Academic Course Description

BHARATH UNIVERSITY Faculty of Engineering and Technology Department of Electronics and Communication Engineering **BEC 013 Automotive Electronics** **Seventh Semester, (Odd Semester)**

Course (catalog) description

1. To facilitate the acquisition of the foundation skills in the process, tools and techniques in the Integrated Product Development area of the Engineering Services industry.
2. To provide the requisite understanding towards application of academic topics from engineering disciplines into real world engineering projects.

Compulsory/Elective course: Elective for EEE students

Credit hours   :   3 credits and 45 hours

Course Coordinator   :   MS.S.DHIVYA,

Instructors   **:**   MS.S.DHIVYA

Name of the instructor	Class handling	Office location	Office phone	Email (domain:@ bharathuniv.ac.in	Consultation
MS.S.DHIVYA	Second year EEE	KS 101	**04422290125**	contactdhivyaeee@gmail.com	9.00 – 9.50 AM

Relationship to other courses:

Pre –requisites   **:**   BEE603-Microprocessor and Microcontroller

Assumed knowledge :   Basic knowledge in Logic gates, Processors and Transistors

Syllabus Contents

UNIT I   AUTOMOBILEELECTRICALSANDELECTRONICS   8
Basic   ElectricalComponentsandtheiroperationinanautomobile-   Startingsystems,Charging   systems– ignitionsystems-Electronicfuelcontrol-Environmentallegislationforpollution- Overviewof vehicle electronic systems-Power trainsubsystem-chassissubsystem-comfortand safetysubsystems.

UNIT II   INTRODUCTIONTOEMBEDDEDSYSTEMS   8
EmbeddedSystemsdefinition-   Components   ofEmbeddedsystems–Microprocessor-ClassificationofMicroprocessors-Microcontrollers-Memory-Peripherals.Introductiontoan embeddedboard(TMS470based/ARM9based)forhandsonlabsessions(RISCprocessor based with standard peripherals /interfacesandI/Os)

UNIT III   OPERATINGSYSTEMINEMBEDDEDENVIRONMENT   7

IntroductiontoOS- General Purpose OS,RTOS-,Kernel- Pre-emptive&Non pre-emptive, Scheduler,Interrupt-Interruptlatency andContextSwitchLatency-BoardSupportpackage, Task- Multi-tasking,Tasksynchronization,Inter-task communication,Featuresof a typical embedded RTOS(μC/OS-II)

UNIT III   INTEGRATEDDEVELOPMENTENVIRONMENT   8
IntegratedDevelopmentEnvironment(IDE)-   Getting Started,Hardware/Software Configuration (Boot Service, Host– TargetInteraction),Booting, Reconfiguration, Managing IDE,TargetServers,Agents,Cross–Development,debugging-IntroductiontoanIDEforthe lab board– RTOS, PC based debugger.

UNIT IV   EMBEDDEDSYSTEMINAUTOMOTIVEAPPLICATIONS   10
Engine Managementsystems- Diesel/Gasoline systems,Varioussensors used insystem- Vehiclesafety systems-electroniccontrolofbrakingandtraction-Introductiontocontrol elementsandcontrolmethodology-Electronictransmissioncontrol-Body electronics- Infotainmentsystems–Navigationsystems- system leveltests–Softwarecalibration using engine and vehicle dynamometers-Environmental tests forelectroniccontrol units.

UNIT V   EMBEDDEDSYSTEMCOMMUNICATIONPROTOCOLS   4
Introduction toControl networking- Communication protocols inembeddedsystems-SPI,I^{2}C, USB, -Vehiclecommunication protocols – Introduction to CAN, LIN, FLEXRAY, MOST, KWP2000-Details of CAN

Total : 45HOURS

Text book(s) and/or required materials

1. R.K. Jurgen,"Automotive electronics handbook,McGrawHillInc, New Delhi,Second Edition,1999.
2.   Paul Pop, PetruEles,ZeboPeng, "Analysis and Synthesis of Distributed Real-Time Embedded Systems",Springer-Verlag US,2004.
3. B.KantaRao, "Embedded Systems", PHILearning Pvt.Ltd, 2nd Edition, 2011

Computer usage: EDA tools like ORCAD
SPICE,Logisim

Professional component

General	-	0%
Basic Sciences	-	0%
Engineering sciences & Technical arts	-	0%
Professional subject	-	0%
Non major elective	-	100%

Broad area : Communication| Signal Processing| **Electronics** | VLSI| Embedded

S.NO	Topics	Problem solving (Yes/No)	Text / Chapter

Test Schedule

S. No.	Test	Tentative Date	Portions	Duration
1	Cycle Test-1	August 1st week	Session 1 to 14	2 Periods
2	Cycle Test-2	September 2nd week	Session 15 to 28	2 Periods
3	Model Test	October 2nd week	Session 1 to 45	3 Hrs
4	University Examination	TBA	All sessions / Units	3 Hrs.

1. To facilitate the acquisition of the foundation skills in the process, tools and techniques in the Integrated Product Development area of the Engineering Services industry. 2. To provide the requisite understanding towards application of academic topics from engineering disciplines into real world engineering projects.	Correlates to program outcome		
	H	**M**	**L**
1. To understand the basic automobile electricals and electronics	a	f,j	
2. To understand the basic Embedded Systems.	c	a	b,h
3. To understand the operating system in embedded environment.	i,l	a,d	
4. Conceptualize new product integrating the hardware, software, controls, electronics and mechanical systems.	e	g,k	a
5. To understand the embedded system used for automotive applications.			d
6. To understand the Communication Protocols used for automotive applications.	f		

Mapping of Instructional Objectives with Program Outcome

H: high correlation, M: medium correlation, L: low correlation

UNIT I	AUTOMOBILE ELECTRICALS AND ELECTRONICS		
1.	BasicElectricalComponentsandtheiroperationinanautomobile	Yes	
2.	Startingsystems,Charging systems	Yes	
3.	Ignitionsystem	Yes	
4.	Electronicfuelcontrol	Yes	
5.	Environmental legislationforpollution	Yes	[T1] [R3]
6.	Overviewof vehicle electronic systems	Yes	
7.	Power trainsubsystem	Yes	
8.	Chassissubsystem	Yes	
9.	Comfort and safetysubsystems	No	
UNIT II	INTRODUCTIONTOEMBEDDEDSYSTEMS		
10.	Embedded Systemsdefinition-	No	
11.	Components ofEmbeddedsystems	Yes	[T1] [R1]
12.	Microprocessor	Yes	
13.	ClassificationofMicroprocessors	Yes	
14.	Microcontrollers	Yes	
15.	Memory	Yes	
16.	Peripherals.Introductiontoan embeddedboard(TMS470based/ARM9based)forhandsonlabsessions(RISCprocessor based with standard peripherals /interfacesandI/Os)	Yes	
17.	Embedded Systemsdefinition	Yes	
18.	Components ofEmbeddedsystems	Yes	
UNIT III	OPERATING SYSTEM IN EMBEDDED ENVIRONMENT		
19.	Introduction to OS	Yes	
20.	General Purpose OS	Yes	
21.	RTOS	Yes	[T1] [R1]
22.	Kernel	Yes	
23.	Pre-emptive&Non pre-emptive	Yes	
24.	Scheduler	No	
25.	Interrupt-Interruptlatency	Yes	

| 26. | ContextSwitchLatency-BoardSupportpackage | Yes | |
| 27. | Multi-tasking | Yes | |

UNIT IV   INTEGRATED DEVELOPMENT ENVIRONMENT

28.	Engine Managementsystems	No	
29.	Diesel/Gasoline systems	No	
30.	Varioussensors used insystem	No	[T1] [R1]
31.	Vehiclesafety systems	No	
32.	Electroniccontrolofbrakingandtraction	No	
33.	Introductiontocontrol elements	No	
34.	Electronictransmissioncontrol-Body electronic	Yes	
35.	Softwarecalibration using engine and vehicle dynamometers.	No	
36.	Environmental tests for electroniccontrol units.	No	
37.	Engine Managementsystems	Yes	

UNIT V   EMBEDDED SYSTEM COMMUNICATION PROTOCOLS

38.	Introduction toControl networking	Yes	
39.	Communication protocols inembedded systems	Yes	
40.	SPI,I^{2}C, USB	Yes	[T1] [R1]
41.	Introduction to CAN, LIN, FLEXRAY, MOST,	Yes	
42.	Introduction toControl networking	Yes	
43.	Introduction to Control networking	Yes	
44.	Communication protocols in embedded systems	Yes	
45.	Communication protocols in embedded systems	Yes	

Teaching Strategies

The teaching in this course aims at establishing a good fundamental understanding of the areas covered using:

- Formal face-to-face lectures

- Tutorials, which allow for exercises in problem solving and allow time for students to resolve problems in understanding of lecture material.

- Laboratory sessions, which support the formal lecture material and also provide the student with practical construction, measurement and debugging skills.

- Small periodic quizzes, to enable you to assess your understanding of the concepts.

Evaluation Strategies

Cycle Test – I	-	5%
Cycle Test – II	-	5%
Model Test	-	10%
Assignment	-	5%
Attendance	-	5%
Final exam	-	70%

Prepared by:MS.S.Dhivya Assistant Professor, Department of EEE   **Dated :**

Addendum

ABET Outcomes expected of graduates of B.Tech / EEE / program by the time that they graduate:

a) An ability to apply knowledge of mathematics, science, and engineering fundamentals.

b) An ability to identify, formulate, and solve engineering problems.

c) An ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

d) An ability to design and conduct experiments, as well as to analyze and interpret data.

e) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

f) An ability to apply reasoning informed by the knowledge of contemporary issues.

g) An ability to broaden the education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

h) An ability to understand professional and ethical responsibility and apply them in engineering practices.

i) An ability to function on multidisciplinary teams.

j) An ability to communicate effectively with the engineering community and with society at large.

k) An ability in understanding of the engineering and management principles and apply them in project and finance management as a leader and a member in a team.

l) An ability to recognize the need for,and an ability to engage in life-long learning.

Program Educational Objectives

PEO1: PREPARATION
Electrical Engineering Graduates are in position with the knowledge of Basic Sciences in general and Electrical Engineering in particular so as to impart the necessary skill to analyze and synthesize electrical circuits, algorithms and complex apparatus.

PEO2: CORE COMPETENCE
Electrical Engineering Graduates have competence to provide technical knowledge, skill and also to identify, comprehend and solve problems in industry, research and academics related to power, information and electronics hardware.

PEO3: PROFESSIONALISM
Electrical Engineering Graduates are successfully work in various Industrial and Government organizations, both at the National and International level, with professional competence and ethical administrative acumen so as to be able to handle critical situations and meet deadlines.

PEO4: SKILL

Electrical Engineering Graduates have better opportunity to become a future researchers/ scientists with good communication skills so that they may be both good team-members and leaders with innovative ideas for a sustainable development.

PEO5: ETHICS
Electrical Engineering Graduates are framed to improve their technical and intellectual capabilities through life-long learning process with ethical feeling so as to become good teachers, either in a class or to juniors in industry.

Course Teacher	Signature
MS.S.DHIVYA	

Course Coordinator   **HOD/EEE**
(MS.S.DHIVYA)   (   )