Walchand Institute of Technology, Solapur

Programme Electronics and Telecommunication Engineering

Vision

To be a distinguished center for nurturing the holistic development of competent young engineers in the electronics and allied field.

Mission

1. To inculcate and stimulate Electronics & allied Engineering proficiency amongst students through quality education and innovative educational practices.
2. To create engineering professionals with social consciousness
3. To foster technical skills of students through creativity and critical thinking
4. To enhance soft skill set of students which is crucial for career success through effectual training

Program Educational Objectives (PEOs)

1. To prepare graduates with strong theoretical background and sound practical knowledge enabling them to analyze and solve Electronics and Telecommunication Engineering problems by applying basic principles of mathematics, science and engineering using modern tools and techniques.
2. To accustom graduates with latest trends to pursue higher education, carry out research and maintain professional development in Electronics, Communication and IT industries with attitude for lifelong learning.
3. To inculcate graduates to be sensitive to ethical, societal and Environmental issues while engaging their professional duties, Entrepreneurship and leadership.
4. To nurture graduates with technical, communicational, managerial skills in order to perform individually or in a team on multidisciplinary fields and make them aware of contemporary issues at National and International levels.

Program Outcomes (POs)

Engineering Graduate will be able to –

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of t h e engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

Engineering graduate in Electronics and Telecommunication Engineering Programme will be able to do-

1. Graduates will be able to attain a **solid foundation** in Electronics and Telecommunication Engineering with an ability to function in multidisciplinary environment.

2. Graduates will be able to use **techniques and skills** to design, analyze, synthesize, and simulate Electronics and Telecommunication Engineering components and systems.

3. Graduate will be capable of **developing programs** in Assembly, High level and HDL languages using contemporary tools for software development.

S.Y. B.Tech (Electronics & Telecommunication Engineering)

ET211 Engineering Mathematics– III– Course Outcomes
At the end of this course, Students will be able to,

ET211.1	Solve higher order linear differential equation related to electrical circuit theory
ET211.2	Express a function in terms of sine's and cosines components so as to model simple periodic functions.
ET211.3	Find the relation between two variables for the given data using regression and can explain various probability distribution functions.
ET211.4	Apply Laplace and inverse Laplace transforms for analysis of simple electrical circuits.
ET211.5	Solve problems on Z transform and explain its properties
ET211.6	Solve the problems of Fourier integral and Fourier transform

ET212 Electronic Circuit Analysis and Design – Course Outcomes
At the end of this course, Students will be able to,

ET212.1	Describe and analyze characteristics of JFET & MOSFET.
ET212.2	Design and analyze Multistage amplifiers & Oscillators
ET212.3	Analyze amplifiers using MOSFET, JFET & power transistors
ET212.4	Evaluate parameters of feedback amplifiers

ET213 Network Theory and Analysis – Course Outcomes
At the end of this course, Students will be able to,

ET213.1	Apply network theorems and the concept of resonance for the analysis of electrical circuits.
ET213.2	Compute two port network parameters and draw equivalent network.
ET213.3	Determine response of transient and steady state linear circuits using Laplace transform.
ET213.4	Design passive filter and attenuator circuits.

ET214 Digital Techniques – Course Outcomes
At the end of this course, Students will be able to,

ET214.1	Design and analyze combinational logic circuit using logic gates.
ET214.2	Describe the use and significance of Logic IC families in digital circuits.
ET214.3	Design and implement asynchronous and synchronous logic circuits using flip flop.
ET214.4	Design counters and synchronous state machines.
ET214.5	Design logic circuits using memory, PLDs and VHDL module.

ET215 Analog Communication– Course Outcomes
At the end of this course, Students will be able to,

ET215.1	Explain the need for modulation and describe different blocks & transmission medium of communication system.
ET215.2	Describe and demonstrate generation & detection of AM, FM, PAM and PTM signals using analog and pulse modulation techniques and compare them.
ET215.3	Derive the expression for AM and FM Signals, Represent their spectrum, and evaluate the transmission power requirement for different modulation index.
ET215.4	Discuss different types of noise, calculate signal to noise ratio, noise figure and describe behavior of AM systems in the presence of noise.
ET215.5	Use modern simulation tools to generate the modulated signals.
ET215.6	Explain the working & characteristics of receivers and Identify receivers required for different communication systems.

E216 Electronics Software Lab-I – Course Outcomes
At the end of this course, Students will be able to,

E216.1	Work with arrays and structures to organize the data.
E216.2	Use string library functions and array of string.
E216.3	Implement dynamic memory allocation.
E216.4	Handle different file operations.
E216.5	Analyze the algorithms for time and space complexity and handle possible errors during program execution

ET221 Control System – Course Outcomes
At the end of this course, Students will be able to,

ET221.1	Describe types and applications of control systems.
ET221.2	Analyze Mechanical and Electrical system using mathematical modeling.
ET221.3	Determine transfer function of closed loop control systems using signal flow graph and block diagram reduction methods.
ET221.4	Determine stability of control systems using Root locus and Routh-Hurwitz criterion.
ET221.5	Perform time domain and frequency domain analysis of control systems required for stability analysis.

ET222 Analog Integrated Circuits – Course Outcomes
At the end of this course, Students will be able to,

ET222.1	Describe working and characteristics of ideal and Practical op-amp.
ET222.2	Design, implement and analyze different linear and non-linear applications of op-amp.
ET222.3	Analyze op-amp frequency response and Design filters & waveform generators using op-amp.
ET222.4	Explain voltage regulators & timing circuits using IC.

ET223 Principles of Digital Communication – Course Outcomes
At the end of this course, Students will be able to,

ET223.1	Describe & calculate information measures and apply source coding techniques for the memoryless discrete sources.
ET223.2	Apply binary block coding techniques for error detection & correction and estimate error detection & correction capabilities of block code.
ET223.3	Explain, demonstrate and analyze different pulse code modulation techniques, binary and M-ary digital modulation techniques and compare them.
ET223.4	Compare coherent and non-coherent detection methods and describe mathematical & analytical concepts of matched filter & correlation receivers.
ET223.5	Explicate the design concepts of baseband data transmission systems and effect of different precoding methods for performance enhancement.
ET223.6	Explain the concept and significance of multichannel and multicarrier system.

ET224 Signals and Systems – Course Outcomes
At the end of this course, Students will be able to,

ET224.1	Use concepts of trigonometry, complex algebra to represent signals & systems and analyze the operations on them.
ET224.2	Apply Convolution to analyze and predict the behavior of continuous time and discrete time LTI systems.
ET224.3	Explain the relationship between sampling theory & aliasing effect and select sampling frequency for real time application.
ET224.4	Analyze the spectral characteristic of signals using Fourier analysis.
ET224.5	Apply the properties and analyze the system using Z-Transform.

ET225 Data Structures – Course Outcomes
At the end of this course, Students will be able to,

ET225.1	Implement linear search and Binary Search algorithm.
ET225.2	Describe and Implement stack, queue and linked list operation.
ET225.3	Write a program for sorting, searching and compare their performance in terms of Space and Time complexity.
ET225.4	Explain and implement Trees, Graph search and traversal algorithms.

ENV22 Environmental Science – Course Outcomes
At the end of this course, Students will be able to,

ENV22.1	Describe the natural environment and its relationships with human activities.
ENV22.2	Explain the ethical means and technological methods for sustainable management of environmental systems.
ENV22.3	Explain social, economical and legal policies involved in the resolution of environmental problems.

ET226 Electronic Software Lab-II – Course Outcomes
At the end of this course, Students will be able to,

ET226.1	Design and simulate electronic circuits using modern EDA tools for real time applications.
ET226.2	Perform various operations on signals using signal processing toolbox .
ET226.3	Design PCB layout for small electronic circuits using PCB designing software.

T.E. (Electronics & Telecommunication Engineering)

ET311 Electromagnetic Engg. &Radiating System – Course Outcomes
At the end of this course, Students will be able to,

ET311.1	Define and recognize different co-ordinate systems and apply divergence, gradient, curl to EM waves.
ET311.2	Derive the laws of electrostatic and magneto static fields, wave equation and apply it for radiating systems.
ET311.3	Apply boundary conditions to different media for wave propagation and Maxwell's equations for analysis of wave propagation.
ET311.4	Explain and demonstrate different types of antennas and their characteristics.

ET312 Principles of Digital Communication– Course Outcomes
At the end of this course, Students will be able to,

ET312.1	Describe & calculate information measures and apply source coding techniques for the memoryless discrete sources.
ET312.2	Apply binary block coding techniques for error detection & correction and estimate error detection & correction capabilities of block code.
ET312.3	Explain, demonstrate and analyze different pulse code modulation techniques, binary and M-ary digital modulation techniques and compare them.
ET312.4	Compare coherent and non-coherent detection methods and describe mathematical & analytical concepts of matched filter & correlation receivers.
ET312.5	Explicate the design concepts of baseband data transmission systems and effect of different precoding methods for performance enhancement.
ET312.6	Explain the concept and significance of multichannel and multicarrier system.

ET313 Software Engineering & Project Management System – Course Outcomes
At the end of this course, Students will be able to,

ET313.1	Illustrate and apply software development life cycle and software models for Case studies.
ET313.2	Formulate software requirement specification documents and state various testing techniques.
ET313.3	Plan tasks for Project Management, formulate the network, schedule activity plan and monitor the progress of project.
ET313.4	Identify risks and provide solutions throughout the project life cycle.

ET314 Digital Signal Processing – Course Outcomes

At the end of this course, Students will be able to,

ET314.1	Select and apply suitable transforming tools for time domain and frequency domain implementations.
ET314.2	Apply properties of DFT to determine DFT, IDFT by direct computation and FFT algorithms.
ET314.3	Design, analyze and compare DSP systems like FIR and IIR Filter.
ET314.4	Draw the structure for the realization of a given system and describe its applications.
ET314.5	Design, apply and simulate DFT, IDFT and filters for discrete signals using advanced tools.

ET315 Microcontroller – I (8051) – Course Outcomes

At the end of this course, Students will be able to,

ET315.1	Describe the architecture, memory organization and features of microprocessor and microcontroller.
ET315.2	Program using assembly language and embedded C for various real time applications.
ET315.3	Interface different peripheral modules with microcontroller 8051 for real time applications.
ET315.4	Describe the operations of different real time embedded applications and practice modern tools for its development.

ET316 Electronic Software Lab-III – Course Outcomes

At the end of this course, Students will be able to,

ET316.1	Apply Object oriented programming paradigms using Java language.
ET316.2	Demonstrate and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
ET316.3	Develop GUI applications using AWT and store and retrieve data from relational database with JDBC.

ET321 Radar & Microwave Engineering– Course Outcomes
At the end of this course, Students will be able to,

ET321.1	Derive transmission line equations, parameters and formulate wave equation in wave guide.
ET321.2	Explain the working of microwave components and devices.
ET321.3	Carry out microwave measurements using microwave bench.
ET321.4	Apply knowledge of microwave components, devices and radar fundamentals for different microwave applications.

ET322 Microcontroller-II (PIC)– Course Outcomes
At the end of this course, Students will be able to,

ET322.1	Explore the features and fundamentals of PIC Microcontroller 16F877 architecture and its Peripherals.
ET322.2	Interpret advanced features in PIC.
ET322.3	Program an embedded system in assembly and C.
ET322.4	Interface, implement and test a single-processor embedded systems for real-time applications

ET323 Electronics Applications & System Design– Course Outcomes
At the end of this course, Students will be able to,

ET323.1	Describe construction, working & analyze characteristics of thyristors.
ET323.2	Analyze AC and DC power control circuits using thyristors.
ET323.3	Design and simulate timers, frequency counters, digital voltmeters and frequency synthesizers.
ET323.4	Design and simulate Communication system components for system design.
ET323.5	Design and analyze controllers for industrial applications.

ET324 Optical Communication – Course Outcomes

At the end of this course, Students will be able to,

ET324.1	Explain various modes and transmission characteristics of optical fiber.
ET324.2	Calculate and Analyze different transmission losses in optical fiber.
ET324.3	Describe different optical sources & detectors and compare their performance characteristics.
ET324.4	Explicate and identify various design parameters for optical communication systems.

ET325 Mobile Communication – Course Outcomes

At the end of this course, Students will be able to,

ET325.1	Discuss the cellular system design and technical challenges
ET325.2	Analyze various losses in mobile radio propagation and describe sharing of radio spectrum in multiple access scheme.
ET325.3	Compare different types of Code Division Multiple Access technique.
ET325.4	Describe architecture of 3G and 4G technologies.

ET326 Mini Hardware Project– Course Outcomes

At the end of this course, Students will be able to,

ET326.1	Draw schematic and Simulate various electronic circuits using modern tools
ET326.2	Design PCB layouts to implement small electronic circuits
ET326.3	Fabricate, test and analyze the designed hardware.
ET326.4	Demonstrate soft skills, leadership, team working and behavioral skills to function effectively in multidisciplinary fields.

ET327 Self Learning Course II- Technical, Operating System – Course Outcomes

At the end of this course, Students will be able to,

ET327 .1	Explain the objective and functions of modern operating systems.
ET327.2	Describe how computing resources are used by application software in an operating system.
ET327.3	Analyze the common algorithms used for various tasks in operating systems.

B.E. Electronics & Telecommunication Engineering

ET411 Computer Communication Network – Course Outcomes
At the end of this course, Students will be able to,

ET411.1	Enumerate the layers of the OSI model and TCP/IP and explain the function(s) of each layer.
ET411.2	Explain Data Communications System and its components.
ET411.3	Identify the different types of network topologies and protocols.
ET411.4	Develop building skills of subnetting and understand routing mechanisms.
ET411.5	Apply basic protocols and tools of computer networks to assist in network design and implementation.

ET412 Embedded System Design – Course Outcomes
At the end of this course, Students will be able to,

ET412.1	Explore design challenges for embedded system development.
ET412.2	Describe ARM core architecture, bus architecture and instruction set.
ET412.3	Implement ARM processor based programs using hardware & tools.
ET412.4	Explain various functions of RTOS.

ET413 Satellite Communication – Course Outcomes
At the end of this course, Students will be able to,

ET413.1	Explain satellite communication and its orbital mechanism.
ET413.2	Calculate link budget using uplink and downlink frequency used for satellite communication system.
ET413.3	Compare FSS, BSS, MSS, single frequency station and Gateway station earth stations.
ET413.4	Analyze position location of GPS system.

ET414 Database Management System (DBMS) – Course Outcomes
At the end of this course, Students will be able to,

ET414.1	Apply the principles of database system and relational query language.
ET414.2	Design database using E-R modeling and apply normalization techniques on a given scenario.
ET414.3	Formulate SQL queries to perform CRUD operations
ET414.4	Apply appropriate indexing technique to optimize the performance of the database
ET414.5	Demonstrate transaction processing techniques.

ET415 Elective - Image & Video Processing– Course Outcomes
At the end of this course, Students will be able to,

ET415.1	Describe and perform basic operations on images and videos.
ET415.2	Design and Apply filters on images in spatial and frequency domain.
ET415.3	Select and apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.
ET415.4	Analyze and implement algorithms for image and video processing applications using modern tools.

ET416 Seminar & Project– Course Outcomes
At the end of this course, Students will be able to,

ET416.1	Identify the thrust areas thorough literature survey to fulfill societal, environmental needs for sustainable development.
ET416.2	Prepare a plan for realization of project and calculate approximate budget of the project
ET416.3	Apply engineering knowledge to design hardware and software architecture of the project.
ET416.4	Exhibit Communicate skills through synopsis, seminar and seminar report.
ET416.5	Demonstrate leadership, team working and behavioral skills to function effectively in multidisciplinary fields.

ET417 Vocational Training– Course Outcomes

At the end of this course, Students will be able to,

ET417.1	Get exposure to industrial environment & practices, undertakes suitable project based learning in vocational training and successfully completes it.
ET417.2	Document the training experience in form of vocational training report using modern tools.
ET417.3	Demonstrates oral presentation skills

ET421 Internet of Things (IoT)– Course Outcomes

At the end of this course, Students will be able to,

ET421.1	Elaborate different components of an IoT System.
ET421.2	Describe the architecture of Cortex M3 series ARM microcontroller.
ET421.3	Write interfacing programs for different applications with ARM Microcontroller.
ET421.4	Describe different communication technologies and application protocols used in IoT.
ET421.5	Elaborate different cloud platforms of IoT.

ET422 Multimedia Communication Technique– Course Outcomes

At the end of this course, Students will be able to,

ET422.1	Illustrate the basic television signal processing.
ET422.2	Explain globally accepted Colour Television standards.
ET422.3	Explore the knowledge of Digital Multimedia System.
ET422.4	Analyze and differentiate lossy and lossless compression algorithms.

ET423 VLSI Design– Course Outcomes

At the end of this course, Students will be able to,

ET423.1	Describe the VHDL programming concepts and design flow.
ET423.2	Design, implement and analyze combinational and sequential logic circuits using VHDL and modern EDA tools.
ET423.3	Explicate CMOS logic, characteristics and design combinational circuits using CMOS logic.
ET423.4	Design and simulate real time applications and describe detail architecture of commercial devices.
ET423.5	Describe testing of logic circuits and design VHDL test bench for combinational circuits.

ET424 Elective - II Data Analytics– Course Outcomes

At the end of this course, Students will be able to,

ET424.1	Discuss challenges in big data analytics and Describe fundamental techniques and principles for data analytics.
ET424.2	Identify, organize and operate on the datasets to compute statistics for data analysis
ET424.3	Select and implement appropriate data visualizations to clearly communicate analytic insights.
ET424.4	Describe and Apply different algorithms and methodologies for integrating & interpreting the data sets to improve effectiveness, efficiency and quality of data analysis.
ET424.5	Use modern tools and apply Data Analytics Lifecycle to address data analytics projects

ET425 Project– Course Outcomes
At the end of this course, Students will be able to,

ET425.1	Apply design concepts for realization of project by considering Engineering ethics.
ET425.2	Develop financial management and Project Planning skills.
ET425.3	Demonstrate leadership, team working and behavioral skills to function effectively in multidisciplinary fields.
ET425.4	Connect effectively to the society through project and project reports.
ET425.5	Demonstrate various soft skills.
ET425.6	Exhibit programming / simulation software, presentation, word processing software at various stages of the project.