FACULTY OF ENGINEERING & TECHNOLOGY

BACHELOR OF ENGINEERING

MINOR DEGREE IN INTERNET OF THINGS (IoT) (DRAFT SYLLABUS)

Course Structure

Sr. No.	Semester	Temp. Course Code	Course Title	L	T	P	Credits
1.	3	IoT-1	Introduction to Internet of Things	3	0	2	4
2.	4	IoT-2	IoT Protocols	3	0	2	4
3.	5	IoT-3	IoT System Design	3	0	2	4
4.	6	IoT-4	Industry 4.0 and IIoT	3	0	2	4
5.	6	IoT-5	Mini Project	0	0	4	2
TOTAL				12	0	12	18

Detailed Syllabus

Course code:	**IoT-1**
Name of the course:	**Introduction to Internet of Things**
Semester:	**3**
Category of Course:	**IoT**

Course objectives:

To make students know the IoT ecosystem and to provide an understanding of the technologies and the standards relating to the Internet of Things. The course will also develop skills on IoT technical planning.

Teaching & Examination Scheme:

Teaching Scheme			Credits	Examination Marks (Maximum/Passing)		Total
				External		
L	T	P	C	ESE(T)	ESE(P)	
3	0	2	4	50/25	50/25	100/50

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ESE (T): End Semester Examination (Theory)

ESE (P): End Semester Examination (Practical)

Course Contents:

Unit	Contents	Hours
1	**Basics of Networking & Basics of Network Security:** Network Types, Layered Network Models, Addressing , Internet of Things TCP/IP Transport layer, Security ,Network Confidentiality, Cryptography, Message Integrity and Authenticity, Digital signatures, Key Management, Internet Security&Firewall.	07
2	**Predecessors of IoT & Emergence of IoT**–Introduction, Wireless Sensor Networks, Machine-to-Machine Communications, Cyber Physical Systems, Architectural components of CPS, IoT versus M2M, IoT versus CPS, IoT versus WoT, Enabling IoT and the Complex Interdependence of Technologies, IoT Networking Components, Addressing Strategies in IoT.	06
3	**IoT Architecture -State of the Art** – Introduction, State of the art, Architecture Reference Model- Introduction, Reference Model, and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	07
4	**IoT Sensing and Actuation & IoT Processing Topologies and Types**: Introduction, Sensors, Sensor Characteristics, SensorialDeviations, SensingTypes, Sensing Considerations, Actuators, Actuators Types, Actuator Types, Actuator Characteristics, Data Formats, Processing in IoT, Processing Topologies, IoT Device Design and Selection Considerations, Processing Offloading, Offload location, Offload decision making, Offloading considerations.	06
5	**IoT Case Studies:** Agricultural IoT, Components of an agricultural IoT, Advantages of IoT in agriculture, Case Studies, Vehicular IoT, Components of vehicular IoT, Advantages of vehicular IoT, Healthcare IoT, Components of healthcare IoT, Advantages and risk of healthcare IoT, Case Studies, Evolution of New IoT Paradigms, Challenges Associated with IoT, Emerging Pillars of IoT.	04

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20%	30%	20%	15%	15%	0

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Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press
2. Bassi, Alessandro, et al, "Enabling things to talk", Springer-Verlag Berlin -2016
3. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017
4. Neil Cameron: Arduino Applied-Comprehensive Projects for Everyday Electronics, Apress.
5. Internet of Things, Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, John Wiley&Sons.
6. Massimo Banzi, Michael Shiloh Make: Getting Started with the Arduino, Shroff Publisher/Maker Media Publishers.

Course Outcomes (CO):

Sr. No.	Course Outcome Statements	% weightage
1	To understand the basics of Networking and Security.	20
2	To understand predecessor of IoT technology and emergence of Internet of Things	20
3	To understand architecture for Internet of Things	30
4	To recognize various devices, sensors, actuators, and various processing paradigms for IoT.	30

List of Practicals /Tutorials:

1. Introduction to Arduino programming.
2. Introduction to Arduino Uno R3
3. To blink the LED with Arduino.
4. To interface push button with Arduino.
5. To interface LCD with Arduino.
6. To read the analog voltage using ADC on Arduino.
7. To detect occupancy of an area using PIR sensors
8. To interface real time clock IC DS1307 with Arduino.
9. To measure the distance of an object using ultrasonic sensor
10. To display temperature and humidity data.

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11. To control LED using remote control.
12. To implement RFID based parking system.

Supplementary Learning Material:

https://onlinecourses.nptel.ac.in/noc21_cs63/preview

Course Articulation Matrix:

CO	PO1	PO2	PO4	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	3	2	2	1	1	1	2	1	1	1	3	1	2
2	3	2	2	3	2	3	2	2	1	1	1	2	1	2	2
3	3	2	3	1	3	1	1	2	1	2	1	2	3	1	2
4	3	2	2	2	1	2	3	3	2	2	2	1	2	2	3

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High) '–' No correlation

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Course code:	**IoT-2**
Name of the course:	**IoT Protocols**
Semester:	**4**
Category of Course:	**IoT**

Course objectives:

The main objective of the course is to make students know the basic concept and architecture of embedded systems and different design protocols used for an embedded system for IoT applications. Students will gain knowledge about the IoT enabled technology.

Teaching & Examination Scheme:

Teaching Scheme			Credits	Examination Marks(Maximum/Passing)		Total
				External		
L	T	P	C	ESE(T)	ESE(P)	
3	0	2	4	50/25	50/25	100/50

ESE (T): End Semester Examination (Theory)

ESE (P): End Semester Examination (Practical)

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Course Contents:

Unit	Contents	Hours
1	**Introduction to Things in IoT**:Introduction, Edge Devices-NodeMCU/ESP 32, A short tour of Linux operating system, Programming edge node, Introduction to Gateways, Gateways types and configurations, Gateway as an extension of the cloud, HTTP access method using API.	07
2	**IoT Connectivity Technologies:** RFID , NFC, Wi-Fi, Bluetooth low energy, IEEE 802.15.4, Zigbee, Thread, Wireless HART, Z-Wave, LoRa, NB-IoT.	07
3	**IoT Communication Technologies**– Introduction, Constrained nodes, Constrained networks, Types of constrained devices, Low power and lossy networks, Infrastructure protocols, Internet protocol version 6 (IPv6), RPL,6LoWPAN, Content-centric networking (CCN), Discovery Protocols, Physical web, Multicast DNS (mDNS), Universal plug and play (UPnP), Data Protocols, MQTT, CoAP, AMQP, XMPP, REST, WebSocket, Identification Protocols, EPC, URIs, Device Management, Semantic Protocols, JSON-LD, Web thing model.	08
4	**IoT Interoperability**: Introduction, Taxonomy of interoperability, Standards, DLNA, Konnex, UPnP, Frameworks, universal, IoTivity, HomeKit.	04
5	**Cloud Computing**-IOT Associated Technologies: Introduction, Virtualization, Advantages of virtualization, Types of virtualization, Cloud Models, Service-Level Agreement in Cloud Computing, Importance of SLA, Metrics for SLA, Cloud Implementation, Cloud simulation, An open-source cloud: OpenStack, A commercial cloud: Amazon web services(AWS), Sensor-Cloud: Sensors-as-a-Service,Importance of sensor-cloud, Architecture of a sensor-cloud platform	04

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20%	30%	20%	15%	15%	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

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Reference Books:

1. Sudip Mishra, Anandarup Mukherjee, Arijit Roy: Introduction to IOT, Cambridge University Press.
2. Hanes et al "IoT Fundamentals", Cisco Press.
3. Rahul Dubey, "An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications", Cengage India Publication.
4. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Keyapplicationsand Protocols", Wiley, 2012.
5. RMD Sundaram Shriram K Vasudevan, Abhishek S Nagarajan, Internet of Things, John Wiley and Sons.
6. Klaus Elk, "Embedded Software for the IoT".
7. Perry Xiao, "Designing Embedded Systems and the Internet of Things (IoT) with the ARM Mbed".
8. Elizabeth Gootman et. al, "Designing Connected Products", Shroff Publisher/O'Reilly Publisher.

Course Outcomes (CO):

Sr. No.	Course Outcome Statements	% weightage
1	To understand the basics of IoT Networking.	25
2	To learn working of IoT Connectivity/Medium access protocols	25
3	To understand about IoT network layer/communication protocols	25
4	To Analyze various IoT Application layer Protocols.	25

List of Practicals /Tutorials:

1. To connect to WiFI and implement Soft API on IOT nodes.
2. To Create a standalone web server that controls outputs (two LEDs).
3. To build a web server with a slider to control the LED brightness.
4. To create an SMS notification system that sends an SMS when sensor readings are above or below a certain threshold.
5. To make HTTP GET and HTTP POST requests to get values, post JSON objects and URL encoded requests with IOT node.
6. To implement client-server communication between two IOT nodes.
7. To implement WebSocket communication protocol to control IOT node.
8. To send emails with the IOT node using an SMTP Server
9. To make HTTP POST requests to post JSON data or URL encoded values to Thing Speak.
10. To make HTTP GET requests to decode JSON data from OpenWeatherMap.org and plot values in charts using Thing Speak.
11. To use MQTT communication protocol to publish messages and subscribe to topics.
12. To create a simple LoRa Sender and LoRa Receiver with the RFM95 transceiver module.

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Supplementary Learning Material:

Introduction to the Internet of Things and Embedded Systems: https://www.coursera.org/learn/iot

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	1	2	3	1	1	1	3	2	2	3	2	2
2	3	2	2	2	1	2	2	2	1	2	1	2	1	3	3
3	3	2	3	2	3	1	1	2	2	1	1	3	3	2	2
4	2	2	1	3	2	1	2	1	3	2	2	2	1	2	3

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High) '–' No correlation

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Course code:	**IoT-3**
Name of the course:	**IoT System Design**
Semester:	**5**
Category of Course:	**IoT**

Course objectives:

To give students hands-on experience using different IoT architectures and provide skills for interfacing sensors and actuators with different IoT architectures. To apply Cloud computing, Machine learning and Data analytics for industrial applications based on IoT.

Teaching & Examination Scheme:

Teaching Scheme			Credits	Examination Marks(Maximum/Passing)		Total
				External		
L	T	P	C	ESE(T)	ESE(P)	
3	0	2	4	50/25	50/25	100/50

ESE (T): End Semester Examination (Theory)

ESE (P): End Semester Examination (Practical)

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Course Contents:

Unit	Contents	Hours
1	**Edge Devices:** Introduction, Edge Devices- Raspberry Pi, A short tour of Linux operating system, Programming edge node, Introduction to Gateways, Gateways types and configurations, Gateway as an extension of the cloud, HTTP access method using API, Introduction and installing the Raspbian Stretch OS, Headless, A short tour of Linux operating system - Computer and Rpi configuration to connect Rpi remotely without Ethernet cable via SSH, IP address, Rpi - Testing the GPIO pins through Scripts, Raspberry pi3 interfacing with Sensor DHT11, Raspberry pi python library install and reading sensor feed, Storing sensor data in cloud and in database, MySQL server on Raspi.	08
2	**Machine Learning using Python**: Pyhton basics and its libraries for machine learning, NumPy, Pandas, SciPy, MatPlotLib and SciKit Learn	08
3	**IoT and data analytics:** IoT and Data Management, Data cleaning and processing, Data storage models. Search techniques, Deep Web, Semantic sensor web, Semantic Web Data Management, Searching in IoT, Real-time and Big Data Analytics for The Internet of Things, Heterogeneous Data Processing, High-dimensional Data Processing, Parallel and Distributed Data Processing.	08
4	**Cloud of Things**: IoT Physical Servers, Cloud Offerings, and IoT Case Studies, Introduction to Cloud Storage Models, Communication API, Eclipse IoT, AWS IoT, Google Cloud IoT, ThingWorx.	06

Suggested Specification table with Marks (Theory)(Revised Bloom's Taxonomy):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20%	30%	20%	15%	15%	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Sudip Misra, Chandana Roy and Anandarup Mukherjee, "Introduction to Industrial Internet of Things and Industry 4.0", CRC Press
2. Rahul Dubey, "An Introduction to Internet of Things: Connecting Devices, Edge Gateway, and Cloud with Applications", Cengage India Publication

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3. Richardson, M., & Wallace, S. (2012). Getting started with raspberry PI. " O'Reilly Publisher Media, Inc."
4. Shrirang Ambaji Kulkarni: Introduction to IOT with Machine learning and Image Processing using Raspberry Pi, CRC Press
5. Rao, M. (2018). Internet of Things with Raspberry Pi 3: Leverage the power of Raspberry Pi 3 and JavaScript to build exciting IoT projects. Packt Publishing Ltd

Course Outcomes:

Sr. No.	Course Outcome Statements	% weightage
1	To learn Python for Machine learning applications	25
2	To understand Raspberry PI along with critical protocols and its communication to cloud.	25
3	To be able to design web/cloud based IoT applications.	25
4	Install, configure and use of AWS CLI and SDK on a Linux system with applications of various AWS services.	25

List of Practicals /Tutorials:

1. Rpi3 introduction and installing the Raspbian Stretch OS.
2. Overview of the graphic user interface for Raspian Linux distribution and operate the Raspberry Pi in "headless mode".
3. Testing the GPIO pins of Rpiby python programs and scripts.
4. Raspberry pi3 python library installation and reading sensor feed.
5. 'Plug and play ' type cloud platform overview for integration to IoT devices.
6. To create a standalone web server with a Raspberry Pi that displays temperature and humidity readings with a DHT11 sensor (Connected to 8266).
7. Control two outputs of an ESP8266 using MQTT protocol.
8. Real time license plate recognition using raspberry pi
9. Design a face recognition robot using Raspberry pi.
10. Environment setup for Android Things with Raspberry pi.
11. Implement an artificial neural network that can recognize keywords in speech.
12. Design a line follower robot using Raspberry pi.

Supplementary Learning Material:

https://onlinecourses.nptel.ac.in/noc21_cs63/preview

Linux Operating System - Course (swayam2.ac.in)

NPTEL: Computer Science and Engineering - NOC:Python for Data Science

NPTEL:: Computer Science and Engineering - NOC:Introduction to internet of things

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Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	2	3	3	2	3	3	2	2	1	1	1	3	3	2
2	3	2	2	2	3	3	2	2	2	1	2	1	1	3	2
3	2	3	3	2	3	1	1	3	2	2	2	2	3	1	2
4	3	2	2	2	1	1	3	1	2	2	2	2	1	3	1

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High) '–' No correlation

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Course code:	**IoT-5**
Name of the course:	**Industry 4.0 and IIoT**
Semester:	**6**
Category of Course:	**IoT**

Course objectives:

The objective of the course is to integrate modern technologies such as sensors, communication, and computational processing. Also, the role of CPS and IoT for industrial transformation will be studied. Students will also learn how to apply IoT in industries to modify the various existing industrial systems.

Teaching & Examination Scheme:

Teaching Scheme			Credits	Examination Marks(Maximum/Passing)		Total
				External		
L	T	P	C	ESE(T)	ESE(P)	
3	0	2	4	50/25	50/25	100/50

ESE (T): End Semester Examination (Theory)

ESE (P): End Semester Examination (Practical)

Course Contents:

Unit	Contents	Hours
1	**Introduction:** Globalization, The Fourth Revolution, LEAN Production Systems; Industry 4.0: Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artifical Intelligence, Big Data and	07

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	Advanced Analysis	
2	**Basics of Industrial IoT:** Industrial Processes-Part I, Part II, Industrial Sensing & Actuation; IIoT-Introduction, Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models-Part I, Part II, IIoT Reference Architecture-Part I, Part II; Industrial IoT- Layers: IIoT Sensing-Part I, Part II, IIoT Processing-Part I, Part II, IIoT Communication-Part I	08
3	**Industrial IoT-Big Data Analytics and Software Defined Networks:**IIoT Analytics- Introduction, Machine Learning and Data Science Part I, Part Il; Industrial IoT: Big Data Analytics and Software Defined Networks: SDN in IIoT-Part I, Part II, Data Center Networks, Industrial IoT	07
4	**Industrial IoT Security:** Fog Computing in IIoT, Security in IIoT-Part I, Part II, Industrial IoT- Application Domains; Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management. **Industrial IoT- Application Domains:** Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Real case studies.	08

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20%	30%	20%	15%	15%	0

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Sudip Misra, Chandana Roy and AnandarupMukherjee, "Introduction to Industrial Internet of Things and Industry 4.0", CRC Press
2. G Veneri Antonio, "Hands-on Industrial Internet of Things", Packt Publication.

Course Outcomes:

Sr. No.	**Course Outcome Statements**	**% weightage**
1	To study sensing and actuation in industries.	25
2	To understand the basics of industrial IoT (IIoT).	25

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3	To apply Big data analytics and Software defined networks in IIoT.	25
4	To study IIoT security and various IIoT application domains.	25

List of Practicals /Tutorials:

1. Smart Home Assistant with cloud integration
2. Intelligent and Weather Adaptive Street Lighting system
3. Development of Agricultural IoT Gateway
4. Connected Agri Warehouses cloud enabled infrastructure
5. Soldier health & Position tracking system with LORA Communication
6. e-health monitoring system for remote patient health monitoring
7. Smart Biometric Attendance System with Raspberry Pi
8. Cloud integrated smart attendance system
9. Automatic Vehicle Accident Alert System using AWS IoT.
10. Design and implement a RFID based smart attendance system.
11. Design and implement a smart liquid level monitoring system.
12. Design a Smart factory for Industry 4.0 (Sketch)

Supplementary Learning Material:

Introduction to Industry 4.0 and Industrial Internet of Things - Course (nptel.ac.in)

https://onlinecourses.nptel.ac.in/noc21_cs63/preview

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
1	3	3	2	1	2	2	1	1	1	2	1	2	3	1	2
2	3	2	1	3	2	1	1	3	2	1	3	2	2	3	2
3	2	3	3	1	1	3	2	3	3	1	2	1	3	2	2
4	3	1	1	2	2	2	3	1	3	1	2	2	1	3	2

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High) '–' No correlation

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Detailed Syllabus

Course code:	**IoT-6**
Name of the course:	**Mini-project**
Semester:	**6**
Category of Course:	**IoT**

Course objectives:

The main objective of Mini Project is to let the students apply the knowledge of theoretical concepts which they have learnt as a part of the curriculum of the minor degree using real time problems or situations.

Teaching & Examination Scheme:

Teaching Scheme			Credits	Examination Marks(Maximum/Passing)		Total
				External		
L	T	P	C	ESE(T)	ESE(P)	
0	0	4	2	00	100/50	100/50

ESE (T): End Semester Examination (Theory)

ESE (P): End Semester Examination (Practical)

Guidelines:

- The mini project is desirable to be done in a group of 2 students. Each group has to prepare a title related to any engineering discipline, and the title must emulate any real-world problem.
- Submit an early proposal. This proposal is a 1-2page(s) report, describes what the project is about and the final product's output. The project proposal will be submitted to the respective guide

Course Outcomes (CO):

Sr. No.	Course Outcome Statements	% weightage
1	Understand, plan, and execute a Mini Project with team.	25
2	To acquire knowledge within the chosen area of technology for project development.	25
3	Identify, discuss, and justify the technical aspects of the chosen project withacomprehensive and systematic approach.	25
4	Communicate and report effectively project related activities and findings.	25

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PROGRAM OUTCOMES (POs)

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.

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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.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Ability to conceptualize interdisciplinary domain knowledge to specific branch of engineering.
2. Ability to acquire employability skills and deep knowledge in emerging and multidisciplinary areas.
3. Carryout engineering projects in broad areas of engineering.

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