DEPARTMENT OF ELECTRONIC AND COMMUNICATION ENGINEERING

M. Tech (EMBEDDED SYSTEMS)

Estd. 1995

About the Program:

Master of Technology in *Embedded Systems* is a two-year post-graduate program dedicated to enlightening students within-depth knowledge on Embedded systems, its control, real-time systems, model-based design and verification, PCB level integration, processor architecture and the applications of embedded systems in real-life. The program offer students with a strong base of Embedded Systems principles and applications in scientific and engineering domains.

Brief view of the Program:

- ✓ **Program Name:** M. Tech (Embedded Systems)
- ✓ **Duration:** 2 Years (4Semesters)
- ✓ **Offered by the Department:** Electronics & Communication Engineering
- ✓ **Program offered since:** 2006
- ✓ **Sanctioned Intake**: 18

Objectives of the Program:

- ❖ Demonstrate outstanding analytical & technical skills to evaluate, analyze and solve real time problems in Embedded Systems.
- ❖ Apply the acquired knowledge to solve engineering problems to suit multidisciplinary situations.
- ❖ Undertake research and development projects in the field of Embedded Systems.
- ❖ Continue the personal development through professional study and self-learning.
- ❖ Demonstrate their professional, ethical and social responsibilities and contribute their part for addressing various global issues.

Expected outcomes / deliverables of the Program:

After the successful completion of the program, students of the program will exhibit the following attributes:

- ❖ Apply the acquired knowledge from undergraduate engineering and other disciplines to identify, formulate and present solutions to technical problems related to various areas of Embedded Systems.

- ❖ Learn advanced technologies and analyze complex problems in the fields of Embedded System design along with the fundamental concepts of engineering.

- ❖ Addressing specific problems in the field of Embedded System in the form of mini projects, analysis, and interpretation of data and synthesis of information to provide valid conclusions by considering societal and environmental factors in the core areas of expertise.

- ❖ Plan and conduct systematic study on a significant research topic effective to the societal, health, legal and environmental issues in the field of Embedded Systems.

- ❖ Use the techniques, skills, modern Integrated Development Environment (IDE) tools, Operating systems, software and equipment necessary to evaluate and analyze the systems in Real time environments.

- ❖ Ability to manage team effectively and become good leaders.

- ❖ Understand the scenario of global business.

- ❖ Demonstrate effective oral and written communication skills in accordance with technical standards.

- ❖ Develop confidence and motivation for self-education and imbibe professional values for lifelong learning.

- ❖ Understand and commit to professional ethics, social responsibilities and norms of engineering practice.

- ❖ Become knowledgeable about contemporary developments by self-learning.

Unique outcomes / deliverables of this Program include:

- ➢ Identify, formulate and solve engineering problems in the broad areas like System Design using Embedded Platforms, Applications in Signal Processing, Machine Vision , Artificial Intelligence and Communication Networks.
- ➢ Use different software tools in the domain of Embedded Systems, for developing applications based on ARM processor core SoC and DSP processor.
- ➢ Integrate multiple sub-systems to optimize performance of Embedded Systems and excel in industry sectors related to Embedded Systems domain.

Embedded System Design Program Highlights:

- o M. Tech Embedded Systems is a PG Program is approved by UGC, AICTE and JNTU Hyderabad
- o It is of four semesters that makes the student to explore contemporary technologies and makes the student industry ready with a focus towards research and promotes self-learning.
- o Dedicated faculty with rich experience to provide exploration of good opportunities.
- o This offers a set of core programs and elective programs, allowing students to specialize in Internet of Things, Machine Learning, Embedded System Design and Implementation methodologies.
- o This program makes use of Languages and Tools such as Embedded C, Python, Verilog HDL, C++, Data Structures, MATLAB, Keil u Vision 5, Code Composer Studio, GCC Compiler, Xilinx-ISE.
- o Improves the research methodology and self-learning using Technical seminars and project works.
- o The Dissertation (Major Project Work) in the third and final semester enables students to closely work with faculty with funded projects with good stipend / work with industry using internships that enables the student to see many opportunities after the graduation and they project their project work in renowned journals or conferences.
- o This program uses a Continuous Evaluation System, mentoring and monitoring by a dedicated program coordinator who will assist the students in the entire journey of 2 years of the program and motivates the students towards the dreams accomplishment.
- o Uses the latest teaching methodologies like WIT & WIL, Program Based Projects, Learning By Doing, Lab Protocol, Story Board that escalates the learning process of the students.
- o Visit to industry premises in regular time that stimulates the students to be ready for industry orientation / research promotion.
- o Facilitates the student world-class infrastructure like High-end computing facility (Dedicated servers, GPUs, LMS and High-end PCs)

Program Curriculum:

The program curriculum of Embedded Systems is designed that meets the aspirations of the industry with practical approach, research orientation and with great social impact. The curriculum includes programs related to Core contents of the Course, Professional electives and Open electives. In each elective the Course offers a collection of rich and contemporary programs that enables the student a good choice.

Semester-1 R18

Course Type	Course Code	Name of the Course	L	T	P	Credits
Core-I	18PC1VS01	Simulation and Synthesis with PLDs	3	0	0	3
Core-II	18PC1ES01	Processors for Embedded System Design	3	0	0	3
Core-III	18PC1ES02	Programming Languages for Embedded Software	3	0	0	3
PE-I	18PE1ES01	Artificial Intelligence	3	0	0	3
	18PE1ES02	Internet of Things				
	18PE1ES03	Communication Buses and Interfaces				
PE-II	18PE1ES04	Parallel Processing	3	0	0	3
	18PE1ES05	Advanced Communication Networks				
	18PE1VS03	Advanced Digital Signal Processing				
Lab-1	18PC2VS01	Simulation and Synthesis with PLDs Laboratory	0	0	3	1.5
Lab-2	18PC2ES01	Processors for Embedded System Design Laboratory	0	0	3	1.5
Project	18PW4ES01	Technical Seminar	0	0	4	2
Audit	18AU5CS01	Research Methodology and IPR	2	0	0	0
		Total	**17**	**0**	**10**	**20**

Semester-2 R18

Course Type	Course Code	Name of the Course	L	T	P	Credits
Core-IV	18PC1ES03	System Design with Embedded Linux	3	0	0	3
Core-V	18PC1ES04	Wireless and Mobile Communications	3	0	0	3
Core-VI	18PC1CP03	Machine Learning	3	0	0	3
PE-III	18PE1ES06	SOC and NOC Architecture	3	0	0	3
	18PE1ES07	Network Security and Cryptography				
	18PE1ES08	Advanced Computer Architecture				
PE-IV	18PE1VS08	Image and video processing	3	0	0	3
	18PE1ES09	Sensors and Actuators				
	18PE1ES10	High Performance Networks				
Lab-3	18PC2ES02	System Design with Embedded Linux Laboratory	0	0	3	1.5

Lab-4	18PC2ES03	Machine Learning and Wireless Communications Laboratory	0	0	3	1.5
Project	18PW4ES02	Mini Project	0	0	4	2
Audit	18AU5EN01	English for Academic and Research Writing	2	0	0	0
		Total	**17**	**0**	**10**	**20**

Semester-3   **R18**

Course Type	Course Code	Name of the Course	L	T	P	Credits
PE- V	18OE1MT01	Selected Topics in Mathematics	3	0	0	3
	18PE1ES11	Wireless Sensor Networks				
	18PE1VS09	Memory Technologies				
OE	18OE1CN01	Business Analytics	3	0	0	3
	18OE1AM01	Industrial Safety				
	18OE1AM02	Operations Research				
	18OE1AM03	Composite Materials				
	18OE1PS01	Waste to Energy				
Project	18PW4ES03	Project Phase- I	0	0	16	8
		Total	**6**	**0**	**16**	**14**

Semester-4   **R18**

Course Type	Course Code	Name of the Course	L	T	P	Credits
Project	18PW4ES04	Project Phase - II	0	0	28	14
			0	**0**	**28**	**14**

Total Credits: 68

Eligibility Criteria:

BE/ B. Tech / AMIE in ECE /EEE/EIE orEquivalent.

Career and Opportunities in Embedded Systems:

Embedded System is the future. An embedded system gives capability to a device to perform fully automatic and semi-automatic task. Every industry needs some artificial intelligence into it and artificial intelligence can be given by embedded systems. No electronic product is without embedded systems in the market.Embedded Systems is very much suitable for anyone who want to make their career in Core domains such as Electronics, Embedded Systems, Software Programming, Robotics, IoT, AI, VLSI, DSP.Plenty of career opportunities are available in embedded systems like Embedded Firmware Engineer, System Software Engineer, Application Software Engineer, Software & Hardware Test Engineer, etc.A skilled embedded system developer has very high demand in all over the world.

Embedded Laboratory

Interactive sessions with Industry expert


Infrastructure

Numerous labs and facilities are set up to cater academic and research needs of the course in the department like Keil u Vision 4, GCC Compiler, TivaC Development Boards, ARM Cortex M3/M4 Development Boards, PYNQ Boards, Raspberry Pi 3 Boards, Beagle Boards,Arduino Boards, Silicon Lab Thunder Board Kits, Xilinx tools for Embedded SystemProgramming, Prototyping, Linux Device Drivers Development, FPGA based Embedded Design....

- ✓ Edge Computing for Internet of Things (IoT) using ARM Development Boards
- ✓ Implementation of Signal Processing, Networking and Wireless Sensor Applications using Code Composer Studio and NetSim
- ✓ Prototyping using ARM development boards and Keil u Vision 5
- ✓ Xilinx ISE tool for implementing Design on FPGA based Embedded Systems.
- ✓ Training Machine Learning Models/Deep Learning Models on high end Nvidia's Graphic Processing Unit (GPU)
- ✓ Upgraded MATLAB tool for Algorithmic Computation and advanced applications
- ✓ High end Systems in laboratory to cope-up with the complexity of the Embedded Design
- ✓ Training Sessions are conducted every week by industry experts to bridge the gap between academia and industry

Thunder BoardRaspberry Pi
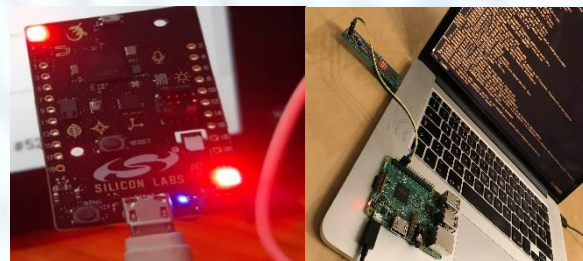
Research Facilities in the Department

Department is facilitated with exclusive research labs such as Internet of Things (IoT) laboratory, Machine Vision Laboratory, Mobile Vision Applications Laboratory and RFID and WSN Applications Laboratory

Training & Placement

Placement Summary/ Year	2015–'17	2017–'19	2018–'20
Eligible Students	14	13	11
Placed Students	11	9	6 (still in progress)
Percentage Placed	78	70	55

- 26 placed out of 38 eligible students from last three years. Still the placement process is in progress.
- Students initially join as intern in AMD, TCS, Robert BOSCH, Tech Mahindra and Silicon Labs through internship with 100% employability. After internship period, they may convert to employee with high salary package.
- 22 students acquired internship in Embedded Systems Domain from last three years.

Our Prominent Recruiters

MOU with Industries

Students involved in Research projects sponsored by ITRA, DRDO, AICTE, UGC,etc..