



# **Walchand Institute of Technology, Solapur**

## **Programme of Electronics and Telecommunication**

### **Engineering**

#### **Program Educational Objectives (PEOs)**

1. Graduates will exhibit strong fundamental knowledge and technical skills in the domain of Electronics and Telecommunication Engineering and allied fields.
2. Graduates will manifest technological progression, hardware & software skills to fabricate sustainable, energy efficient and futuristic solutions to pursue successful professional careers in multidisciplinary fields.
3. Graduates will demonstrate professional ethics, effective communication, teamwork, leadership qualities and ability to relate engineering issues to broader social context along with lifelong learning.



# Walchand Institute of Technology, Solapur

## Programme of Electronics and Telecommunication Engineering

### 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 the 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.



# Walchand Institute of Technology, Solapur

## Programme of Electronics and Telecommunication Engineering

### 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.



**Walchand Institute of Technology, Solapur**  
**Programme Electronics and Telecommunication Engineering**  
**Course Outcomes (COs)**

**S.Y. B.Tech (Electronics & Telecommunication Engineering)**  
**w.e.f.2019-20**

**ET211 Engineering Mathematics– III– Course Outcomes**

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

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

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

### **ET213 Network Theory and Analysis – Course Outcomes**

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

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

### **ET214 Digital Techniques – Course Outcomes**

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

<b>ET214.1</b>	Demonstrate the use of codes and k-map minimization techniques in digital circuits.
<b>ET214.2</b>	Design combinational logic circuit using logic gates.
<b>ET214.3</b>	Illustrate the use and significance of logic IC families and flip-flops in digital circuits.
<b>ET214.4</b>	Design asynchronous and synchronous sequential logic circuits.
<b>ET214.5</b>	Apply concepts of synchronous state machines for designing digital applications.
<b>ET214.6</b>	Design logic circuits using memory, PLDs and VHDL modules.

### ET215 Analog Communication– Course Outcomes

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

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

<b>E216.1</b>	Work with arrays and structures to organize the data.
<b>E216.2</b>	Use string library functions and array of string.
<b>E216.3</b>	Implement dynamic memory allocation.
<b>E216.4</b>	Handle different file operations.
<b>E216.5</b>	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,

<b>ET221.1</b>	Describe types and applications of control systems.
<b>ET221.2</b>	Analyze Mechanical and Electrical system using mathematical modeling.
<b>ET221.3</b>	Determine transfer function of closed loop control systems using signal flow graph and block diagram reduction methods.
<b>ET221.4</b>	Determine stability of control systems using Root locus and Routh-Hurwitz criterion.
<b>ET221.5</b>	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,

<b>ET222.1</b>	Explain working, AC,DC characteristics of ideal & practical op amp leading to comparing ideal and practical op amp
<b>ET222.2</b>	Describe frequency response of op amp
<b>ET222.3</b>	Analyze different linear and non linear applications of op amp
<b>ET222.4</b>	Design first and second order filters and can analyze oscillators & signal generators
<b>ET222.5</b>	Design applications using voltage regulator, PLL, timer and function generator ICs.

### **ET223 Principles of Digital Communication – Course Outcomes**

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

<b>ET223.1</b>	Describe & calculate information measures and apply source coding techniques for the memoryless discrete sources.
<b>ET223.2</b>	Apply binary block coding techniques for error detection & correction and estimate error detection & correction capabilities of block code.
<b>ET223.3</b>	Explain, demonstrate and analyze different pulse code modulation techniques,
<b>ET223.4</b>	Explain, demonstrate and analyze binary and M-ary digital modulation techniques and compare them.
<b>ET223.5</b>	Describe mathematical & analytical concepts of matched filter & correlation receivers and explain synchronization techniques.
<b>ET223.6</b>	Explicate 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,

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

<b>ET225.1</b>	Implement searching algorithms.
<b>ET225.2</b>	Describe and Implement abstract data structures with associated operations.
<b>ET225.3</b>	Describe and implement sorting algorithms.
<b>ET225.4</b>	Describe and implement traversal algorithms for non-linear data structures.
<b>ET225.5</b>	Compare given data structures on time and space complexity of CRUD operations.

### **ENV22 Environmental Science – Course Outcomes**

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

<b>ENV22.1</b>	Describe the natural environment and its relationships with human activities.
<b>ENV22.2</b>	Explain the ethical means and technological methods for sustainable management of environmental systems.
<b>ENV22.3</b>	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,

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

**T.Y. B.Tech (Electronics & Telecommunication Engineering)**  
**w.e.f. 2020-21**

**ET311 : Electromagnetic Field Theory**

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

<b>ET311.1</b>	Define and recognize different co-ordinate systems and apply divergence, gradient, curl to EM waves.
<b>ET311.2</b>	Derive the laws of electrostatic, magneto static fields and electromagnetic wave equations.
<b>ET311.3</b>	Apply boundary conditions to different media for wave propagation and Maxwell's equations for analysis of wave propagation.
<b>ET311.4</b>	Derive transmission line equations, parameters.
<b>ET311.5</b>	Apply knowledge of Smith chart to determine transmission line parameters.

**ET312 : Digital Design & HDL**

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

<b>ET312.1</b>	Explain different syntax of HDL language.
<b>ET312.2</b>	Design and analyze combinational logic circuits using VHDL and Verilog.
<b>ET312.3</b>	Design and analyze sequential logic circuits using VHDL.
<b>ET312.4</b>	Describe architecture and internal components of CPLD, FPGA, ASIC and SOC and compare them.
<b>ET312.5</b>	Explain different testing methods for combinational Logic, sequential logic, IC and write test bench for simple combinational circuits.

### **ET313 : Digital Signal Processing**

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

<b>ET313.1</b>	Select and apply suitable transforming tools for time domain and frequency domain implementations.
<b>ET313.2</b>	Apply properties of DFT to determine DFT, IDFT by direct computation and FFT algorithms.
<b>ET313.3</b>	Design, analyze and compare DSP systems like FIR and IIR Filter.
<b>ET313.4</b>	Draw the structure for the realization of a given system and describe its applications.
<b>ET313.5</b>	Design, apply and simulate DFT, IDFT and filters for discrete signals using advanced tools.

### **ET314 : Microcontrollers and Applications**

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

<b>ET314.1</b>	Describe the fundamental features and operation of contemporary microcontroller.
<b>ET314.2</b>	Identify memory organization of a microcontroller and Illustrate microcontroller memory and peripherals expansion capability.
<b>ET314.3</b>	Analyze the program for time and code complexity.
<b>ET314.4</b>	Develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts.

### **ET315A : Business Ethics**

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

<b>ET315A.1</b>	Make students aware of the basics of business ethics and related theories.
<b>ET315A.2</b>	Explain different tools for decision making and management in business ethics.
<b>ET315A.3</b>	Get acquainted with corporate and ethical issues related to it.
<b>ET315A.4</b>	Explain different ethical issues related to various stakeholders.

### **ET315B : Managerial Economics**

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

<b>ET315B.1</b>	Elaborate the concepts of managerial economics.
<b>ET315B.2</b>	Analyze the issues related to demand, supply and market
<b>ET315B.3</b>	Use different tools for demand analysis and forecasting.
<b>ET315B.4</b>	Analyze the production and cost functions
<b>ET315B.5</b>	Decide price on the basis of market, demand and supply.

### **ET316 : Electronic Software Lab-III**

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

<b>ET316.1</b>	Write Python scripts using procedure and object oriented approach of writing a computer program.
<b>ET316.2</b>	Exhibit ability to use Python's standard library packages to provide solution to a given problem.
<b>ET316.3</b>	Test and debug python script for a given problem.

### **ET321 : Antenna & Wave Propagation**

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

<b>ET321.1</b>	Identify basic antenna parameters.
<b>ET321.2</b>	Analyze radiation pattern of various antennas.
<b>ET321.3</b>	Illustrate antenna parameter measurements.
<b>ET321.4</b>	Identify the characteristics of radio wave propagation.
<b>ET321.5</b>	Explain various applications of antennas.

### **ET322 : Embedded System**

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

<b>ET322.1</b>	Explore design challenges for embedded system development.
<b>ET322.2</b>	Describe ARM core architecture and Instruction set.
<b>ET322.3</b>	Implement ARM Processor based programs using hardware & tools.
<b>ET322.4</b>	Explain various functions of RTOs.

### **ET323 : Electronic System Design**

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

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

### **ET324 : Advanced Mobile Communication**

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

<b>ET324.1</b>	Recognize cellular concepts in mobile communication.
<b>ET324.2</b>	Examine the Mobile radio propagation, cellular system design, and to identify multiple access techniques used in mobile communication.
<b>ET324.3</b>	Analyze mobile technologies like GSM.
<b>ET324.4</b>	Categorize the mobile communication evolution of 2G to 5G technologies.
<b>ET324.5</b>	Describe overview of 4G & 5G next generation technology.

### **ET325A : Optical Communication**

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

<b>ET325A.1</b>	Explain various modes and transmission characteristics of optical fiber.
<b>ET325A.2</b>	Calculate and Analyze different transmission losses in optical fiber.
<b>ET325A.3</b>	Describe different optical sources & detectors and compare their performance characteristics.
<b>ET325A.4</b>	Explicate and identify various design parameters for optical communication systems.

### **ET325B : Sensors & Applications**

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

<b>ET325B.1</b>	Elaborate the concept of sensors and its characteristics.
<b>ET325B.2</b>	Describe the working principle of analog and digital sensors.
<b>ET325B.3</b>	Design sensor interface circuits for a given engineering problem.
<b>ET325B.4</b>	Select an appropriate sensor for a given engineering application based on interface technique, material and technology of a sensor.
<b>ET325B.5</b>	Describe the working principle of different types of actuators.

### **ET326 : Mini Hardware Project**

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

<b>ET326.1</b>	Produce PCB artwork using an appropriate EDA tool
<b>ET326.2</b>	Practice good soldering,testing,fault detection and effective trouble-shooting
<b>ET326.3</b>	Design and implement application based hardware project
<b>ET326.4</b>	Present technical seminar and display the project

**B.E. (Electronics & Telecommunication Engineering)**  
**w.e.f.2019-20**

**ET411 Computer Communication Network – Course Outcomes**

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

<b>ET411.1</b>	Enumerate the layers of the OSI model and TCP/IP and explain the function(s) of each layer.
<b>ET411.2</b>	Explain Data Communications System and its components.
<b>ET411.3</b>	Identify the different types of network topologies and protocols.
<b>ET411.4</b>	Develop building skills of subnetting and understand routing mechanisms.
<b>ET411.5</b>	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,

<b>ET412.1</b>	Demonstrate the role of individual components involved in a typical embedded system.
<b>ET412.2</b>	Analyze the characteristics of different computing elements w.r.t. ARM architecture and select the most appropriate one for an embedded system.
<b>ET412.3</b>	Architect the design of a given embedded system
<b>ET412.4</b>	Substantiate the role of different software modules in the development of embedded systems
<b>ET412.5</b>	Develop simple tasks to run on an RTOS

**ET413 Satellite Communication – Course Outcomes**

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

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



### **ET414 Database Management System (DBMS) – Course Outcomes**

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

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

### **ET415 Elective - Image & Video Processing– Course Outcomes**

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

<b>ET415.1</b>	Describe and perform basic operations on images and videos.
<b>ET415.2</b>	Design and Apply filters on images in spatial and frequency domain.
<b>ET415.3</b>	Select and apply appropriate technique for preprocessing, segmentation and feature extraction of images and videos in real time applications.
<b>ET415.4</b>	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,

<b>ET416.1</b>	Identify the thrust areas through literature survey to fulfill societal, environmental needs for sustainable development.
<b>ET416.2</b>	Prepare a plan for realization of project and calculate approximate budget of the project
<b>ET416.3</b>	Apply engineering knowledge to design hardware and software architecture of the project.
<b>ET416.4</b>	Exhibit Communicate skills through synopsis, seminar and seminar report.
<b>ET416.5</b>	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,

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

**ET421 Internet of Things (IoT)– Course Outcomes**

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

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

**ET422 Multimedia Communication Technique– Course Outcomes**

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

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

### ET423 VLSI Design– Course Outcomes

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

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

<b>ET424.1</b>	Discuss challenges in big data analytics and Describe fundamental techniques and principles for data analytics.
<b>ET424.2</b>	Identify, organize and operate on the datasets to compute statistics for data analysis
<b>ET424.3</b>	Select and implement appropriate data visualizations to clearly communicate analytic insights.
<b>ET424.4</b>	Apply different preprocessing techniques for data quality enhancement
<b>ET424.5</b>	Use the tools and techniques to apply different algorithms and methodologies

### ET425 Project– Course Outcomes

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

<b>ET425.1</b>	Apply design concepts for realization of project
<b>ET425.2</b>	Plan for management and financial aspects of the project.
<b>ET425.3</b>	Demonstrate leadership and team working behavioral skills and function effectively in multidisciplinary fields.
<b>ET425.4</b>	Communicate effectively to the society through presentation skills using project and project report.
<b>ET425.5</b>	Use programming / simulation, PCB designing software at various stages of project