Pimpri Chinchwad Education Trust's

PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Curriculum Structure and Syllabus of Honors in

DATA INFORMATICS

(Regulations 2023)

Effective from Academic Year 2026-27

(Updated with Minor Changes)

Institute Vision

To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education.
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with an ability to think and act independently in demanding situations.

EOMS Policy

“We at PCCOE are committed to offer exemplarily Ethical, Sustainable and Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders.

We shall strive for technical development of students by creating globally competent and sensible engineers, researchers and entrepreneurs through Quality Education.

We are committed for Institute’s social responsibilities and managing Intellectual property.

We shall achieve this by establishing and strengthening state-of-the-art Engineering Institute through continual improvement in effective implementation of Educational Organizations Management Systems (EOMS).”

Course Approval Summary

Board of Studies - Department of E&TC Engineering

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS chairman
1	Information Management Systems	BET25HN01	10	
2	Information Management Systems Lab	BET25HN02	12	
3	Internet of Medical Things	BET26HN01	13	
4	Internet of Medical Things Lab	BET26HN02	15	
5	Intelligent systems for healthcare	BET27HN01/ BET28HN02	16	
6	Project	BET28HN01/ BET27HN03	18	

Approved by Academic Council:

Chairman, Academic Council
Pimpri Chinchwad College of Engineering,Pune

INDEX

PCET's Pimpri Chinchwad College of Engineering
PCCOE
"Knowledge Brings Freedom"
Progress Credibility Confidence
Optimism Excellence
Since 1998

Preface

Looking at Global Scenario to enhance the employability skills and impart deep knowledge in emerging/ multidisciplinary areas, an additional avenue is provided to passionate learners through the Minors and Honors Degree Scheme in academic structure.

For Honors degree program, student has to earn additional 20 credits in emerging area of one's own domain.

Objectives of Honors Degree

- To enable students to pursue allied academic interest in contemporary areas.
- To provide effective yet flexible options for students to achieve basic to intermediate level competence in the contemporary area.
- To enhance the employability skills with different combinations of competencies and flavors.
- To provide an academic mechanism for fulfilling demand of specialized areas from industries for higher order skill jobs.
- To provide a strong foundation to students aiming to pursue research/ higher studies in the contemporary field of study.

Data Informatics

Field of Data informatics is the intersection of various domains like information science, computer science, and applied sciences. This field deals with the resources, devices, and methods required to optimize the acquisition, storage, retrieval, and use of information in various application areas.

Features of data Informatics course for Electronics Engineers

This course helps to explore in following areas-

1. Analyzing data to help facilitate decisions and actions of health, finance, military etc. sector.
2. Understanding issues related to collecting, storing and analyzing medical information in a digital format.
3. Combining knowledge of several fields with engineering, informatics and communication systems.
4. to gain an in-depth understanding of the data analysis and statists and to develop relevant programming skills

Objectives:

1. Explain the subject health informatics as an academic discipline and its practical application in health care
2. Introduce students to problems and challenges that health informatics addresses
3. Introduce students to the research and practice of health informatics
4. Provide all students with basic skills and knowledge in health informatics to apply in their future health-related career.
5. Lead students in discussion around ethical and diversity issues in health informatics
6. Provide additional direction to those interested in further (i.e., graduate) study in the field.

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

1. Explore how technology can be used to improve health care delivery in health care organizations and in public health.
2. Acquire breadth of knowledge of the principles of health informatics.
3. Develop basic skills in using health informatics principles to improve practice.
4. Acquire a conceptual and theoretical framework of the design, development, and implementation of health information systems.
5. Acquire a basic understanding of educational and instructional design theory and principles and how the principles can be applied to deliver effective training to users of health information systems.

Curriculum Structure

Curriculum Structure
Scheme -A

Sem-ester	Course Code	Course Name	Teaching Scheme					Evaluation Scheme						
			L	P	T	Hrs	CR	FA1	FA2	SA	TW	PR	OR	Total
V	BET25HN01	Information Management Systems	4	-	-	4	4	20	20	60	-	-	-	100
	BET25HN02	Information Management Systems Lab	-	2	-	2	1	-	-	-	25	-	25	50
VI	BET26HN01	Internet of Medical Things	4	-	-	4	4	20	20	60	-	-	-	100
	BET26HN02	Internet of Medical Things Lab	-	2	-	2	1	-	-	-	25	-	25	50
VII	BET27HN01	Intelligent systems for healthcare	4	-	-	4	4	20	20	60	-	-	-	100
VIII	BET28HN01	Project	-	8		8	4	-	-	-	100		50	150
Total			**12**	**12**		**24**	**18**	**60**	**60**	**180**	**150**	**-**	**100**	**550**

Abbreviations:
1 Lecture hour = 1 Credit 2 Lab Hours = 1 Credit 1 Tutorial Hour = 1 Credit Abbreviations are: L-Lecture, P-Practical, T-Tutorial, H- Hours, FA-Formative Assessment , SA- Summative Assessment, TW–Termwork, OR – Oral, CR- Credits

Curriculum Structure
Scheme -B

Sem-ester	Course Code	Course Name	Teaching Scheme					Evaluation Scheme						
			L	P	T	Hrs	CR	FA1	FA2	SA	TW	PR	OR	Total
V	BET25HN01	Information Management Systems	4	-	-	4	4	20	20	60	-	-	-	100
	BET25HN02	Information Management Systems Lab	-	2	-	2	1	-	-	-	25	-	25	50
VI	BET26HN01	Internet of Medical Things	4	-	-	4	4	20	20	60	-	-	-	100
	BET26HN02	Internet of Medical Things Lab	-	2	-	2	1	-	-	-	25	-	25	50
VII	BET27HN03	Project	-	8		8	4	-	-	-	100		50	150
VII	BET28HN02	Intelligent systems for healthcare	4	-	-	4	4	20	20	60	-	-	-	100
Total			**12**	**12**		**24**	**18**	**60**	**60**	**180**	**150**	**-**	**100**	**550**

Course Syllabus

Program:	B. Tech. (E&TC) -Honors In Data Informatics					Semester:	V
Course:	Information Management System					Code:	BET25HN01
	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
Credit	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
4	4	-	-	20	20	60	100

Prior Knowledge of: Medical data collection and processing **is essential.**

Course Objectives:

1. To introduce the collection, analysis and management of health Information management system
2. To cover need and requirement of different informatics skills
3. To introduce the detail about Electronics medical record.
4. To introduce the concept of designing and evaluation of methodology of information system
5. To explore the security aspect of health management data
6. To introduce the standards and norms related with Information management

Course Outcomes:

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

1. Understand the information and management systems features.
2. Acquire Medical signals and medical images by handling hardware setups.
3. Analyze single dimensional ECG and multi-dimensional EEG signal features.
4. Analyze the characteristics of the Electronic Health Record (EHR) as a component of a comprehensive Health Information Systems (HIS).
5. To understand the Quality norms and Data security
6. To apply Quality assurance management to systems

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Health Information Management System:** Information and management model, Collect and maintain health data (such as data elements, data sets, and databases). Conduct analysis, documentation in the health record, supports the diagnosis and reflects the patient's progress, clinical findings, and discharge status. Policies and procedures, accuracy of health data. Verify timeliness, completeness, accuracy, and appropriate	11
2.	**Real Time Health Data Acquisition:** Instrumentation setup for ECG, EEG, PCG, Signal Processing systems, Characteristics of: -X-Ray Imaging, Magnetic Resonance Imaging, Positron Emission Tomography.	11
3.	**Data analysis**: - ECG: P, QRS, T waves, Heart Beat rate detection, First & Second Heart sound, Detection of EEG rhythms, Time-Domain Analysis, Frequency- and Wavelet-Domain Analysis.	11
4.	Electronic medical record: Overview of the Electronic Health Record (EHR) Clinical Workflow, Coding Systems, Data Capture & Functional Benefits (Data Entry at the Point of Care, Electronic Orders, Longitudinal Patient Records, Problem List, Flow Sheets, & Anatomical Drawings. Using the EHR to Improve Patient Health	9
5.	**Data Security:** Apply confidentiality and security measures to protect electronic health	9

	information. Protect data integrity and validity using software or hardware technology. Apply departmental and organizational data and information system security policies. Use and summarize data compiled from audit trails and data quality monitoring programs	
6.	**Quality assurance and management:** Concepts of Quality of Care , Quality Improvement Approaches ,Standards and Norms , Quality Improvement Tools , Introduction to NABH guidelines	9
	Total	60

Text Books:

1. Enrico Coiera, Guide to Health Informatics (Arnold Publication) (2003)
2. ArjunPanesar, Machine Learning and AI for Healthcare. Big Data for improved Health Outcomes (2019)
3. Arun Kumar Sangaiah, S.P. Shantharajah, et al., Intelligent Pervasive Computing Systems for Smarter Healthcare (2019)

Reference Books:

1. AthinaLazakidou, Handbook of Research on Informatics in Healthcare And Biomedicine (2006)
2. ArisGkoulalas-Divanis, GrigoriosLoukides, Anonymization of Electronic Medical Records to Support Clinical Analysis (2013)
3. Khalil Khoumbati, Yogesh Kumar Dwivedi, et al., Handbook of Research on Advances in Health Informatics and Electronic Healthcare Applications - Global Adoption and Impact of Information Communication.

-

Program:	B. Tech. (E&TC) -Honors In Data Informatics				Semester:		V
Course:	Information Management Systems Lab				Code: BET25HN02		
	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
Credit	**Lecture**	**Practical**	**Tutorial**	**TW**	**OR**	**PR**	**Total**
01	--	2	--	25	25	--	50

Prior knowledge of:

1. Medical data collection and processing
2. Programming using 'C' **is essential**

Course Objectives:

1. To explain need of health information management system in clinical research
2. To discuss methods of Electronics health record management and maintenance.
3. To explore role of security and confidentiality in Health information management.

Course Outcomes: At the end of Laboratory work, the students will be able to:

1. Design Complex information management system for medical applications.
2. Design clinical records for research and history maintenance.
3. Develop GUI based application on android for securely storing health information.
4. Develop information web-based storage and retrieval system.

General Guidelines: Any six Experiments is to be performed.

Detailed Syllabus:

Expt. No.	List of Experiments
1	Design and Implement Information management System for complex health data analysis using SQTL
2	Filter the noisy ECG signal 'ecg_hfn.dat'(sampling frequemcy=1000Hz) using four different low pass filters Order 2 Cutoff Frequency 10 Hz Order 8 Cutoff Frequency 20 Hz Order 8 Cutoff Frequency 40 Hz Order 8 Cutoff Frequency 70 Hz
3	QRS Complex Detection using Pan Tompkin Algorithm
4	Design and Implement Information management System for clinical Finding records or Electronics Health Records
5	Design and Implement GUI based Information coding system and security credential
6	Develop Website for collecting information of Blood Bank.
7	Develop Website for statistical information searching for health diseases.

Reference Books:

1. ArshdeepBahga, Vijay Madisetti, "lnternet of Things – A hands-on approach", Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.
3. Jan Ho" ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
5. Michael Margolis, Arduino Cookbook, "Recipes to Begin, Expand, and Enhance Your Projects", OReilly Media, 2nd Edition.

Program:	B. Tech. (E&TC) -Honors In Data Informatics					Semester:	VI
Course:	Internet of Medical Things (IoMT)					Code:	BET26HN01
	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
Credit	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
4	4	-	-	20	20	60	100

Prior Knowledge of:

1. Basic communication systems and Basics **IoT** **Is essential**

Course Objectives:

1. Describe the basic concepts of IOT in healthcare
2. Explain existing hardware platforms and sensor interfaces for various healthcare based Applications
3. Describe he ways of communication between the client and the server in IOT
4. Explain applications in healthcare using IOT based approach and substantiate the same with appropriate case studies

Course Outcomes: After completion of this course Students should be able to :

1. Understand Role of IoT in health care sector
2. Compare various protocols in IoMT
3. Analyze the communication system requirements of IOT in health care
4. Understanding Internet and economics of internet in Health care system
5. Analyzing Case studies of IoT in health care.
6. Understand wearable devices in IoMT.

Detailed Syllabus:

Unit	Description	Duration
1.	**Internet of Things (IOT):** An Introduction Introduction to Embedded Systems- an overview, features. Networked Embedded System types and overview, wireless communication standards- zigbee, Bluetooth & Wi-Fi. OSI & TCP/IP model in a nutshell. Introduction to the Internet and understand how internet works. Introduction to Smart Objects or Things. IOT- understand what IOT is and discuss its application in health-care systems- Patient Monitoring & diagnostics, Home healthcare & Personal care & Fitness.	**11**
2.	**Protocol based systems:** Structure of protocols and protocols life cycles, application of protocols , passive and active protocols systems, protocols representations and language, Design of protocols ,construction and maintenance.	**8**
3.	**Communication system in Healthcare:** Communication system basics, Information transaction in health care, machine communication on set of layered protocols, wireless and wireline communication, clinical communication and telemedicine.	**8**
4.	**The Internet and web health services:** Evolution of internet as a tool to support health systems, communication on internet, Web health services, online systems for decision making, Security on internet, Information economics on internet.	**11**
5	Applications of Iot in Medicine Healthcare Monitoring system through Cyber-physical system, An loT Model for Neuro sensors, AdaBoost with feature selection using loT for somatic mutations evaluation in Cancer, Secured architecture for loT enabled Personalized Healthcare Systems, Healthcare Application Development in Mobile and Cloud Environments, Case study : Approach to predict Diabetic Retinopathy through data analytics, Diagnosis of chest diseases using artificial neural networks	**11**

6	**Wearable devise in IOMT:** Overview on Wearable Devices for Medical Applications: Wearable/Implantable Devices for Monitoring Systems. Wearable Sensors for Monitoring Exercise and Fatigue Estimation in Rehabilitation.	**11**
	Total	60

Text Books:

1. Guide to healthcare informatics , 2nd Edition, Arnold Publication, EnriocoCoira 2019
2. ABC of Health Informatics , ABC series by Frank Sullivan, Jyreme C Watt , 2006

Program:	B. Tech. (E&TC) -Honors In Data Informatics				Semester:		VI
Course:	Internet of Medical Things Lab				Code		BET26HN02
	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
Credit	Theory	Practical	Tutorial	TW	OR	PR	Total
01	-	02	--	25	25	--	50

Prior knowledge of:

1. Programming languages 'C'and SQL
2. Statistical methods of data handling

is essential

Course Objectives:

1. To deliver practical knowledge of Medical data processing and management.
2. To explain application communication methods for medical applications.
3. To explore Internet of Medical Things (IoMT)

Course Outcomes:

At the end of Laboratory work, the students will be able to:

1. Select appropriate communication coding method for medical information handling.
2. Understand concepts of clinical communication and telemedicine.
3. Design Wearable Devices for Medical Applications.

Detailed Syllabus:

Expt. No.	List of Experiments
1	Design and implement READ codes for ECG data handling using 'C'
2	Create and establish SNOMED protocol for lung diseases using SQL
3	Design and implement Heart Patient Monitoring system using IoT Platform
4	Design IoT environment for remote patient monitoring.
5	Design Qualitative and Quantitative based prediction model for disease detection.

Reference Books:

1. ArshdeepBahga, Vijay Madisetti, "lnternet of Things – A hands-on approach", Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012.
3. Jan Ho" ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
5. Michael Margolis, Arduino Cookbook, "Recipes to Begin, Expand, and Enhance Your Projects", OReilly Media, 2nd Edition.

Program:	B. Tech. (E&TC) -Honors In Data Informatics					Semester:	VII
Course:	Intelligent Systems for Healthcare					Code:	BET27HN01/ BET28HN02
	Teaching Scheme			Evaluation Scheme			
Credit	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
4	4	-	-	20	20	60	100

Prior Knowledge of: Medical data collection and processing **is essential.**

Course Objectives:

1. To explore technological challenges in healthcare and medical information handling
2. To cover significance of machine learning and artificial intelligence in ehealth management systems.
3. To introduce new technology in health monitoring such as Telemedicine, bio-surveillance, bioinformatics.

Course Outcomes: After learning the course, the students should be able to:

1. Understand existing healthcare and intelligent systems.
2. Apply machine learning and AI models for healthcare monitoring and analysis.
3. Design Intelligent Pervasive Computing Systems for Smarter Healthcare.
4. Analyze knowledge management system in ehealth, medicine and telemedicine
5. Understand importance of Bio-surveillance and bioinformatics
6. Analyse the performance of designed system for various health related applications.

Detailed Syllabus:

Unit	Description	Duration
1.	**Introduction to Healthcare and Intelligent System:** Overview of Health Care Systems and Key Challenges, Case Study on Electronic Medical Records Data, Clinical decision support systems, Intelligent systems, Rule-based expert systems, Model-based systems, Machine learning systems for new clinical knowledge, , Automated interpretation, level of Interpretation, Intelligent Monitoring Systems, types of errors due to automations.	10
2.	**Machine Learning and AI for Healthcare:** Machine Learning Approach in healthcare, Role of Artificial Intelligence, Applications of AI in Healthcare, Healthcare Data—Little and Big Use Cases, Realizing the Potential of AI in Healthcare, Evaluating Learning for Intelligence, Ethics of Artificial Intelligence and Machine Learning, Health Intelligence , Future of Healthcare, Evidence- Based Medicine, Connected Medicine, Medication Adherence, Smart Implantable.	11
3.	**Intelligent Pervasive Computing Systems for Smarter Healthcare:** Intelligent Sensing and Ubiquitous Systems (ISUS) for Smarter and Safer Home Healthcare, PeMo-EC: An Intelligent, Pervasive and Mobile Platform for ECG Signal Acquisition, Processing, and Pre-Diagnostic Extraction, The Impact of Implantable Sensors in Biomedical Technology on the Future of Healthcare Systems, IoT-Based Noninvasive Wearable and Remote Intelligent Pervasive Healthcare Monitoring Systems for the Elderly People	10
4.	**TELEMEDICINE AND E-HEALTH:** Knowledge Management in Telemedicine, Telemedicine Systems and Devices for Patient Monitoring, Telehealth Applications in Telemedicine, Mobile Tele-monitoring Insights, Tele-pathology and Digital Pathology, Goals and Benefits of Knowledge Management in Healthcare	9
5.	**Bio-surveillance:** Event reporting, Infectious disease surveillance systems, Online evidence retrieval, communication technologies to support bio- surveillance, Bioinformatics: concept of Bioinformatics, Genome science and	10

	data, Applications of Bioinformatics.	
6.	**Case Studies:** Secure Pervasive Healthcare System and Diabetes Prediction Using Heuristic Algorithm, Threshold-Based Energy-Efficient Routing Protocol for Critical Data Transmission to Increase Lifetime in Heterogeneous Wireless Body Area Sensor Network, Data Mining Techniques for the Detection of the Risk in Cardiovascular Diseases, Smart Sensing System for Cardio Pulmonary Sound Signals.	10
	Total	60

Text Books:

1. Enrico Coiera, Guide to Health Informatics (Arnold Publication) (2003)
2. Arjun Panesar, Machine Learning and AI for Healthcare. Big Data for improved Health Outcomes (2019)
3. Arun Kumar Sangaiah, S.P. Shantharajah, et al., Intelligent Pervasive Computing Systems for Smarter Healthcare (2019)

Reference Books:

1. AthinaLazakidou, Handbook of Research on Informatics in Healthcare And Biomedicine (2006)
2. Aris Gkoulalas-Divanis, GrigoriosLoukides, Anonymization of Electronic Medical Records to Support Clinical Analysis (2013)
3. Khalil Khoumbati, Yogesh Kumar Dwivedi, et al., Handbook of Research on Advances in Health Informatics and Electronic Healthcare Applications - Global Adoption and Impact of Information Communication.

Program:	B. Tech. (E&TC) -Honors In Data Informatics				Semester:	VII /VIII
Course:	Project				Code:	BET28HN01/ BET27HN03
	Teaching Scheme (Hrs./Week)		Evaluation Scheme and Marks			
Credit	Lecture	Practical	PR	TW	OR	Total
4	-	08-	-	100	50	150

Prior Knowledge of: Information management, Machine Learning and IoT **is essential.**

Course Objectives:

1. To test students knowledge of course implementation.
2. To make students ready for data analytics-oriented design and analysis.

Course Outcomes: After learning the course, the students should be able to:

1. Solve real time problems observed in industry.
2. Deal with data handling, management and analysis of real time application.

Detailed Guidelines:

1. The students are encouraged to take projects for developing software solutions and hardware platforms using the concept of course taken under the certification.
2. Project should be individual and preferably form Industry.
2. The project guidelines mentioned in B.Tech (E&TC) structure will be followed for evaluation of performance and certification compliance.

Vision and Mission of E&TC Department

VISION : To be recognized as a distinguished department in the field of electronics and telecommunication transforming students into competent technocrats by providing an Ethical, Sustainable and Value-Added Quality Education.

MISSION :

1. To create competent Electronics and Tele-communication engineers with Knowledge, Skill and Attitude by establishing a conducive learning environment.
2. To nurture technical competency, entrepreneurship skills and promote higher studies through the state-of-art facilities for building successful careers.
3. To facilitate research by engaging in projects of industrial requirement and national importance.
4. To impart Life skills, Ethical and Social values for self-sustainability.

Programme Educational Objectives (PEO's)

1. Establish a strong base in mathematics, basic sciences, and the fundamental principles of Electronics and Telecommunication Engineering for the students.
2. Equip students with a comprehensive understanding of Electronics and Telecommunication Engineering, enabling them to effectively comprehend, analyse, design, and to innovate practical solutions for real-world challenges.
3. Foster the development of effective communication skills, teamwork, and professional ethics among students, in order to meet the demands of employers and prepare them for higher studies and successful careers.
4. Promote social consciousness and a sense of responsibility among students, creating awareness about their commitment and obligations to society.

Program Outcomes (PO's)

Engineering Graduates 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 thesssse 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)

1. **PSO1:** Ability to exhibit the competency to solve the problems related to Electronics & Telecommunications Engineering by applying advanced knowledge in the fields of VLSI, Embedded Systems, Signal Processing, Communication, Computing and Automation.
2. **PSO2:** Ability to design and analyse Electronics & Telecommunications systems using state of the art hardware and software tools to address the needs of the industry and society.
3. **PSO3:** Ability to build research and problem-solving attitude through Project based learning to address the societal, environmental, health and safety issues.

PCCOE
"Knowlege Brings Freedom"
Progress Credibility Confidence
Optimism Excellence
Since 1999