DEVI AHILYA VISHWAVIDYALAYA, INDORE

School of Instrumentation

1.1.1
Program outcome and course outcome

Course structure for M. Tech. (Internet of Things)

(Started from July 2018 Batch)

LEGEND: The numbers that appear at the end of each course title 3, 4, 6, 8, etc. indicate the credits and contact hours per week. Theory courses as of four (three) credits are to be covered in 45 (34) lectures each of one hour in a semester.

The origin of School of Instrumentation has been towards contributing to the domain of Instrumentation with a vision to focus on education, research, entrepreneurship, innovation and be in the forefront in each and every emerging area in it.

In the recent era of technological revolution being unleashed by the Internet of Things (IoT) due to the availability of extremely low cost and low power hardware platforms in the form of Embedded System boards and within the single chip , we are seeing the development of a new convergence between hardware and software. Its effect is being seen in the rapid evolution it is developing in different domains, such as, automation, e-health, mobile communication, smart home, automotive sector, consumer electronics, pervasive computing, computer architecture, etc. Therefore, there is a need to utilize this field by educating and training the future students to use this field of technology and to support the mandate of MAKE IN INDIA concept of Govt. of India.

Programme Outcomes (POs)

1. Graduates would have inclusive technical knowledge to provide engineering solutions in a contemporary, global, economical, environmental and societal context for sustainable development in the field of intelligent systems.

2. Graduated would acquire soft and writing skill through seminar, project writing and thesis presentation for effective dissemination of knowledge

3. They would have the aptitude to learn continuously and to adapt continuous development in the related field.
4. To train graduates to show professionalism, fulfill the ethical values in their profession and relate engineering issues to benefit the society as well as environment.
5. To value the importance of goal-setting and to realize the need for life-long reflective learning

Programme Specific Outcomes (PSOs)

The Programme specific Objectives of M.Tech. (IOT) Program is to become a successful professional and have the capability to handle independent projects.

1. Enhanced knowledge in the field of Intelligent instrumentation in a global context and the ability to utilize the knowledge for solving the various engineering problems in that area.
2. Ability to carry out significant advances for conducting research in a wider perspective according to the latest trend of technology.
3. Ability to propose realistic and best solutions with due consideration to safety, cultural, societal and environmental factors for various real-life engineering problems in the field of Instrumentation.
4. Aptitude to design, develop and propose theoretical and practical methods to resolve complex engineering problems in the field of intelligent Instrumentation networks.
5. Capability to develop and utilize modern tools for solving various engineering problems in the field of Instrumentation.
6. Competent to design processes systems and deliver solutions considering health, safety, manufacturability, societal and environmental factors in ethical and legal manner.

SCHEME OF EXAMINATION: TWO-YEAR (4 SEMESTER) COURSE

FIRST SEMESTER

Semester 1

ISC 751 SYSTEMS DESIGN ENGINEERING	The student should be able • To critically read and analyse information to write systems engineering tools • Apply creative thinking and engineering design processes • Apply Systems Engineering processes that encapsulates all areas of design
ISC 753 WIRELESS SENSOR PROTOCOLS & PROGRAMMING	Students will • able to work on some existing applications of wireless sensor actuator networks • able to apply these principles in the context of wireless sensor networks • learn the various hardware, software platforms that exist for sensor networks • get an overview of the various network level protocols for MAC, routing, time synchronization, aggregation, consensus and distributed tracking
ISC 755 EMBEDDED SYSTEM DESIGN	Students will • Acquire knowledge about microcontrollers embedded processors and their applications. • Able to understand the internal architecture and

	interfacing of different peripheral devices with different types of Microcontrollers. • Able to write the programs for microcontroller in different languages • Understand the role of embedded systems in automation and in different industries. • Understand the design concept of embedded systems.
ISG757 PYTHON FOR IOT	Students will learn • to design and develop programming for the interfacing of practical IoT devices and computer hardware. • how to use Python-based IDE (integrated development environments) for the different intelligent boards. • How to trace and debug Python code on the device.
ISG 763 Introduction to Nanoelectronics and MEMS/NEMS Devices:	Students will learn • To explain the fundamental theory, design engineering and working principles of Micro/Nano Electromechanical Systems (MEMS/NEMS) and microsystems • To be able to explain the different sensing an actuation methods.

	• To be able to recognise optimal micro-fabrication, micro-machining, packaging techniques and process flows for micro devices and systems • Distinguish the design, fabrication and packaging techniques applicable to microsystems specially for integrated circuits.

SEMSTER-II

IS 752 **IOT ARCHITECTURE AND PROTOCOLS**	Students will be able • To Understand the Architectural of IoT • To Understand the IoT Reference Architecture and Real World Design Constraints • To Understand the various IoT Protocols for different layers such as Datalink, Network, Transport, Session, Service • To design and write the different test protocols in different layers
IS754 BIG DATA AND CLOUD COMPUTING	Students will be able • Understand challenges with Big Data Analysis. • Understand different types of cloud platforms. • Get the knowledge about the different reasons for adopting a cloud solution, and the challenges with these different reasons.

	• Implement and configure a big data analysis, including configuring the cloud platform and (if applicable) database. • Independently set up a development environment consisting of local machine configurations and cloud based servers.
IS756 **REAL TIME OPERATING SYSTEMS EMBEDED OS**	Students will be able • To understand the issues in real time computing • To solve scheduling problems and can apply them in real time applications • Design an RTOS and will be able to interpret the feasibility of a task To build the device driver and kernel internal for Embedded OS
IS758 COMMUNICATION TECHNOLOGIES FOR IOT	Students will be able • To understand wireless communication technologies, IoT system architecture, security requirements of IoT applications and its solutions. • To know about the building blocks of the IoT system architecture with more focus on wireless communication technologies and security components. • To analyze and compare relevant protocols, networking technologies, and various security solutions that allow them to make correct design choices and tradeoffs based on application requirements.

ISE 766 IOT: Legal Issues	Students will be able • To understand about the privacy, transparency and data ownership. • To gain the relevant knowledge about the breach of confidence, cybersecurity threats, and e-surveillance • To critically examine whether privacy protection laws, consent, and confidentiality measures are fit for purpose and proportionate given demands of the market

THIRD and Fourth Semester

IS851 Project cum Training

(i)	Mid-term evaluation	06
(ii)	Comprehensive Viva voce – III	04
(iii)	Final Project evaluation	12
(iv)	Final Project presentation	06
(v)	Comprehensive Viva voce – IV	04
	Total Credits:	**32**

Course structure for M. Tech. (Instrumentation)
(Revised from July 2017 Batch)

LEGEND: The numbers that appear at the end of each course title 3, 4, 6, 8, etc. indicate the credits and contact hours per week. Theory courses as of four (three) credits are to be covered in 45 (34) lectures each of one hour in a semester.

Objectives:

The programme is designed to educate in the field of Instrumentation. Our strength is in the field of Embedded System, Automation and Signal processing. The programme trains students to become professionals who are competent to choose from various methods when facing a particular problem in the field of Instrumentation.

Programme Outcomes (POs) :

1. Graduates would have inclusive technical knowledge with capability to identify and solve the complex problems with the help of modern tools in Instrumentation and related fields.

2. Graduated would acquire soft and writing skill through seminar, project writing and thesis presentation.

3. They would have the aptitude to learn continuously and to adapt continuous development in the related field.

4. To train graduates to show professionalism, fulfill the ethical values in their profession and relate engineering issues to benefit the society as well as environment.

Programme Educational Outcomes (PEOs) :

1. The Programme Educational Objectives of this Programme is to become a successful professional and have the capability to handle independent projects.

2. Enhanced knowledge in the field of Instrumentation in a global context and the ability to utilize the knowledge for solving the various engineering problems in that area.

3. Ability to carry out significant advances for conducting research in a wider perspective according to the latest trend of technology.

4. Ability to propose realistic and best solutions with due consideration to safety, cultural, societal and environmental factors for various real-life engineering problems in the field of Instrumentation.

5. Aptitude to design, develop and propose theoretical and practical methods to resolve complex engineering problems in the field of Instrumentation.

6. Capability to develop and utilize modern tools for solving various engineering problems in the field of Instrumentation.

SCHEME OF EXAMINATION: TWO-YEAR (4 SEMESTER) COURSE
FIRST SEMESTER
List of Core Courses:

ISC-701 Process Control and Automation	the student will be able to • understand the theory and practical approach of controllers • type of controller that can be used for specific problems in industry. • design of controllers for interacting multivariable systems.
ISC-703 Microcontroller Based System Design-I	The student will be able to: • Understand the architecture, hardware, programming and interfacing of the different 8-bit microcontroller • Develop microcontroller based systems for real time applications • Understand the basic concepts of embedded system design and its applications to various fields
ISC-705 Industrial Transducer	The student will be able to: • Understand the concept of different sensor, its hardware schematics, level of integration , transduction principle • Gain knowledge on IEEE 1451 smart transducer interface for sensor and actuator • Understand the functionality and usage of different types of sensors used extensively in industrial and in different sectors of automation
ISC-707 Instrument Technology Lab-I	The students will be familiar with • Understand the different parameters of the sensors and transducers • Design of signal conditioning circuits for a given sensor • Design and tuning of different controllers for different activities • Modelling of a given system • Implementation of simple closed loop control system in real time • Use of Microcontroller for the design of standalone instrumentation systems
List of Generic Elective (Any Two):	
ISG-711 Industrial Electronics	the student will be able to: • Understand the operation of controlled rectifiers, choppers, inverters and their applications • study about voltage source inverter, current source inverter and PWM • Learn about the applications of power semiconductor devices for the speed control of AC and DC motors

ISG-713 Analytical Instrumentation	The students will be able to • Understand various fundamentals of spectroscopy, qualitative and quantitative analysis. • Apply to analyse the different spectroscopic data
ISG-715 Computer Graphics and Computer aided Instrument design	The students will be able • to acquire knowledge of computer graphics tools, animation and its controlling techniques of instrument systems • understand the fundamental concepts of computer graphics, learn how to integrate Design and Manufacturing Systems through incorporation of computers Identify
List of Elective:	
ISE-720 Computer Programming and Numerical Technique	The students will be able to • use syntax-related concepts including context-free grammars, parse trees, recursive-descent parsing, printing, and interpretation. • Implement the different features of object-oriented language and functional languages. • Implement the different numerical techniques for the purpose of different calculations used in different courses.

SECOND SEMESTER

ISC-702 Computer Controlled and SCADA Systems	The student will • Design, Monitor**,** analyze and control the various process parameters of industrial process. • Learn state of art control techniques (PLC and SCADA, DCS)
ISC-704 Micro-controller based system design -II	The student will be able to Acquire knowledge about Top-down SoC design flow. Understand the ASIC Design flow and EDA tools.
ISC-706 VLSI Design	The student will be able to • Understand the basic Physics and Modelling of MOSFETs • Learn the basics of Fabrication and Layout of CMOS Integrated Circuits Model digital systems in VHDL and Systems at different levels of abstraction. • Simulate and verify a design • Use computer-aided design tools to synthesize, map, place, routing, and download the digital designs on the FPGA board
ISC-708 Instrument Technology Lab-II	The students will be familiar with • Understand the different parameters PLC • Interfacing of several sensors with the Microcontroller to get real time data Use of FPGA for the design of instrumentation systems

List of Generic Elective (Any Two):	
ISG-712 Bio-Medical Instrumentation	The student will be able to: • Know the human anatomy and physiological signal measurements • Learn about the techniques used for measurement of Blood flow, blood pressure, respiration rate and body temperature • Analyze the recording of ECG, EEG, EMG and ERG signals • Understand the concept of assisting and therapeutic devices
ISG-714 Digital Control Systems	The students will be able to • the fundamentals of various discrete-time systems. • employing a digital computer in the process loop. adaptive control paradigm
ISG-716 Digital Signal Processing	**T**he student will be able to: • Demonstrate theoretical foundation on digital signal processing; understand the relationship between systems and signals, describe systems or filters using input–output equation, impulse response, frequency response, and transfer function • Use FFT for signal analysis with the understanding of sampling effects and windowing effects
List of Elective:	
ISE-722 Computer Networks	The students will be able to • Gain the basic knowledge of various computer networks both wired and wireless types • Understand network architecture, TCP/IP and OSI reference models • Identify and understand various techniques and modes of transmission • Understand network security and define various protocols such as FTP, HTTP, Telnet, DNS

Total Credits: 32

THIRD and Fourth Semester
ISC 801 Project cum Training:

(i)	Mid-term evaluation	08
(ii)	Comprehensive Viva voce – III	04
(iii)	Final Project evaluation	10
(iv)	Final Project presentation	06
(v)	Comprehensive Viva voce – IV	04
	Total Credits:	**32**