INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

EMBEDDED SYSTEMS FOR AUTOMATIVE APPLICATIONS								
III Semester: ES								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BESE26	**Elective**	3	0	0	3	40	60	100
Contact Classes: 45	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 45**		
Prerequisite: Real time operating system.								

I. COURSE OVERVIEW:
Embedded systems are basically an extension of advanced robotic applications, which have had a profound impacton almost all our modern technology such as video cameras, computing machinery, smartphones, digital display systems, and so on. Embedded systems are used to control and monitor various safety features of a vehicle, including airbags, seat belts, and anti-lock braking systems. These systems work together to ensure that the driver and passengers are safe in the event of an accident.

II. COURSES OBJECTIVES:
The students will try to learn

I. The fundamental knowledge of the Automotive applications.
II. Obtain knowledge and their working of Embedded systems control and monitor various safety features of a vehicle principles.
III. Identify the various areas of application for inclusion of Embedded systems.

III. COURSE OUTCOMES:
At the end of the course students should be able to:

CO1 Develop programming skills in embedded systems for various applications.
CO2 Identify and Acquire knowledge about the Life cycle of embedded design and its testing.
CO3 Analyze and acquire basic knowledge about programming and system control to perform a specific task.
CO4 Illustrate the principle and characteristics of automotive applications to simulate using tools
CO5 Select the Life cycle of embedded design and its testing.
CO6 Make use of modern embedded systems to design and implement the various applications.

VI. COURSE CONTENT:

MODULE - I: INTRODUCTION (9)
An embedded system-definition, examples, current technologies, integration in system design, embedded system design flow, hardware design concepts, software development, processor in an embedded system and other hardware units, introduction to processor based embedded system design concepts.

MODULE –II: EMBEDDED HARDWARE (9)

Embedded hardware building blocks, embedded processors, ISA architecture models, internal processor design, processorperformance, board memory ROM, RAM, auxiliary memory, memory management of external memory board memoryand performance.

Embedded board input / output, serial versus parallel I/O, interfacing the I/O components, I/O components and performance, board buses, bus arbitration and timing, integrating the bus with other board components, bus performance.

MODULE –III: EMBEDDED SOFTWARE (9)

Device drivers, device drivers for interrupt-handling, memory device drivers, on-board bus device drivers, board I/O drivers, explanation about above drivers with suitable examples. embedded operating systems, multitasking and processmanagement, memory management, I/O and file system management.

OS standards example, POSIX OS performance guidelines, board support packages, middleware and application software,middle Ware examples, application layer software examples.

MODULE –IV: AUTOMOTIVE SYSTEMS OVERVIEW (9)

Automotive vehicle technology, overview of vehicle categories, various vehicle sub systems like chassis, body, driveline,engine technology, fueling technology, vehicle emission, brakes, suspension, emission, doors, dashboard instruments, wiring harness, safety & security, comfort and infotainment, communication & lighting, future trends in automotive embedded systems.

MODULE –V: AUTOMOTIVE SENSORY SYSTEM (9)

Automotive sensors and transducers: temperature, manifold and barometric pressures, humidity, carbon dioxide (CO2), carbon Monoxide (CO), oxygen (O2) Sensors, proximity distance sensors, engine speed sensors, throttle position sensors,pressure sensors, knock Sensor & Mass flow sensor.

V. TEXT BOOKS:

1. Thomas Braun, "Embedded Robotics: Mobile Robot Design and Applications with Embedded Systems", 3rd Edition, springer-Verlag Berlin Heidelberg, 2008.
2. Saeed B Niku, (2019), introduction to Robotics, analysis, control and applications, Wiley Publications. ISBN: 978-1-119-52760-2.
3. R.K. Mittal and I J Nagrath, "Robotics and Control", Tata McGraw Hill, 1st Edition, 2003.

VI. REFERENCE BOOKS:

1. William B. Ribbens, "Understanding Automotive Electronics, an Engineering Perspective", seventh edition, butter worth-Heinemann Publications.
2. Ronald K. Jurgen, "Automotive Electronics Handbook", Mc-Graw Hill.
3. Kinckle, Uwe, Nielsen & Lars, "Automotive Control Systems for Engine, Driveline, and Vehicle", 2nd Edition,springer publication

VII. WEB RESOURCES:

1. http://www.gettextbooks.com/author/ Thomas Braunl
2. http://nptel.ac.in/video.php?subjectId=112101099
3. http://nptel.ac.in/courses/112101099/

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank

3. Assignments
4. Model question paper - I
5. Model question paper - II
6. Lecture notes
7. Power point presentations
8. Early Lecture Readiness Videos