Agriculture, Inventory Management & Quality Control, Plant Safety and Security, Facility Management. **(6 Hrs.)**

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Unit-VI	**Case Studies of IIoT Systems:** IIoT application development with Embedded/PC based development boards, Development of mini project on new version of operating systems and Edge development board, Recent trends Industrial IoT (That project should also address to the societal needs.) **(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	"Industrial Internet of Things: Cyber manufacturing Systems"	Sabina Jeschke	Wiley	2017
2.	"Building the Internet of Things: Implement New Business Models, Disrupt Competitors, and Transform Your Industry"	Maciej Kranz	Wiley	2016
3.	"IoT Protocols: Industrial and Consumer Devices"	Venkatesh Sarangan	Apress	2022
4.	"Security for the Internet of Things: A Practical Approach"	Shancang Li	CRC Press	2018
5.	"Data Analytics for the Internet of Things"	Hoang T. Dinh	Springer	2021
6.	"Architecting the Industrial Internet of Things"	Dieter Uckelmann	Springer	2016
7.	"Smart Manufacturing: Applications and Case Studies"	S. Srinivasan	CRC Press	2020

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-VI

Course Code: ECE353 Course: **Software Engineering** **Teaching Scheme:** Lectures: 3 Hrs./ Week Tutorial: -- Hrs./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Data Base Management, Data Structure, Object Oriented Programming
Objectives	The objectives of the course is • To understand the Concepts of Software Engineering
Course Outcomes	At the end of the course the student will be able to 1. Identify requirements & assess the process models. 2. Plan, schedule and track the progress of the projects. 3. Design the software projects. 4. Do testing of software project.
Unit-I	**Introduction** : The evolving role of software, changing nature of software, software myths. Types of software, characteristics of Software, attributes of good software, Generic view of process: Software engineering- a layered technology, a process framework, basic software model. **(6 Hrs.)**
Unit-II	**Software Requirements**: Functional and non-functional requirements, user requirements, system requirements, interface specification, the software requirements document. Requirements engineering process: Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management. System models: Context models, behavioral models, data models, object models. **(6 Hrs.)**
Unit-III	**Design Engineering**: Design process and design quality, design concepts, the design model. Creating an architectural design: software architecture, data design, architectural styles and patterns, architectural design. **(6 Hrs.)**
Unit-IV	**Project Management:** Process, Metrics, Estimations, Project Management Concepts: The Management Spectrum, People, Product, Process, Project, The W5HH Principle, Metrics in the Process and Project Domains, Project Estimation: Project Planning Process, Software Scope and feasibility, Resources: Human Resources, Reusable software, Environmental Resources. **(6 Hrs.)**

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Unit-V	**Metrics for Process and Products**: Software Measurement : size & function oriented metrics(FP & LOC), Metrics for Project and Software Quality, Project Risk Management: Risk Analysis & Management: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, Risk Mitigation, Risks Monitoring and Management, The RMM Plan. **(6 Hrs.)**
Unit-VI	Software Quality Management: Introduction Quality concepts, software quality assurance, software reviews, formal technical reviews, statistical software quality assurance, software reliability, the ISO 9000 quality standards. Introduction to software testing: Define testing, testing lifecycle, types of testing, general testing method: black-box and white-box testing **(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Software Engineering, A practitioner's Approach	Roger S. Pressman,	Mc Graw Hill International Edition	6th
2.	Software Engineering	Sommerville	Pearson Education	7th
3.	The unified modeling language user guide	Grady Booch, James Rambaugh, Ivar Jacobson	Pearson Education	--
4.	Fundamentals of Software Engineering	Rajib Mall	PHI	4th

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Course Code: ECE354 Course: **Cloud Computing** **Teaching Scheme:** Lectures: 3 Hrs./ Week Tutorial: -- Hr./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Basic knowledge of computer networks and operating systems. Understanding of databases and web technologies. Familiarity with programming concepts and languages.
Objectives	The objectives of the course is • To introduce students to the fundamental concepts and principles of cloud computing. • To familiarize students with various cloud service models and deployment models. • To provide students' knowledge of various cloud computing platforms. • To explore the security and privacy challenges in cloud computing and the techniques to address them. • To develop skills in designing scalable and reliable cloud solutions • To understand the emerging trends and future prospects of cloud computing.
Course Outcomes	At the end of the course the student will be able to 1. Explain the basic concepts and components of cloud computing. 2. Differentiate between various cloud computing deployment models. 3. Utilize different cloud services, such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS). 4. Assess the security risks and implement security measures for cloud-based applications.
Unit-I	**Introduction to Cloud Computing** Introduction to cloud computing, Characteristics and benefits of cloud computing, Evolution of cloud computing, Cloud service models (SaaS, PaaS, IaaS), Cloud deployment models (public, private, hybrid, community), Cloud architecture and components **(6 Hrs.)**
Unit-II	**Virtualization and Cloud Infrastructure** Virtualization concepts and technologies, Virtual machines and hypervisors, Server virtualization and management, Storage virtualization, Network virtualization, Software-defined infrastructure. **(6 Hrs.)**
Unit-III	**Cloud Computing Platforms** Introduction to cloud computing platforms (AWS, Azure, Google Cloud),Platform as a Service (PaaS) overview, Deploying applications on cloud platforms, Scalability and

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	elasticity, Monitoring and management of cloud resources. . **(6 Hrs.)**
Unit-IV	**Cloud Security and Privacy** Security challenges in cloud computing, Data privacy and protection, Identity and access management, Encryption and key management, Auditing and compliance in the cloud. **(6 Hrs.)**
Unit-V	**Cloud Application Development** Cloud application architecture and design, Application migration to the cloud, Cloud-native development, DevOps in the cloud, Containerization and orchestration (e.g., Docker, Kubernetes) **(6 Hrs.)**
Unit-VI	**Emerging Trends and Future of Cloud Computing** Serverless computing, Edge computing and fog computing, Artificial intelligence and machine learning in the cloud, Big data analytics in the cloud, Internet of Things (IoT) and cloud integration. **(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Cloud Computing: Concepts, Technology & Architecture	Thomas Erl, Ricardo Puttini, and Zaigham Mahmood	Pearson	May 2013
2.	Cloud Computing: Principles and Paradigms	Rajkumar Buyya, James Broberg, and Andrzej Goscinski	John Wiley & Sons Inc	March 2011
3.	Cloud Computing Bible.	Barrie Sosinsky	John Wiley & Sons Inc	2010
4.	Mastering Cloud Computing	Rajkumar Buyya, Christian Vecchiola, and S. Thamarai Selvi.	McGraw Hill Education;	July 2017

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Syllabus of T. Y. B.Tech. Agricultural Engineering (Semester VI)

Course Code: AED391 Course: Open Elective-III: (Fundamentals of Bioenergy) **Teaching Scheme:** Theory: 3 Hrs./week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs.

Prerequisite	Basic knowledge of Bioenergy sources and biomass utilization
Objectives	1. Understand bioenergy technologies, processes, reactions and energy conversion rates for Anaerobic Digestion, gasification, pyrolysis (fast, intermediate and slow) and combustion 2. Know what constitutes a suitable feedstock for bioenergy applications
Unit-I	**Introduction to bioenergy-** Introduction, Unit of Energy and Introduction of Bioenergy, How Biomass Formed on the Earth, Basic Biomass Technology (Resources and Production) Biomass Production: Wastelands, classification and their use through energy plantation, selection of species, methods of field preparation and transplanting. **(6 Hrs)**
Unit-II	**Bioethanol-** Biofuels: Introduction, Ethanol production process, Biodiesel production process, Environmental Benefits, Bio-oil: Pyrolysis or Destructive distillation. **(6 Hrs)**
Unit-III	**Biogas-** Biogas: Introduction, process description, Constituents of biogas, main features of biogas plant, Classification & Popular designs, Applications, factors considered for selection of biogas plant, advantages, disadvantages. **(6 Hrs)**
Unit-IV	**Biodiesel-** Biodiesel production processes, Biodiesel characterization, Biodiesel feedstocks, Environmental permitting and safety considerations for biodiesel production. **(6 Hrs)**
Unit-V	**Thermo Chemical Processes:** Basic concepts in gasification and pyrolysis, chemistry of gasification, Gasification Types – Updraft Gasifier, downdraft, cross draft, applications, difference. **(6 Hrs)**
Unit-VI	**Biomass utilization:** Biomass densification technique (briquetting, pelletization, and cubing), environmental aspect of bio-energy, waste to energy conversion. **(6 Hrs)**

References

Sr. No.	Title	Author	Publication	Edition
1	Introduction to Bioenergy (Energy and the Environment)	Vaughn C. Nelson, Kenneth L. Starcher	CRC Press	1st
2	Bioenergy: Biomass to Biofuels	Anju Dahiya	Elsevier Science	2nd
3	Bioenergy: Principles and Applications	Yebo Li and Samir Kumar Khanal	Wiley	2nd

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Course Code: CED391 Course: Open Elective III – Solid Waste Management Teaching Scheme: Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite	Environmental Science
Objectives	To get introduced to the generation, collection and management of the various types of solid waste and different waste management techniques.
Unit-I	**Introduction to Solid Waste Management (SWM):** Need and Objectives, Waste Management Hierarchy, Functional elements, Environmental impact of mismanagement. Solid waste: Sources, types, Composition, Quantities, Physical, chemical and biological properties. **(06 Hrs)**
Unit-II	**Generation of solid waste: Factors affecting. Storage and collection:** General considerations for waste storage at source, Types of collection Systems, Transfer station: Meaning, Necessity, Transportation of solid waste: Means and Methods, Routing of vehicles. **(06 Hrs)**
Unit-III	**Segregation and Material Recovery:** Objectives, Stages of segregation, sorting operations, Guidelines for sorting for materials recovery, E waste management, Biomedical waste management. **(06 Hrs)**
Unit-IV	**Waste processing: processing technologies**: Composting, thermal conversion technologies incineration, treatment of biomedical wastes. Energy recovery from solid waste: Parameters affecting energy recovery, Bio-methanation, Fundamentals of thermal processing, Pyrolysis, Incineration, Advantages and disadvantages of various technological options. **(06 Hrs)**
Unit-V	**Disposal:** Landfills and its introduction, Definition, Essential components, Site selection, Land filling methods, Leachate analysis and landfill gas management, treatment & disposal, Determination of capacity of landfill disposal site. **(06 Hrs)**
Unit-VI	**Hazardous waste management (HWM):** Types of hazardous waste (such as nuclear, biomedical and industrial waste), problems and issues related to HWM, Need for HWM, Legislations on management and handling of HW, Hazardous Characteristics, reduction of wastes at source, Recycling and reuse, labelling and handling of hazardous wastes, incineration, solidification & stabilization of hazardous waste. **(06 Hrs)**

	Sr. No.	Title	Author	Publication	Edition
References	1	Integrated Solid Waste Management	Hilary Theisen and Samuel A, Vigil	McGraw- Hill, New York	1993
	2	CPHEEO, Manual on Municipal Solid waste management,	Central Public Health and Environmental Engineering Organization	Government of India	2000

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3	Environmental Resources Management, Hazardous waste Management	Michael D. LaGrega, Philip L Buckingham Jeffrey C. E vans	Mc-Graw Hill International edition	2001
4	Solid waste Engineering	Vesilind P.A., Worrell W and Reinhart	Thomson Learning Inc., Singapore	2002
5	Hazardous Waste Management	Charles A. Wentz	McGraw Hill International Edition,New York	2nd

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Syllabus of T. Y. B. Tech. Computer Science and Engineering (Semester VI)

Course Code: CSE391 Course: Open Elective-III: RHCSA (RedHat Certified System Administration) **Teaching Scheme:** Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisites	This course has prerequisites like previous system administration experience on other operating systems is beneficial. Fundamental knowledge of Operating System.
Objectives	1. Develop a strong understanding of the command-line interface (CLI) and become proficient in using essential command-line tools and utilities for system administration tasks. 2. Understanding fundamental system administration tasks, such as managing file systems, users, and groups. 3. Ability to Install, update, and remove software packages using package management tools and service management. 4. Ability to identify and resolve common system issues, perform system analysis, and troubleshoot problems related to hardware, software. 5. Ability to configure and troubleshoot network interfaces and handling system security. 6. Ability to manage storage devices and file systems and utilize containerization tools like Podman.
Unit-I	**Introduction to Red Hat Enterprise Linux (RHEL, Filesystem and File Permissions** Overview of RHEL and its features. Installation and deployment of RHEL, Filesystem hierarchy standard (FHS), Managing files and directories **(6 Hrs)**
Unit-II	**User and Group Administration** Permissions and ownership User and group management, Password policies and authentication methods, User and group quotas user and group-level security measures, such as password policies and file permissions, to maintain system integrity. **(6 Hrs)**

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Unit-III	**Package Management, System Initialization** Package installation, removal, and verification Managing software repositories, Dependency resolution and package querying, Boot process and run levels Managing services and daemons, Systemd and SysVinit. **(7 Hrs)**
Unit-IV	**System Maintenance, Troubleshooting and System Recovery** System updates and patching, Kernel management, Managing log files and system monitoring, System troubleshooting methodologies, Rescue and recovery techniques, Boot loader configuration and troubleshooting. **(7 Hrs)**
Unit-V	**Network Configuration** Network interfaces and configurations, IP addressing and routing, DNS configuration. configuring firewalls, securing SSH access, and implementing SELinux policies to protect the system from unauthorized access and potential threats **(7 Hrs)**
Unit-VI	**Storage Administration & Run containers** Disk partitioning and formatting, Logical Volume Manager (LVM), Filesystem creation and mounting, Deploy Container, Manage Container Storage and Network Resources, Manage Containers as System Services **(7 Hrs)**

Textbooks / Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Linux System Programming	Robert Love	O'Reilly, SPD	10th
2.	UNIX Network Programming	W.R. Stevens	McGraw-Hill	5th
3.	Linux Command Line and Shell Scripting Bible	Richard Blum and Christine Bresnahan	McGraw Hill	6th
4.	UNIX and Linux System Administration Handbook	Evi Nemeth, Garth Snyder, Trent R. Hein	Ben Whaley	3rd
5.	RHCSA/RHCE Red Hat Linux Certification Study Guide	RedHat Student Guide	RedHat	9th

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Course Code: CSE392 Course: Open Elective-III: Digital Marketing **Teaching Scheme:** Theory: 3 Hrs/week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisites	Basic Understanding of Digital Marketing
Objectives	1. To understand the basic concept of digital marketing 2. To understand the concept of search engine optimization. 3. Implement Social Media Optimization 4. Discuss the concept of google advertising
Unit-I	**Digital Marketing Introduction** Concept of Digital Marketing, Use of Digital Marketing, Digital Marketing Platform, Digital Marketing Strategy, Types of Digital Marketing – Organic & Paid, Digital Marketing VS Traditional Marketing. How is it different from traditional marketing, ROI between Digital and traditional Marketing. **(7 Hrs)**
Unit-II	**Search Engine Optimization (SEO)** Introduction of SEO, Search Engine working, SEO Tools Web position Analysis, Competition Analysis, Google Algorithms and Updates. **(6 Hrs)**
Unit-III	**Social Media Optimization (SMO)** **Facebook** - Profile Creations, Creating groups and pages, Tips and Guides, Posts And promotions, Events Creations, Video Marketing, Promotional Techniques, Integration Techniques. **Twitter** -Set-up and usage Tips, Promoted Tweets, Video Marketing, Promotional Techniques, Integration Techniques, Analytics. **LinkedIn**-Profile Creations, Company Page Creations, Tips and Guides, LinkedIn posts LinkedIn promotions LinkedIn Groups, Video Marketing, Promotional

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	Techniques, Integration Techniques, **Instagram** -Integration Techniques, Promotional Techniques. **(5 Hrs)**
Unit-IV	**Introduction to SEM** Google AdWords, Search Advertising, Display Advertising, Mobile Advertising, Video Advertising, Shopping Advertising, Report generation, Google AdWords Express, Setup, Google Mapping Ads. **(6 Hrs)**
Unit-V	**E-Commerce Management** Maintenance of an online product-listing website through product keyword research, product pricing, positive reviews, and customer retention. **(6 Hrs)**
Unit-VI	**Email Marketing** How to create and send product-based emails in bulk, and ensure that all of the emails have a good open rate and conversion rate. **(6 Hrs)**

Textbooks / Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Digital Marketing For Dummies	Ryan Deiss & Russ Henneberry	Tata McGraw Hill	6th
2.	Social Media Marketing All-in-one Dummies	Jan Immerman, Deborah Ng	Prentice Hall	3rd
3.	Digital Marketing	Seema Gupta	Tata McGraw Hill	1st

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-VI

Course Code: ECE391 Course: **Data Science** **Teaching Scheme:** Lectures: 3 Hrs./ Week Tutorial: - Hr./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Programming Concepts, Data Structure, Basic Linear Algebra, Basic Probability and Statistics.
Objectives	The objectives of the course are • Give an introduction to data science and its applications. • Understand use of statistics in data science • Use data science to analyze large and unstructured data with different tools
Course Outcomes	At the end of the course the student will be able to 1. Demonstrate the fundamental concepts and principles of data science. 2. Apply data preprocessing techniques to clean and prepare data for analysis. 3. Perform statistical analysis and interpret the results. 4. Implement and evaluate machine learning algorithms for data prediction and classification.
Unit-I	**Introduction to Data Science:** Overview of Data science and its terminologies, Applications of Data Science, Role of Data science in emerging technologies. Data types and Data sources, Data preprocessing techniques, Statistical concepts for Data Science. **(6 Hrs.)**
Unit-II	**Machine Learning for Data Science:** Introduction to machine learning algorithms, Supervised learning: linear regression, logistic regression, decision trees, and random forests, Unsupervised learning: clustering algorithms, dimensionality reduction, Feature generation and selection using Machine learning. **(6 Hrs.)**
Unit-III	**Data Visualization and Communication:** Principles of data visualization, Exploratory data analysis using visual techniques Tools and libraries for data visualization. Mining Social Networks: Social Networks graphs, clustering of graphs, direct discoveries of communities in graphs, analyze the portioning of graphs, the neighborhood properties of graphs. **(6 Hrs.)**

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Unit-IV	**Big Data Analytics and cloud computing for Data Science:** Introduction to big data and its challenges, Distributed computing frameworks: Hadoop and Spark, Big data processing and analysis. Cloud concept and computing for data science. **(6 Hrs.)**
Unit-V	**Programming Languages and libraries for Data Science:** Python for Data Science, Python libraries for data science. R programming language for Data science. Implementation examples in Python and R language. **(6 Hrs.)**
Unit-VI	**Ethical Considerations in Data Science**: Privacy, security, and ethical considerations in data science, Bias, fairness, and interpretability in machine learning algorithms, Legal and regulatory aspects of data science. **(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Python for Data Analysis	Wes McKinney	O'Reilly Media	2nd
2.	The Elements of Statistical Learning	Trevor Hastie, Robert Tibshirani, Jerome Friedman	Springer	2nd
3.	Data Science for Business	Foster Provost, Tom Fawcett	O'Reilly Media	1st
4.	Hands-On Machine Learning with Scikit-Learn and TensorFlow	Aurélien Géron	O'Reilly Media	2nd
5.	Doing Data Science: Straight Talk from The Frontline	Cathy O 'Neiland Rachel Schut	O'Reilly Media, Inc	3rd

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-VI

Course Code: ECE392 Course: **Control Systems** **Teaching Scheme:** Lectures: 3 Hrs./ Week Tutorial: - Hr./ Week	Credits: 3 – 0 – 0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Teacher Assessment: 10 Marks Continuous Internal Evaluation: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs.

Prerequisites	Linear algebra and calculus
Objectives	The objectives of the course are • The objective of this course is to introduce students to the fundamental concepts and principles of control systems. • Students will develop an understanding of the analysis and design of control systems, including time-domain and frequency-domain techniques.
Course Outcomes	At the end of the course the student will be able to 1. Understand the basic concepts and terminology of control systems. 2. Analyze linear time-invariant (LTI) systems using Laplace transforms and transfer functions. 3. Design and analyze feedback control systems using time-domain techniques. 4. Analyze control system stability using Routh-Hurwitz and Nyquist criteria.
Unit-I	**Introduction to Control Systems** Definition and classification of control systems, Feedback and feedforward control, Open-loop System, closed-loop control and their examples. Distinguish between open and close system. Laplace transforms. **(6 Hrs.)**
Unit-II	**Mathematical Modeling of Dynamic Systems** Differential equations and transfer functions, Advantages, Disadvantages and Properties of Transfer function, transfer function representation, Block diagrams and signal flow graphs, State-space representation. **(6 Hrs.)**
Unit-III	**Time-Domain Analysis** Time response analysis, Step response analysis. Time constant and system behavior. Transient and steady-state response, Second-order system characteristics: Step response analysis. Natural frequency and damping ratio. Undamped, underdamped, critically damped, and overdamped systems Performance specifications: Rise time, settling time, peak time, and peak overshoot. Steady-state error and error constants. Introduction to error analysis. **(6 Hrs.)**
Unit-IV	**Stability Analysis:** Definition of stability, Stability conditions based on the Routh array, Application of the Routh-Hurwitz criterion to analyze system stability. Nyquist stability criterion, Application of stability criteria to determine system stability. **(6 Hrs.)**

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Unit-V	**Frequency-Domain Analysis:** Frequency response analysis, Relationship between time-domain and frequency-domain representations, Bode plots, Nyquist stability criterion, Stability margins, gain margin and phase margin. **(6 Hrs.)**
Unit-VI	**Controller Design:** Sensors and actuators, Sampling and discrete-time control systems, Proportional-Integral-Derivative (PID) controllers, Frequency response design (lead, lag, and lead-lag compensation), Digital controllers and hardware implementation. **(6 Hrs.)**

References

Sr. No.	Title	Author	Publication	Edition
1.	Modern Control Engineering	Katsuhiko Ogata	--	--
2.	Control Systems Engineering	Norman S. Nise	--	--
3.	Feedback Control of Dynamic Systems	Gene F. Franklin, J. David Powell, and Abbas Emami-Naeini	--	--
4.	Automatic Control Systems	Benjamin C. Kuo and Farid Golnaraghi	--	--

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Syllabus of S. Y. B.Tech. (Electrical Engineering) (Semester III)

Course Code: EED391 , Course Title: Special Purpose Electric Machines **Teaching Scheme:** Theory: 03 Hrs / week	Credits: 3-0-0 Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Prerequisite	Basic electrical Engineering, magnetic circuit, conventional electrical machines
Objectives	1. To understand different types of motors for particular application 2. To examine behaviour of machines for specific applications 3. To compare different machines 4. To develop knowledge in regards of control and use of machines
Unit-I	**Induction Generators** Construction, operating principle, types, operating characteristics , Applications.(06 Hrs)
Unit-II	**Doubly fed induction Machines** Construction, operating principle, types, operating characteristics, Applications to grid connected wind and mini/micro hydel systems. (06 Hrs)
Unit-III	**Switched Reluctance Motor**: Construction, operating performance, control and applications. **Variable reluctance stepper motor:** Construction, operating performance, control and applications. (06 Hrs)
Unit-IV	**Linear Machines:** Linear Induction Machines and Linear Synchronous Machines: Construction, operation, performance, control and applications. (06 Hrs)
Unit-V	**BLDC Machine :** Construction, magnetic materials used, types of motors ,control and applications. Recent developments in BLDC motors. (06 Hrs)
Unit-VI	**Permanent Magnet Machines:** Construction, magnetic materials used, types of motors e.g. PMDC and PM Synchronous Machine, control and applications. Recent developments in electrical machines. (06 Hrs)

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References

Sr. No.	Title	Author	Publication	Edition
1	Switched Reluctance motor drives'	R.Krishnan,	CRC press, 2001	1st Edition
2	Permanent magnet and Brushless DC motors'	T.Kenjo and S.Nagamori	Clarendon press. London, 1988	1st Edition
3	Special Electrical Machines	Simmi P Burman	S.K. Kataria& Sons	2nd Edition
4	Permanent Magnet Synchronous and Brushless DC Motor Drives	R. Krishnan.	New Delhi, Prentice, Hall of India, 2009	2nd Edition
5	Special Electrical Machines	Venkataratnam	Taylor and Francis, 2009	1st Edition

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Syllabus of T. Y. B. Tech. (AIDS) Semester VI

Course Code: AID391 Course: Business Intelligence **Teaching Scheme:** Theory: 03 Hrs/week	Credits: 3-0-0 In Semester Examination-I: 15 Marks In Semester Examination-II: 15 Marks Continuous In-semester Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 02 Hrs

Prerequisites	No Prerequisites
Objectives	1. Student should learn fundamental concepts of Business Intelligence. 2. To learn analytics framework to support decision making in business intelligence.
Unit-I	**Understanding Business Intelligence** The Challenge of Decision Making, What Is Business Intelligence?, The Business Intelligence Value Proposition, The Combination of Business and Technology (6 Hrs)
Unit-II	**Business Intelligence Technology Counterparts** Data Warehousing: What Is a Data Warehouse?, Data Marts and Analytical Data, Organization of the Data Warehouse Enterprise Resource Planning: Distributing the Enterprise, First ERP, then Business Intelligence, The Current State of Affairs Customer Relationship Management: CRM, ERP, and Business Intelligence Customer Decisions, Decisions About Customers, Business Intelligence and Financial Information (6 Hrs)
Unit-III	**The Spectrum of Business Intelligence** Enterprise and Departmental Business Intelligence, Strategic and Tactical Business Intelligence, Power and Usability in Business Intelligence, Finding the Right Spot on the Continuum, Business Intelligence: Art or Science? (6 Hrs)

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Unit-IV	**Business Intelligence User Interfaces** Querying and Reporting, Reporting and Querying Toolkits, Basic Approaches: Building Ad-Hoc Queries, Building On-Demand Self-Service Reports, Enhancing and Modifying, Data Access: Pull-Oriented Data Access, Push-Oriented Data Access, Dashboards: EIS Is the Engine, Metric System and KPIs, Business Intelligence Dashboards (6 Hrs)
Unit-V	**On-Line Analytical Processing (OLAP)** OLAP:OLAP and OLTP, Operational Data Stores, Variations in Data and Approach, OLAP Applications and Functionality, Multi-Dimensions: Thinking in More Than Two Dimensions, What Are the Possibilities?, Drilling and Pivoting, OLAP Architecture: Cubism, Tools, ROLAP, MOLAP, HOLAP, Data Mining (6 Hrs)
Unit-VI	**Visualization, Guided Analysis and** Visualization: The Basics, Unconstrained Views, Guided Analysis: The Business Intelligence Two-Step, How to Guide the Guides, Handling Unstructured Data (6 Hrs)

	Sr. No.	Title	Author	Publication	Edition
Textbooks / Reference Books	1	Decision Support and Business Intelligence Systems	Efraim Turban, Ramesh Sharda, Jay Aronson, David King	Pearson Education, 2009.	9th
	2	The Savy Manager's Guide Getting Onboard with Emerging IT,	David Loshin, Business Intelligence	Morgan Kaufmann Publishers.	2009

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Syllabus of T. Y. B. Tech. Mechanical Engineering (Semester VI)

Course Code: MED391 Course: Open Elective III (Industry 4.0) **Teaching Scheme:** Theory: 3 Hrs/week Credits: 3-0-0	Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continuous Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Course Objectives	1. To make students aware of the structure and role of Industry 4.0, in current evolving industrial environment. 2. To give learners overview of Industry 4.0 technologies and their integration.
Unit I	**Introduction-** Four industrial revolutions, Digital transformation of Industry and the fourth industrial revolution, Scope of Industry 4.0, Automation pyramid and Industry 4.0, Principles of Industry 4.0. **(6 Hrs)**
Unit II	**Internet of Things (IoT)–** Concept of IoT, IoT Architecture – Sensing layer, Network layer, Data processing layer, Application layer, Applications of IoT – for automobiles, homes, etc. Internet of Service (IoS), Internet of Energy (IoE). **(6 Hrs)**
Unit III	**Technologies in Industry 4.0 (1)-** Augmented reality and Virtual Reality, 3D Printing, Collaborative robots, Smart material handling, Smart sensors, Concept of smart products. **(6 Hrs)**
Unit IV	**Technologies in Industry 4.0 (2)-** Machine learning, Introduction to Cyber Physical Systems (CPS), Components of Cyber Physical Systems, Digital twins, Machine vision, Smart factory, Artificial intelligence. **(6 Hrs)**
Unit V	**Data in Industry 4.0-** Big Data, Data Mining, Data Analytics, Cloud computing, Data – anew resource of organization, Data analysis for optimal decision making, Digitalization of the entire value chain. **(6 Hrs)**
Unit VI	**Applications of Industry 4.0-** Industry 4.0 in Manufacturing – Predictive maintenance, Real-time supply-chain optimization, Digital performance management, Smart energy consumption, Challenges in implementing Industry 4.0. **(6 Hrs)**

Textbook/ Reference Books	**Sr. No.**	**Title**	**Author**	**Publication**	**Edition**
	1	Industry 4.0 - the Industrial Internet of Things	Industry 4.0_ the Industrial Internet of Things	Industry 4.0_ the Industrial Internet of Things	-

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	2	Industry 4.0-Managing The Digital Transformation	Alp Ustundag, Emre Cevikcan	Springer	1st
	3	Automated Manufacturing System	Hugh Jack	Lulu.com	7th
	4	Industry 4.0- Opportunities Behind The Challenge	Dr. Mirjana Stankovic, Ravi Gupta and Dr. Juan E. Figueroa	UNIDO General Conference 2017	-
	5	Handbook of Ind. Automation	Richard L. Shell Ernest L. Hall	CRC Press	1st

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Syllabus of T. Y. B. Tech. Mechanical Engineering (Semester VI)

Course Code: MED392 Course: OE-III Operations Research **Teaching Scheme:** Theory: 03 Hrs/week Credits: 3-0-0	Mid Semester Examination-I: 15 Marks Mid Semester Examination-II: 15 Marks Continues Internal Evaluation: 10 Marks Teacher Assessment: 10 Marks End Semester Examination: 50 Marks End Semester Examination (Duration): 2 Hrs

Objectives	1. To familiarize the students with formal quantitative approach to problem solving 2. To formulate real life engineering problems 3. To solve engineering problems using various Operations Research Techniques
Unit-I	**Introduction to Operations Research :** Basics definition, scope, objectives, phases, models, applications and limitations of Operations Research. (02 Hrs)
Unit-II	**Linear Programming Problem :** Formulation of LPP, Graphical solution of LPP, Simplex Method, Artificial variables, Big-M method, two-phase method, degeneracy and unbound solutions. (08 Hrs)
Unit-III	**Transportation Model :** Transportation Problem: Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test – the stepping stone method or MODI method. Degeneracy in Transportation Problem. (08 Hrs)
Unit-IV	**Assignment Problem:** Hungarian Method to solve Assignment Problem, Travelling Salesman as an Extension of Assignment Problem. (04 Hrs)
Unit-V	**Queuing model and Sequencing model :** Queuing Systems And Structures, Notation Parameters, Single Server and Multi Server Models, Poisson Input, Exponential Service, Constant Rate Service, Infinite Population Sequencing Model: Introduction, n jobs through two machines, n jobs through three machines, two jobs through m machines and n jobs through m machines. (06 Hrs)
Unit-VI	**Network Models:** Fulkerson's rule, concept and types of floats, float calculations, CPM and PERT, Crashing cost and crashing Network. (08 Hrs)

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	Sr. No.	Title	Author	Publication	Edition
Text Book/ Reference Books	1.	Operations Research	Taha H.A.	Prentice Hall Of India.	Ninth Edition
	2.	Introduction to Operations Research	Frederick S. Hillier and Gerald J. Lieberman	Tata McGraw-Hill	Seventh Edition
	3.	Operations Research	P.K. Gupta, D.S Hira	S. Chand & Co.	Fourth Edition
	4.	Operations Research	Man Mohan, P. K. Gupta, Kanti Swarup	S. Chand & Co.	12th Edition
	5.	Operations Research Principles and Practice	Ravindran, Phillips and Solberg	Mc. WSE Willey	Second Edition
	6.	Operations Research: Applications and Algorithms	Wayne L. Winston, Jeffrey B. Goldberg	Thomson Brooks	Fourth edition
	7.	Operations Research: Theory, Methods and Applications	S. D. Sharma, Himanshu Sharma	Kedar Nath Ram Nath	Fourth Edition
	8.	PERT and CPM: Principles and Applications	L. S. Srinath	East-West Press Private Limited,	Third Edition
	9.	Project Planning and Control with PERT & CPM	Dr. B.C. Punmia & K.K. Khandelwal	Firewall Media	Fourth Edition

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Syllabus of T. Y. B. Tech. Plastic and Polymer Engineering (Semester VI)

Course Code: PPE391	Credits: 03
Course: Open Elective III: Waste Management and Circular Economy	Mid Semester Examination-I: 15 Marks
Teaching Scheme: 03 hrs/week	Mid Semester Examination-II: 15 Marks
Theory: 03 hrs/week	Continuous Internal Evaluation: 10 Marks
Tutorial: N.A.	Teacher Assessment: 10 Marks
	End Semester Examination: 50 Marks
	End Semester Examination (Duration): 2 Hrs

Prerequisite	Plastic materials, processing, rheology, basics of polymer technology and designing
Objectives	• It aims to provide students with a comprehensive understanding of sustainable practices and the principles of the circular economy within the context of polymer engineering. • Students will explore various strategies, technologies, and policies for achieving sustainability, reducing environmental impact, and promoting circularity in the polymer industry. • The course will emphasize the importance of integrating sustainable principles in the design, production, and disposal of polymer materials.
Unit-I	**Topic Title: Introduction to Waste Management and Circular Economy** Definition and significance of sustainability in polymers, basics of waste management, principles and goals of the circular economy, environmental, social, and economic dimensions of waste management, life cycle thinking and assessment in plastics. (04 Hrs)
Unit-II	**Topic Title: Waste generation, composition, and management** Sources and types of plastic and polymer waste, composition analysis and characterization of waste, quantification and assessment of waste generation, waste management and treatment methods: MSWM processing and plastics waste management comprising of waste hierarchy i.e., prevention, minimization, reuse, recycling, energy recovery, and disposal. (08 Hrs)
Unit-III	**Topic Title: Sustainable Polymer Processing** Energy-efficient processing techniques, clean and green manufacturing practices, waste reduction and recycling in polymer processing, sustainable additives and processing aids (06 Hrs)
Unit-IV	**Topic Title: Sustainable Waste Management and Disposal** Waste characterization and classification in polymers, mechanical recycling, waste-to-energy conversion technologies, biological treatment methods for polymer waste, hazardous waste management and regulations, sustainable landfilling and waste disposal practices (06 Hrs)

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Unit-V	**Topic Title: Circular Economy Strategies** Design for recycling and upcycling principles, closed-loop supply chains and reverse logistics, extended producer responsibility and product stewardship, circular economy business models and initiatives, case studies on successful implementation of circular economy strategies (06 Hrs)
Unit-VI	**Topic Title: Policy and Regulatory Framework for Sustainability** International and national policies promoting sustainability in polymers, Environmental regulations and standards for the polymer industry, corporate social responsibility and sustainability reporting, challenges, and opportunities in implementing sustainable practices, future trends and emerging technologies in sustainable polymer engineering (06 Hrs)

Textbooks / Reference Books

Sr. No.	Title	Author	Publication	Edition
1.	Waste Management and the Circular Economy in Selected OECD Countries	OECD	OECD Publishing	1st Edition, 2019
2.	Plastics and Sustainability: Towards a Peaceful Coexistence between Bio-based and Fossil Fuel-based Plastics	Michael Tolinski	Wiley	1st Edition 2011
3.	Plastics and Sustainability: Towards a Deeper Understanding of the Environmental Role of Plastics in Today's World	Conor P Carlin	Wiley-Scrivener	1st Edition 2021
4.	Strategic Management for the Plastics Industry: Dealing with Globalization and Sustainability	Jones, Roger F.	CRC Press	1st Edition 2013
5.	Plastics in the Circular Economy	Vincent Voet, Jager, Rudy and Folkersma	De Gruyter	1st Edition 2023
6.	A Practical Guide to Plastics Sustainability: Concept, Solutions, and Implementation	Michel Biron	William Andrew Publishers	1st Edition, 2020
7.	Circular Economy and Waste Valorisation: Theory and Practice from an International Perspective	Jingzheng Ren, Long Zhang	Springer	1st Edition, 2022

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-VI

Course Code: ECE371 Course: **Lab-I: Computer Network & Security** **Teaching Scheme:** Practical: 02 Hrs./ Week	Credits: 0 – 0 – 1 Teachers Assessment: 25 Marks

Prerequisites	Communication Engineering
Objectives	The objectives of the course are • To understand computer network topologies and types of network. • To develop an understanding of various protocols. • To use modern tools for network traffic analysis and security analysis.
Course Outcomes	At the end of the course the student will be able to 1. Analyze networks using simulation tools. 2. Demonstrate various security schemes using simulation tools.
List of Experiments	1. Configure network topologies using packet tracer tool. 2. Design of web page design using HTML. 3. Design and analyze network and backbone using simulation tools. 4. Demonstrate LAN and data transfer through router. 5. Analyze Address Resolution Protocol and Reverse Address Resolution Protocol. 6. Study and analyze performance of FTP & SMTP,SNMP protocols. 7. Write program for error detection and correction code (Parity check/CRC/Hamming code). 8. Analyze ciphers using Cryptool. 9. Analyze HMAC using Cryptool. 10. Analyze digital signatures.

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-VI

Course Code: ECE372 Course: **Lab-II: Industrial IOT** **Teaching Scheme:** Practical: 02 Hrs./ Week	Credits: 0 – 0 – 1 Teachers Assessment: 25 Marks

Prerequisites	Basic knowledge of Electronics and programming
Objectives	The objectives of the course are • Gain hands-on experience in implementing IIoT systems using popular hardware platforms and communication protocols. • Explore various sensors and actuators used in IIoT applications and their integration with microcontrollers and development boards.
Course Outcomes	At the end of the course the student will be able to 1. Apply practical skills to interface embedded boards with components, actuators, and sensors in order to facilitate communication and data exchange. 2. Demonstrate the project based Industrial IoT application
List of Experiments	1. Flashing the OS on to the device into a stable functional state by porting desktop environment with necessary packages. 2. Write an application to read temperature from the environment. If temperature crosses threshold value, then it notifies with buzzer. 3. Write a program to detect obstacle using IR sensor and notify it using indicator. 4. Create a simple web interface using NodeMCU 1.0 to control the actuator remotely through the interface. 5. Create a simple web interface using NodeMCU 1.0 to monitor sensor remotely through the interface. 6. Write an application using Raspberry Pi/Arduino for smart health monitoring system which records heart beat rate and temperature. 7. Write a network application for communication between two devices using LoRA module to on and off remote water pump. 8. Build an application using the light sensors, monitor the surrounding light intensity & automatically turn ON/OFF the high intensity LED's by taking some pre-defined threshold light intensity value. 9. Build a weather monitoring system using humidity, temperature and raindrop sensor and Raspberry Pi/Arduino board. 10. Build monitoring of boiler parameters using Raspberry Pi/Arduino board/NodeMCU.

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-VI

Course Code: ECE373 Course: **Lab-III Software Engineering** **Teaching Scheme:** Practical : 02 Hrs./ Week	Credits: 0 – 0 – 1 ESE/Oral: 25 Marks
Prerequisites	Data Base Management, Data Structure, Object Oriented Programming
Objectives	The objectives of the course are • To solve real life problems by applying software engineering principles • To impart state-of-the-art knowledge on Software Engineering
Course Outcomes	At the end of the course the student will be able to 1. Identify requirements and apply software process model to selected case study. 2. Develop architectural models for the selected case study.
List of Experiments	1. Preparing Software Requirements Specifications 2. Design data flow diagram 3. Design use case Diagrams 4. Design activity Diagrams 5. Design of sequence Diagrams 6. Design State chart Diagrams 7. Design component Diagrams 8. Design class and object Diagrams 9. Design a test plan for given scenario 10. Perform estimation of project using FP estimation for given system.

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-VI

Course Code: ECE374 Course: **Lab-IV: Cloud Computing** **Teaching Scheme:** Practical : 02 Hrs./ Week	Credits: 0 – 0 – 1 ESE/Oral: 25 Marks
Prerequisites	Familiarity with programming concepts and languages
Objectives	The objectives of the course are • To develop practical skills in deploying, configuring, and managing cloud-based applications. • To enable students to evaluate and select appropriate cloud computing solutions for real-world scenarios.
Course Outcomes	At the end of the course the student will be able to 1. Deploy and manage cloud-based applications using popular cloud platforms. 2. Evaluate and select appropriate cloud computing solutions for real world problems
List of Experiments	1. Setting up a virtualization environment using tools like VirtualBox or VMware 2. Deploying a simple web application on a public cloud platform (e.g., AWS, Azure, Google Cloud) 3. Creating and managing virtual machines in a cloud environment 4. Implementing load balancing and auto-scaling for a cloud-based application 5. Containerizing an application using Docker and deploying it on a container orchestration platform like Kubernetes 6. Implementing data backup and disaster recovery strategies for cloud-based applications 7. Configuring and securing cloud storage services (e.g., Amazon S3, Google Cloud Storage) 8. Designing and implementing a serverless architecture using AWS Lambda or Azure Functions 9. Analyzing and visualizing big data using cloud-based tools (e.g., Apache Spark, Amazon EMR) 10. Exploring edge computing by deploying a simple IoT application using cloud resources

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Syllabus of Third Year B. Tech Electronics and Computer Engineering Semester-VI

Course Code: ECE375 . Course: **Lab-V: Major Project-I** **Teaching Scheme:** Practical: 04 Hrs/week	Credits: 0 – 0 – 2. Teachers Assessment: 25 Marks ESE/Oral: 25 Marks

Objectives	Solve a real life societal problem through research based approaches
Course Outcome	At the end of the course the student will be able to 1. Formulate an analytical model for an engineering problem and obtain its solution with necessary tools. . 2. Perform and manage as an individual or as a member of a team with ethical values. 3. Examine the concepts of environment and sustainability 4. Write effective reports and communicate effectively on civil engineering problems. 5. Present the conclusions in a way to benefit the society.
Instructions to Students	Solving a real life problem should be the focus of under graduate projects. Faculty members should prepare project briefs (giving scope and references) well in advance which should be made available to the students at the departmental level. The project may be classified as hardware / software / modelling / simulation. It may comprise any elements such as analysis, design, synthesis, validation etc. Interdisciplinary/Multidisciplinary projects are encouraged.
Guidelines	The department will appoint a project coordinator who will coordinate the following. 1. Grouping of students (a maximum of 3/4 in a group) 2. Allotment of projects and project guides 3. Project monitoring at regular intervals. All projects allotments are to be completed as given in the Academic Calendar. All projects will be monitored at least twice in a semester through students' presentation and will be conducted as per Academic Calendar. Distribution of marks for TA shall be as follows: Problem Statement 10; Literature Review 10; Group formation and identification of individual responsibility 10; Objective of Project activity 10; Knowledge of domain, technology and tools being used 10 **For TA 50 Marks to be converted to 25 Marks.**

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Distribution of marks for ESE/Oral shall be as follows:

Realization of project as per problem statement 10; Design & Testing 30; Documentation and Report Writing 20; Quality of Work 15; Performance in Question & Answers Session 15; Timely Completion of Project work 10

For ESE/Oral – 100 Marks to be converted to 25 Marks.

Efforts be made to carry out industry based/ Societal Projects. Problems can also be invited from the industries/Society to be worked out through undergraduate projects.

In case of Interdisciplinary/Multidisciplinary Projects, as per the requirements, a greater number of Guides may be appointed. A Joint committee of involved departments shall conduct the review of the students.

The students shall aim to promote their project work in project exhibitions/competitions, paper presentation/publication in reputed journals and conferences.

The relevance of project and implementation including details of attainment of POs and PSOs addressed through the projects with justification must be clearly stated.

Phases of Major Project - I:

Phase I: Need Statement, Literature Review, data collection, Problem Statement, Objectives, Scope, Analysis/Framework/ Algorithm

Phase II: Details of Hardware & Software, Methodology, and Implementation plan for next semester.

Phase III: Submission of report of project work.

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