INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTOR

Course Title	**WIRELESS LANS AND PANS**				
Course Code	**BESB03**				
Programme	M.Tech				
Semester	I				
Course Type	Elective				
Regulation	IARE - R18				
Course Structure	Theory			Practical	
	Lectures	Tutorials	Credits	Laboratory	Credits
	3	-	3	-	-
Course Faculty	Ms. C.Devisupraja, Assistant Professor				

I. COURSE OVERVIEW:

Embedded systems have become the next inevitable wave of technology, finding application in diverse fields of engineering. The goal of this course is to impart training to graduate engineers, in specialized area of Embedded Systems so that they can develop expertise in developing and deploying embedded systems over a wide range of applications. This course provides the basic knowledge over the hardware units and devices for design of embedded systems. It also provides the information about the Use architectures of embedded RISC processors and system on chip processor design of embedded systems. This course is intended to Analyze interrupt latency, context switching time, for development of device drives for timing devices.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AEC524	VI	Wireless Communication and Networks	3

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Wireless LANs and PANs	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✔	LCD / PPT	✔	Seminars	✔	Videos	✔	MOOCs
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

The course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two CIA examinations.

Semester End Examination (SEE): The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into five units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows. Two full questions with "either" or "choice" will be drawn from each unit. Each question carries 14 marks. There could be a maximum of two sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept.
30 %	To test the analytical skill of the concept.
20 %	To test the application skill of the concept.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 25 marks for Continuous Internal Examination (CIE), 05 marks for Technical Seminar and Term Paper.

Table 1: Assessment pattern for CIA

Component	**Theory**		**Total Marks**
Type of Assessment	**CIE Exam**	**Technical Seminar and Term Paper**	
CIA Marks	25	05	30

Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 9th and 17th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration, consisting of 5 one mark compulsory questions in part-A and 4 questions in part-B. The student has to answer any 4 questions out of five questions, each carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Technical Seminar and Term Paper:

Two seminar presentations and the term paper with overview of topic are conducted during II semester. The evaluation of technical seminar and term paper is for maximum of 5 marks. Marks are awarded by taking average of marks scored in two Seminar Evaluations.

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	Apply advanced level knowledge, techniques, skills and modern tools in the field of embedded system and sub areas IoT, Processor technology, storage technology.	3	Term paper
PO 2	Function on multidisciplinary environments by working cooperatively, creatively and responsibly as a member of a team.	2	Term paper and Guest Lectures
PO 3	Respond to global policy initiatives and meet the emerging challenges with sustainable technological solutions in the field of electronic product designing.	3	Seminar and Guest Lectures
PO 6	Independently carry out research / investigation and development work to solve practical problems.	3	NPTEL Videos and Guest Lecturers

3 = High; 2 = Medium; 1 = Low

VII. COURSE OBJECTIVES:

The course should enable the students to:

I	Learn about First and Second Generation Cellular Systems, Cellular Communications from 1G to3G, Wireless 4G systems.
II	Understand about importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies infrared technology, UHF narrowband technology, Spread Spectrum technology.
III	Learn about Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem and Reliability.

VIII. COURSE OUTCOMES (COs):

COs	Course Outcome	CLOs	Course Learning Outcome
CO 1	Describe first and second generation cellular systems and analyze cellular communications from 1G to 3G.	CLO 1	Understand and Analyze First and Second Generation Cellular Systems with architectures.
		CLO 2	Analyze Cellular Communications from 1G to 3G with architectures of AMPs, GSM and GPRS.
		CLO 3	Explain Wireless 4G systems & Wireless Spectrum of 4G with increased bandwidth and speed.
CO 2	Understand various WLAN topologies and analyze deeply the different transmission techniques.	CLO 4	Distinguish Random access methods of pure ALOHA and slotted ALOHA.
		CLO 5	Describe Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).
		CLO 6	Describe the importance of Wireless LANs with components such as BSS, stations, ESS, Distributed systems

COs	Course Outcome	CLOs	Course Learning Outcome
CO 3	Demonstrate network architecture and MAC layer issues and describe the importance of MAC layer applications.	CLO 7	Explain WLAN Topologies of infrastructure and adhoc mode of operations.
		CLO 8	Analyze transmission techniques and distinguish wired and wireless LANs.
CO 4	Explore Bluetooth technology and its specifications, and describe the importance of wireless private area networks.	CLO 9	Explain network architecture of IEEE 802.11 standard for wireless lans and analyze MAC Layer issues.
		CLO 10	Describe importance of wireless PANs and explain Bluetooth technology with specifications and enhancements.
		CLO 11	Explain Bluetooth interference issues, traffic engineering, QoS and dynamics slot assignment.
CO 5	Develop practical skills in use of ZigBee components and network topologies.	CLO 12	Describe IEEE 802.15.3 architecture.
		CLO 13	Understand ZigBee technology, components and network topologies.
		CLO 14	IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications.

IX. COURSE LEARNING OUTCOMES(CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to	PO's Mapped	Strength of Mapping
BESB03.01	CLO 1	Understand and Analyze First and Second Generation Cellular Systems with architectures.	PO 1	2
BESB03.02	CLO 2	Analyze Cellular Communications from 1G to 3G with architectures of AMPs, GSM and GPRS.	PO 1, PO 2	2
BESB03.03	CLO 3	Explain Wireless 4G systems & Wireless Spectrum of 4G with increased bandwidth and speed.	PO 1, PO 3	1
BESB03.04	CLO 4	Distinguish Random Access Methods of Pure ALOHA and Slotted ALOHA.	PO 2, PO 3	3
BESB03.05	CLO 5	Describe Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).	PO 1	3
BESB03.06	CLO 6	Describe importance of Wireless LANs with components such as BSS, stations, ESS, Distributed systems	PO 1	3
BESB03.07	CLO 7	Explain WLAN Topologies of infrastructure and adhoc mode of operations.	PO 3	3
BESB03.08	CLO 8	Analyze Transmission Techniques and Distinguish wired and wireless LANs.	PO 1, PO 3	2
BESB03.09	CLO 9	Explain Network Architecture of IEEE 802.11 standard for wireless lans and Analyze MAC Layer issues.	PO 3, PO 6	2
BESB03.10	CLO10	Describe importance of Wireless PANs and explain Bluetooth technology with Specifications and Enhancements.	PO 1, PO 6	3

BESB03.11	CLO 11	Explain Bluetooth interference issues, Traffic Engineering, QoS and Dynamics Slot Assignment.	PO 2	2
BESB03.12	CLO 12	Describe IEEE 802.15.3 architecture.	PO 2, PO 6	3
BESB03.13	CLO 13	Understand ZigBee technology, components and network topologies.	PO 2	2
BESB03.14	CLO 14	IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications.	PO 3, PO 6	3

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Outcomes (COs)	Program Outcomes(PO)			
	PO 1	PO 2	PO 3	PO 6
CO 1	3	2	2	
CO 2	3	3	3	
CO 3	2		3	
CO 4	3	2	3	2
CO 5		2	3	3

XI. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcome(PO)			
	PO 1	PO 2	PO 3	PO 6
CLO 1	3			
CLO 2	3	2		
CLO 3	3		3	
CLO 4		3	2	
CLO 5	2			
CLO 6	2			
CLO 7			3	
CLO 8	2		3	
CLO 9			3	3

CLO 10	3			3
CLO 11		2		
CLO 12		2		3
CLO 13		2		
CLO 14			2	3

3 = High; 2 = Medium; 1 = Low

XII. ASSESSMENT METHODOLOGIES –DIRECT:

CIE Exams	PO1, PO2, PO3, PO 6	SEE Exams	PO1, PO2, PO3, PO 6	Seminar and Term Paper	PO1, PO2, PO3, PO6
Viva	-	Mini Project	-	Laboratory Practices	-

XIII. ASSESSMENT METHODOLOGIES –INDIRECT:

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIV. SYLLABUS:

UNIT -I	WIRELESS SYSTEM&RANDOM ACCESS PROTOCOLS	Classes: 08
Introduction, First and Second Generation Cellular Systems, Cellular Communications from 1G to3G, Wireless 4G systems, The Wireless Spectrum; Random Access Methods: Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).		

UNIT – II	WIRELESS LANS	Classes: 10
Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Wireless Networks, comparison of wired and Wireless LANs; WLAN Technologies: Infrared technology, UHF narrowband technology, Spread Spectrum technology.		

UNIT – III	THE IEEE 802.11 STANDARD FOR WIRELESS LANS	Classes: 08
Network Architecture, Physical layer, The Medium Access Control Layer; MAC Layer issues: Hidden Terminal Problem, Reliability, Collision avoidance. Congestion avoidance, Congestion control, Security, The IEEE 802.11e MAC protocol.		

UNIT - IV	WIRELESS PANS	Classes: 10
Introduction, importance of Wireless PANs, The Bluetooth technology: history and applications, technical overview, the Bluetooth specifications, piconet synchronization and Bluetooth clocks, Master-Slave Switch;		

Bluetooth security; Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Piconet scheduling, Bridge selection, Traffic Engineering, QoS and Dynamics Slot Assignment, Scatter net formation.		
UNIT -V	**THE IEEE 802.15 WORKING GROUP FOR WPANS**	**Classes: 09**
The IEEE 802.15.3, The IEEE 802.15.4, ZigBee Technology, ZigBee components and network topologies, The IEEE 802.15.4 LR-WPAN Device architecture: Physical Layer, Data Link Layer, The Network Layer, Applications; IEEE 802.15.3a Ultra wideband..		

TEXT BOOKS:

1. Carlos de Morais Cordeiro, Dharma Prakash Agrawal, "AdHoc and Sensor Networks", World Scientific, 2011.
2. Vijay K.Garg, "Wireless Communications and Networking", Morgan Kaufmann Publishers, 2009.

REFERENCES:

1. Kaveh Pahlaram, Prashant Krishnamurthy, "Wireless Networks", PHI, 2002.
2. Marks Ciampor, Jeorge Olenewa, "Wireless Communication", Cengage Learning, 2007.

XV. COURSE PLAN:

The course plan is meant as a guideline. There may probably be changes.

Lecture No	Topic Outcomes	Topic/s to be covered	Reference
1-3	Understand and analyze first and second generation cellular systems.	Introduction, first and second generation cellular systems, Cellular communications from 1G to3G, Wireless 4G systems, The wireless Spectrum	T1: 5.1, 5.2, R1: 1.7
4-6	Analyze Cellular Communications from 1G to 3G.	Random Access Methods: Pure ALOHA, Slotted ALOHA, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA)	T1:6.1,6.2, 6.3, T1: 6.4-6.6
7-9	Explain Wireless 4G systems, The Wireless Spectrum.	Introduction, importance of Wireless LANs, WLAN Topologies, Transmission Techniques: Wired Networks, Transmission Techniques: Wireless Networks	T1:6.4-6.6, T1:6.7-6.8, 6.15 R2:7.1, 8.1
10-13	Describe Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Detection (CSMA/CD), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA).	comparison of wired and Wireless LANs, WLAN Technologies: Infrared technology, UHF narrowband technology	T1:7.1, 7.4 T1:7.7, 7.8-7.10 R2:7.2
14-16	Explain WLAN Topologies and analyze transmission techniques	Spread Spectrum technology, Network Architecture, Physical layer, The Medium access control layer	T1: 6.12, 9.4,9.6 R2: 4.2,
17-20	Describe importance of Wireless Local Area Networks.	MAC Layer issues: Hidden terminal problem, Reliability, Collision avoidance, congestion avoidance, Congestion control	T1: 7.12,10.4, R2: 4.2, T1: 10.6
21-22	Explain Network architecture and analyze MAC layer issues.	Security, The IEEE 802.11e MAC protocol. The IEEE 802.11e MAC protocol. Introduction, importance of wireless PANs,	T1: 10.5, T1: 8.1,8.2, 8.4,8.5,8.6 R2: 4.4

Lecture No	Topic Outcomes	Topic/s to be covered	Reference
		the Bluetooth technology: history and applications	
23-27	Describe importance of Wireless Private Area Networks.	Technical overview, the Bluetooth specifications, piconet synchronization and Bluetooth clocks, Master-Slave Switch, Bluetooth security	T1: 8.2,8.9 R2: 4.4,
28-36	Explain Bluetooth technology and Bluetooth specifications.	Enhancements to Bluetooth: Bluetooth interference issues, Intra and Inter Piconet scheduling, Bridge selection, Traffic Engineering	T1: 8.12, 8.13, 8.14
37 - 40	Analyze Enhancements to Bluetooth	QoS and Dynamics Slot Assignment, Scatter net formation., The IEEE 802.15.3, The IEEE 802.15.4, ZigBee components and network topologies	T1: 9.1, 9.2,9.3
41 - 45	Describe IEEE 802.15.3, The IEEE 802.15.4	The IEEE 802.15.4 LR-WPAN device architecture, physical layer, data link layer, the network layer, applications, IEEE 802.15.3a ultra wideband.	R1:7.1,7.3 R1:7.4,7.7

XVI. GAPS IN THE SYLLABUS-TO MEET INDUSTRY /PROFESSIONAL REQUIREMENTS:

S No	Description	Proposed Actions	Relevance with POs
1	Currently available Wireless Communication and Networks	Seminars / Guest Lectures / NPTEL	PO 1, PO 2, PO 6
2	Interfacing Modules	Work Shops/ Guest Lectures / NPTEL	PO 2, PO 6

Prepared By:
Ms. C Devisupraja, Assistant Professor

HOD, ECE