SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHAVIDYALAYA

(Deemed to be University U/S 3 of UGC Act 1956) (Accredited with "A" Grade by NAAC)
Enathur, Kanchipuram – 631561

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CURRICULUM AND SYLLABUS FOR FULL TIME

B.E. (Hons.) Computer Science and Engineering with Specialization in Internet of things

(Applicable for students admitted from 2025-2026 onwards)

REGULATION AY 2025-2026

B.E. (Hons.) Computer Science and Engineering with Specialization in Internet of things

These regulations are applicable to the students admitted from the AY 2025-26 Onwards.

CHOICE BASED CREDIT SYSTEM FOR B.E. (HONS.) CSE with IOT FULL-TIME PROGRAMME CREDITS

Theory courses: Courses with 4/3 credits will be assigned 3 Lectures and 2/1 Tutorial hours per week.

Practical courses: Courses with 2 credits will be assigned 4 hours of lab/practical work per week

From semester III to VII, the honors. Credits distribution as follows

Sl.No	Semester	Credits
1.	III	3
2.	IV	5
3.	V	3
4.	VI	3
5.	VII	5
Total		**19**

For the award of the Hons./Minor degree, a student has to earn a minimum of 19 credits.

DURATION OF THE PROGRAMME

A student is normally expected to complete B.E. (HONS.) CSE with IOT programme in four years and in any case, not more than seven years from the time of admission.

REGISTRATION FOR COURSES

A newly admitted student will automatically be registered for all the courses prescribed for the first year, without any option.

All other students shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration, with the approval of the Dean on the recommendation of the Head of the Department, along with a late fee will be done, up to the last working day.

Registration for the project work shall be done only for the final semester.

ASSESSMENT

The break-up of assessment and examination marks for theory subjects is as follows.

First Assessment Test	:	15 Marks
Second Assessment Test	:	15 Marks
Assignment & Attendance (seminars, group discussion)	:	10 Marks
Total (Internal Marks)	:	40 Marks
End semester Examination (External Marks)	:	60 Marks
Total (Internal + External)	:	100 Marks

The break-up of the assessment and examination marks for practical is as follows.

Observations	:	15 Marks
Model Test	:	15 Marks
Record book & Attendance	:	10 Marks
Total (Internal Marks)	:	40 Marks
End semester Examination (External Marks)	:	60 Marks
Total (Internal + External)	:	100 Marks

The project work will be assessed for 40 marks by a committee consisting of the Guide and the Head of the Department. The Head of the Department shall be the Chairman. 60 marks are allotted for the project viva voce examination at the end of the semester.

WITHDRAWAL FROM A COURSE

A student can withdraw from the course at any time before a date fixed by the Head of the Department prior to the second assessment, with the approval of the Dean on the recommendation of the Head of the Department.

TEMPORARY BREAK OF STUDY

A student can take a one-time temporary break of study covering the current year/semester and/or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid-semester test. However, the student must complete the entire program within the maximum period of seven years.

SUBSTITUTE ASSESMENT

A student, who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the end semester examination, may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the commencement of the end-semester examination.

A student who wishes to have a substitute assessment for a missed assessment must apply to the concerned faculty member within a week from the date of the missed assessment.

ATTENDANCE REQUIREMENTS

To be eligible to appear for the examination in a particular course, a student must put in a minimum of 80% of attendance in the course. However, if the attendance is 70% or above but less than 80% in any course, the authorities can permit the student to appear for the examination in the course on payment of the prescribed condonation fee.

A student who withdraws from or does not meet the minimum attendance requirement in the course must re-register for and repeat the course.

PASSING AND DECLARATION OF EXAMINATION RESULTS

All assessments of all the courses on the absolute mark basis will be considered and passed by the results passing board in accordance with the rules of the University. Thereafter, the Controller of Examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average & cumulative grade point average and prepare the grade cards.

90 to 100 marks	-	Grade 'S'
80 to 89 marks	-	Grade 'A'
70 to 79 marks	-	Grade 'B'
60 to 69 marks	-	Grade 'C'
55 to 59 marks	-	Grade 'D'
50 to 54 marks	-	Grade 'E'
less than 50 marks	-	Grade 'F'
Insufficient attendance	-	Grade 'I'
Withdrawn from the course	-	Grade 'W'

A student who obtains less than 50 marks out of 100 in the subject or less than 24 out of 60 in

External exam or is absent for the examination will be awarded Grade 'F'.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course and earned the credits for that course. Such a course cannot be repeated by the student.

A student who obtains letter grade F in a course has to reappear for the examination in that course.

The following grade points are associated with each letter grade for calculating the grade point average.

S – 10; A-9; B-8; C-7; D-6; E-5; F-0

A student can apply for revaluation of one or more of his /her examination answer papers within a week from the date of issue of Grade sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After results are declared, Grade cards will be issued to the students. The Grade card will contain the list of courses registered during the year/semester, the grades scored and the grade point average (GPA) for the year/semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the Year/Semester , divided by the sum of the number of credits for all courses taken in that year/semester. CGPA is similarly calculated considering all the courses taken from the time of admission.

After successful completion of the program, the Degree will be awarded with the following classification based on CGPA:

For First Class with Distinction, the student must pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First Class, the student must pass within four years from the time of admission and obtain a CGPA of 6.5 or above.

For Second Class, the student must pass within seven years from the time of admission.

B.E. (Hons.) Computer Science and Engineering with Specialization in Internet of things

Honors Course						
Sl.No	**Semester**	**Course Title**	**L**	**T**	**P**	**C**
1.	III	Introduction to Internet of Things	3	0	0	3
2.	IV	Embedded Systems and Sensors with Lab	3	0	4	5
3.	V	Communication and Networking Technologies for IoT	3	0	0	3
4.	VI	IoT Architecture and Programming	3	0	0	3
5.	VII	Industrial Applications of IoT with Lab	3	0	4	5
Total						**19**

III – SEMESTER

Course Code		L	T	P	C
Course Title	INTRODUCTION TO INTERNET OF THINGS	3	0	0	3

PRE-REQUISITES

Basic Knowledge of Computers, Fundamentals of electronics, Basic Understanding of communication concepts

OBJECTIVES

•	To understand the fundamental concepts, evolution, and key characteristics of IoT.
•	To understand interfacing techniques and basic hardware components involved in IoT implementation.
•	To understand IP addressing, protocols, and data transmission methods in IoT systems.
•	To explore basic IoT platforms, cloud concepts, and tools for data collection and visualization.
•	To study real-world IoT applications across various domains such as smart homes and healthcare.

COURSE OUTCOMES

At the end of course, the students will be able to

1.	Understand the basic concepts, architecture, and components of IoT systems.
2.	Identify and describe various IoT hardware devices such as sensors, actuators, and microcontrollers.
3.	Explain different communication technologies, protocols, and data transmission methods used in IoT.
4.	Apply basic IoT platforms and tools for data collection, visualization, and simple application development.
5.	Analyze real-world IoT applications, along with their benefits, challenges, and future trends.

POs and COs MAPPING TABLES

	PO 01	PO 02	PO 03	PO 04	PO 05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO 01	3	2	-	-	1	-	-	-	-	-	-	2	2	1	1
CO 02	3	2	1	-	2	-	-	-	-	-	-	2	2	1	1
CO 03	3	2	1	-	2	-	-	-	-	-	-	2	2	1	1
CO 04	2	2	2	1	3	-	-	-	1	1	-	2	1	2	2
CO 05	2	2	1	1	1	2	2	1	1	1	-	2	1	2	2

LEGEND: 1-LOW, 2 – MEDIUM, 3-HIGH

UNIT – I	BASICS OF INTERNET OF THINGS	9

Definition of Internet of Things – evolution of IoT – characteristics of IoT – IoT vs Internet – basic components of IoT (sensor – actuator – controller – network) – working principle of IoT systems – introduction to smart devices and connected systems.

UNIT – II	IoT HARDWARE AND DEVICES	9
Introduction to sensors and actuators – basic sensor types (temperature – humidity – light – motion) – microcontrollers used in IoT (Arduino – NodeMCU) – interfacing concepts – switch mode power supply – embedded boards used in IoT.		
UNIT – III	**IoT COMMUNICATION FUNDAMENTALS**	**9**
Introduction to communication in IoT – wired and wireless communication – Wi-Fi – Bluetooth – Zigbee basics – IP addressing concept – basic idea of protocols (HTTP – MQTT overview only) – data transmission in IoT.		
UNIT – IV	**IoT PLATFORMS AND TOOLS**	**9**
Introduction to IoT platforms – cloud basics for IoT – simple platforms (ThingSpeak – Blynk) – data collection and visualization – mobile app interaction – basic dashboard creation – introduction to web interfaces for IoT.		
UNIT – V	**IoT APPLICATIONS AND CASE STUDIES**	**9**
Introduction to IoT applications – smart home systems – smart agriculture – healthcare monitoring – industrial applications overview – advantages and challenges of IoT – future scope of IoT**.**		

TEXT BOOKS

1.	Bahga, Arshdeep and Madisetti, Vijay, "Internet of Things: A Hands-on Approach", Universities Press, 1st Edition, 2015.
2.	Buyya, Rajkumar and Dastjerdi, Amir Vahid, "Internet of Things: Principles and Paradigms", Morgan Kaufmann Publishers, 1st Edition, 2016.
3.	Raj Kamal, "Internet of Things: Architecture and Design Principles", McGraw Hill Education / McGraw Hill India, 2nd Edition, 2023.

REFERENCES

1.	Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key Applications and Protocols", John Wiley & Sons / Wiley, 2nd Edition, 2012.
2.	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, 1st Edition, 2017.

LEARNING OUTCOMES

By the end of this course, learners will be able to:

1.	Understand the fundamental concepts, architecture, and components of IoT systems.
2.	Identify and describe various sensors, actuators, and microcontrollers used in IoT.
3.	Explain basic communication technologies and protocols involved in IoT systems.
4.	Apply simple IoT platforms and tools to collect, monitor, and visualize data.
5.	Analyze real-world IoT applications and evaluate their impact, challenges, and future scope.

PREPARED BY

Dr R. Govindarajan & Dr N C A Boovarahan (Department of CSE)

Course Code		L	T	P	C
Course Title	EMBEDDED SYSTEMS AND SENSORS	3	0	4	5

PRE-REQUISITES

Basic knowledge of digital electronics, Fundamentals of microprocessors/microcontrollers, C programming, Basic concepts of analog electronics and control systems.

OBJECTIVES

- To understand embedded hardware architecture and microcontroller internals.
- To develop real-time embedded firmware using interrupts and scheduling techniques.
- To study sensor engineering, calibration, and signal conditioning methods.
- To design embedded control systems with sensors and actuators.
- To implement edge-level intelligent embedded systems.

COURSE OUTCOMES

At the end of course, the students will be able to

1.	Understand embedded system hardware architecture and microcontroller operations.
2.	Apply real-time programming concepts using interrupts, timers, and scheduling techniques.
3.	Analyze sensor characteristics and implement signal conditioning techniques.
4.	Design embedded control systems with sensor interfacing and actuator control.
5.	Develop and integrate intelligent embedded systems using edge computing concepts.

POs and COs MAPPING TABLES

	PO 01	PO 02	PO 03	PO 04	PO05	PO 06	PO 07	PO 08	PO 09	PO 10	PO 11	PO 12	PSO 01	PSO 02	PSO 03
CO 01	3	2	1	1	1	-	-	-	-	-	-	1	3	2	1
CO 02	2	2	2	2	1	-	-	-	1	-	-	2	2	2	1
CO 03	2	2	1	2	1	-	-	-	-	-	-	1	2	1	1
CO 04	2	2	2	1	1	-	-	-	1	1	-	1	1	1	2
CO 05	2	2	2	1	2	1	1	-	1	1	-	2	2	2	2

LEGEND:1-LOW, 2 – MEDIUM, 3-HIGH

UNIT – I	**EMBEDDED HARDWARE DESIGN**	**9**

Embedded system hardware components – microcontroller architecture (AVR – ARM Cortex-M) – register level programming concepts – clock systems – watchdog timers – memory mapping and bus architecture – GPIO architecture and configuration – power management in embedded systems – PCB level considerations for embedded design.

UNIT – II	**REAL-TIME EMBEDDED SYSTEMS AND FIRMWARE DESIGN**	**9**

Interrupt driven programming – timers – counters – PWM generation – real-time constraints and deterministic behavior – task scheduling (cooperative and preemptive) – embedded

firmware design patterns – state machines in embedded systems – low power firmware techniques (sleep modes) – debugging techniques (JTAG – serial debugging).		
UNIT – III	**SENSOR ENGINEERING AND SIGNAL CONDITIONING**	**9**
Sensor classification (active – passive – analog – digital) – sensor characteristics (accuracy – drift – hysteresis – linearity) – calibration techniques and error compensation – signal conditioning circuits (operational amplifiers – filters) – analog front end design – noise reduction techniques – data acquisition systems – practical challenges in sensor interfacing.		
UNIT – IV	**ADVANCED SENSOR INTERFACING AND EMBEDDED CONTROL**	**9**
Multi-sensor interfacing – ADC resolution and sampling theory – sensor fusion basics – actuator interfacing (DC motor – stepper motor – servo – relay) – closed loop control systems – PID basics – embedded control applications (temperature control – speed control) – system reliability and fault tolerance.		
UNIT – V	**EDGE INTELLIGENCE AND EMBEDDED SYSTEM INTEGRATION**	**9**
Edge computing in embedded systems – lightweight data processing – TinyML basics – energy efficient embedded design – system integration (sensor – controller – actuator) – hardware software co-design – case studies (smart energy meter – embedded health monitoring – industrial sensor node) – design of standalone intelligent embedded system.		

LIST OF EXPERIMENTS

UNIT – I	**EMBEDDED HARDWARE DESIGN**
1.	LED running light using time delay setting.
2.	LED dim and bright using PWM techniques.
UNIT – II	**REAL-TIME EMBEDDED SYSTEMS AND FIRMWARE DESIGN**
3.	Object detection using ultrasonic sensor.
4.	Fire alarm system using flame sensor.
UNIT – III	**SENSOR ENGINEERING AND SIGNAL CONDITIONING**
5.	Interface and analyze temperature sensor (LM35 / DHT11).
6.	Smart Lighting system using LDR and Relay.
UNIT – IV	**ADVANCED SENSOR INTERFACING AND EMBEDDED CONTROL**
7.	Motion based Security System using PIR Sensor and buzzer.
8.	Smart dust bin system using ultrasonic sensor and servo motor.
UNIT – V	**EDGE INTELLIGENCE AND EMBEDDED SYSTEM INTEGRATION**
9.	Water level monitoring and Pump control using Ultrasonic sensor and relay.
10.	Multi-Sensor Smart Control System for plant monitoring system.

Lab Tools / Components and Environments

- Microcontroller boards (Arduino development board, NodeMCU)
- Digital Multimeter
- DC motor
- Servo Motors
- Sensors (LDR, LM35, DHT11, PIR Sensor, Ultrasonic sensor, flame sensor, water level sensor,

Soil moisture sensor, TDS sensor)

- Op-amps (IC 741/LM358)
- Motor driver modules
- DC Pump motor
- Relay modules
- Breadboards, LEDs, Resistors, Capacitors, Buzzers, Variable potentiometers
- LED dot matrix display, LCD display I2C module
- Power board, Power supply, Connecting wires

Programming Environment:
Arduino IDE

TEXT BOOKS & REFERENCES

1.	Raj Kamal , "Embedded Systems: Architecture, Programming and Design", Tata McGraw-Hill Education, 2nd Edition,2017.
2.	K. V. Shibu, "Introduction to Embedded Systems" Tata McGraw-Hill Education, 2nd Edition, 2017.
3.	Jacob Fraden "Handbook of Modern Sensors: Physics, Designs and Applications" Springer, 5th Edition, 2016.

REFERENCES

1.	Frank Vahid and Tony Givargis "Embedded System Design: A Unified Hardware/Software Introduction" John Wiley & Sons, 2nd Edition, 2001.
2.	Michael J. Pont "Embedded C Programming and the Microcontroller", CRC Press, 2nd Edition, 2017.
3.	John G. Webster "Measurement, Instrumentation, and Sensors Handbook" CRC Press, 2nd Edition, 2014.
4.	Charles Platt "Make: Sensors" Maker Media, 2nd Edition, 2018.
5.	Dogan Ibrahim "ARM-Based Embedded Systems" Newnes (Elsevier),1st Edition, 2017.
6.	Pete Warden and Daniel Situnayake "TinyML: Machine Learning with TensorFlow Lite on Arduino and Ultra-Low-Power Microcontrollers", O'Reilly Media 1st Edition, 2019.

LEARNING OUTCOMES

By the end of this course, learners will be able to:

1.	Explain and interpret the architecture of embedded systems and microcontroller components.
2.	Implement and demonstrate interrupt-driven programs, timers, PWM, and basic scheduling techniques in embedded systems.
3.	Analyze and evaluate sensor characteristics and design suitable signal conditioning circuits for accurate data acquisition.
4.	Design and develop embedded systems integrating sensors and actuators for closed-loop control applications.
5.	Develop and integrate intelligent embedded solutions using edge computing and basic TinyML concepts.

PREPARED BY

Dr.T.Lakshmibai, Dr.T.Dinesh Kumar & Dr.R.Govindarajan