



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited "A" Grade by NAAC | 12B Status by UGC | Approved by AICTE

www.sathyabama.ac.in

SCHOOL OF ELECTRICAL AND ELECTRONICS

Minutes of Board of Studies Meeting held on 20th May 2023

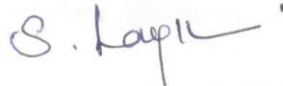
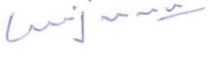
(Time: 10.30 a.m. to 12 noon)

- Dr.N.M.Nandhitha, Prof. & Dean School of Electrical and Electronics started the meeting by welcoming both the external and the internal members to the Board of Studies meeting (20.05.2023, 10.00 a.m. to 12.00 noon)
- Dr.T.Ravi, Head, Dept. of Electronics and Communication Engineering informed the board that core competencies are identified from the feedback obtained from the students, faculty, Alumni and employers.
- The agenda of the meeting is curriculum and syllabus revision for respective batch.
- Initial discussion was started with Course Outcome and it has been suggested to modify the CO statement. The CO- PO articulation matrix is framed for each course.
- Dr.T.Ravi listed the curriculum which includes the list of Core Courses, Elective Courses, Skill Enhancement Courses, Mandatory Audit Courses and Experiential Learning Courses.
- Dr.S.Barani explained the concept of Practical heavy courses introduced in each semester. The students will be getting more practical knowledge by doing experiment while studying theory.
- Dr.N.M Nandhitha presented the syllabus of audit courses such as Environmental Science and Engineering, Basic Health and Hygiene for Engineering, Constitutional Law, Human Relations at Work, Yoga. Students can choose the audit course for their personal enrichment, interest in a subject, or to review material they've previously studied. Dr.M.D.Selvaraj Associate Professor, IIITDM appreciated the above choice of audit course.
- Dr.P.Chitra listed the Project-Based Learning Approach (PBLA) courses in the respective curriculum. It helps the students in developing essential skills such as critical thinking, problem-solving, collaboration, and communication. Dr.N.Sivakumaran Prof., NIT Tiruchy suggested PBLA for healthcare and medicine related courses also.
- Dr.M.Sumathi presented the syllabus for "Electronic Devices(Practical heavy courses)". Mr.J.Visweswaran appreciated the introduction of new topics nano devices and bio sensor incorporated in the course.

- Dr.S.Lalitha Kumari presented the changes incorporated in 'Digital Logic Circuits'. Dr M D Selvaraj. Professor, IIITDM accepted the changes suggested.
- Dr.S.Lakshmi presented the syllabus revision carried out in the course "Cellular Mobile Networks" and "Cryptography and Network Security". Dr.N.Sivakumar went through the syllabus and suggested the following topics include traditional problems associated with Cyber Crime, Introduction to Incident Response, Digital Forensics Phishing in the syllabus.
- Dr.M.Sugudev presented the syllabus for PG courses. The syllabi for Analog Integrated Circuit Design and Software for Embedded Systems were discussed to the BoS members. The members were satisfied with the syllabus and accepted the same.
- After discussion, the members accepted the revision in the curriculum. The next BoS meeting may be scheduled in November 2023. The meeting was concluded with a vote of thanks.

The following internal members were present in the meeting.

Internal Members

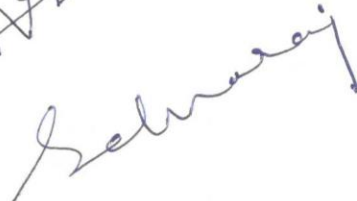
1. Dr.N.M.Nandhitha 
2. Dr.T.Ravi 
3. Dr.M.Sumathy 
4. Dr.S.Lakshmi 
5. Dr.V.Vijayabasker 
6. Dr.P.Chitra 
7. Dr.P.Kavipriya 
8. Dr.S.Barani 
9. Dr.S.Poornapushpakala 
10. Dr.E.Annadevi 

External Members

Dr.N.Sivakumaran
Professor, Dept. of I & C
NIT, Trichy



Dr.M.D.Selvaraj
Professor, Dept of ECE
IIITDM, kancheepuram.



Mr.J.Visweswaran,
Academic Technical Consultant,
NI, Bangalore



Dr. Senthil Arunachalam ,
Director Automotive,
Jasmin Infotech Pvt. Ltd,
Chennai-119.





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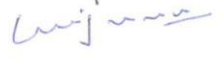
Minutes of Board of Studies Meeting held on 25th Nov 2023

(Time: 10.30 a.m. to 12 noon)

- Dr.N.M.Nandhitha, Prof. & Dean School of Electrical and Electronics started the meeting by welcoming both the external and the internal members to the Board of Studies meeting (25.11.2023, 10.00 a.m. to 12.00 noon).
- Dr.T.Ravi, Head, Dept. of Electronics and Communication Engineering informed the board that core competencies are identified from the feedback obtained from the students, faculty, Alumni and employers.
- The agenda of the meeting is curriculum and syllabus revision for respective batch.
- Initial discussion was started with Course Outcome and it has been suggested to modify the CO statement. The CO- PO articulation matrix is framed for each course.
- Dr.S.Barani explained the introduction of lab heavy courses "Python Programming" for 2023-2024 academic year. Dr.M.D.Selvaraj Professor, IIITDM appreciated the introduction of lab heavy loaded courses as it will enhance the coding ability of the students.
- When Dr.T.Ravi discussed the new course "Knowledge Engineering and Expert System", Dr.N.Sivakumaran Prof., NIT Tiruchy appreciated the inclusion of "Connectionist Models and Expert System" in the course.
- Dr.S.Lakshmi presented the syllabus revision carried out in the course "Mobile Adhoc Networks" and "Optical Networks". Dr.N.Sivakumar went through the syllabus and suggested the following topics Optical TDM Networks can be included for the course Optical Networks.
- Dr.Poornapushpakala discussed the new syllabus "Deep Learning: Principles and Practices". Dr.Senthil Arunachalam suggested to incorporate the medical analysis and related case study in the course.
- Dr.M.Sugudev presented the syllabus for PG courses. The syllabus of "Real Time Operating Systems", "Real Time Signal and Color Image Processing" and "Strategies In Industry 5.0" was discussed with the BoS members. The members approved the new syllabus.
- After discussion, the members accepted the revision in the curriculum. The next BoS meeting may be scheduled on May 2024. The meeting was concluded with a vote of thanks.

The following internal members were present in the meeting.

Internal Members

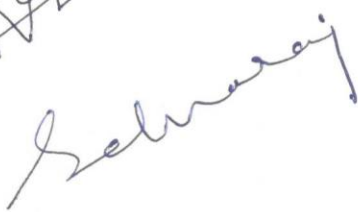
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6. Dr.P.Chitra 
7. Dr.P.Kavipriya 
8. Dr.S.Barani 
9. Dr.S.Poornapushpakala 
10. Dr.E.Annadevi 

External Members

Dr.N.Sivakumaran
Professor, Dept. of I& C
NIT, Trichy



Dr.M.D.Selvaraj
Professor, Dept of ECE
IIITDM, kancheepuram.



Mr.J.Visweswaran,
Academic Technical Consultant,
NI, Bangalore



Dr. Senthil Arunachalam ,
Director Automotive,
Jasmin Infotech Pvt. Ltd,
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SCHOOL OF ELECTRICAL AND ELECTRONICS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ACADEMIC YEAR 2023 - 2024

BoS conducted on 20th May 2023

SL. NO	COURSE CODE	SUBJECT COURSE NAME	NEW COURSE / REVISED COURSE	FOCUS ON
1.	S13BLH11	Electronic Devices	New Course	Skill Development
2.	S13BLH21	Digital Logic Circuits	New Course	Skill Development
3.	SECA3001	Cryptography and Network Security	Revised Course	Skill Development
4.	SECA3012	Cellular Mobile Networks	Revised Course	Skill Development
5.	S35PB11	Analog Integrated Circuit Design	New Course	Skill Development
6.	S35BLH11	Software for Embedded Systems	New Course	Employability, Skill Development
7.	SECB5103	Microcontrollers	New Course	Employability, Skill Development

Dr.T.Ravi
HOD / ECE



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S13BLH11	ELECTRONIC DEVICES	L	T	P	EL	Credits	Total Marks
		2	0	4	0	4	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- To acquaint the students with the construction, theory and operation of the basic electronic devices.
- To understand the mechanisms of current flow in semi-conductors.
- To familiarize on the principle of operation, capabilities and limitation of various advanced semiconductor devices and its practical application.
- To design practical circuits with alternate electronic devices.
- To study Nano devices.

UNIT 1 BASIC SEMICONDUCTOR DEVICES

12 Hrs.

PN junction diode- construction and operation, Current equations, Diffusion and drift current densities, forward and reverse bias characteristics, Breakdown in PN Junction Diodes. Applications - Rectifiers, Limiting and Clamping Circuits, Zener diode-construction and VI characteristics. Design and Experimental Verification of Diode Characteristics (PN and Zener) and applications (Rectifiers and Voltage Regulators).

UNIT 2 BIPOLAR JUNCTION TRANSISTORS

12 Hrs.

Bipolar junction transistors, NPN -PNP, construction, forward and reverse bias characteristics -Early effect, current equations-Input and Output characteristics of CE,CB,CC-Ebers Moll Model-Multi Emitter Transistor, Gummel Poon-model- Verification of Transistor Characteristics (CE,CB,CC).

UNIT 3 FIELD EFFECT TRANSISTORS

12 Hrs.

JFETs-Drain and Transfer characteristics,-Current Equations-Pinch off voltage and its significance-MOSFET-Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET,DUALGATEMOSFET- Non – Theoretical Comparison of JFET and MOSFET Characteristics.

UNIT 4 SPECIAL SEMICONDUCTOR DEVICES

12 Hrs.

Schottky barrier diode-SCR, DIAC, TRIAC, Varactor diode, Tunnel diode, UJT, LDR, Phototransistor, Gallium Arsenide device- Heuristics approach to Special semiconductor devices, VI characteristics of special semiconductor devices.

UNIT 5 NANO DEVICES

12 Hrs.

Nano Sensors for measurement of temperature, humidity, pressure- Bio Sensors for measurement of blood pressure, heart rate, glucose level, SPO2- Chemical Sensors for pH, gas measurement- sensors for automation, Linearity characteristics of sensors.

Max. 60 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to



New Courses



Deleted Content



Added

- CO1** Apply the knowledge of basic semiconductor materials by understanding fabrication processes.
- CO2** Analyze the characteristics of various electronic devices
- CO3** Analyze the various circuit configurations and its classifications of BJT and MOSFETs.
- CO4** Analyze the characteristics of special semiconductor devices.
- CO5** Analyze the performance characteristics of various sensors.
- CO6** Select suitable sensors for automation.

TEXT / REFERENCE BOOKS

1. Donald A Neaman, "Semiconductor Physics and Devices", 4th Edition, Tata McGraw Hill Inc. 2012.
2. Wolfgang Fritzsche (Editor), Jürgen Popp (Editor) "Optical Nano- and Microsystems for Bio-analytics (Springer Series on Chemical Sensors and Biosensors Book 10)" 2012th Edition
3. Juin J. Liou (Editor), Shien-Kuei Liaw (Editor), Yung-Hui Chung (Editor), "Nano Devices and Sensors Hardcover – Import, 25 April 2016"
4. David Bell, "Fundamentals of Electronic Devices and Circuits", 5th Edition, Oxford University Press 2012.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A** MCQ Questions**20 Marks****PART B** Laboratory Practical**80 Marks****New Courses****Deleted Content****Added**

S13BLH21	DIGITAL LOGIC CIRCUITS	L	T	P	EL	Credits	Total Marks
		2	0	4	0	4	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- To impart knowledge on various types of Binary logics.
- To design a binary logic circuit for an arithmetic expression.
- To understand the usage of registers and counters used in various digital circuits.
- To understand the design of memory devices used
- To get an exposure about the electronics behind design of Basic digital logical elements.

UNIT 1 NUMBER SYSTEMS, LOGIC FUNCTIONS AND BOOLEAN ALGEBRA
12 Hrs.

Number systems – Number systems conversions - Binary arithmetic – Binary codes – Logic functions- Universal gate functions - Boolean algebra – Functionally complete operation sets, Reduction of switching equations using Boolean algebra, Realization of switching function, Experimental verification of Logic gates.

UNIT 2 DESIGN OF COMBINATIONAL LOGIC
12 Hrs.

Design procedure of Combinational Logic – Design of two level gate networks - Sum of Products (SOP) - Product of Sums(POS) - Canonical SOP - Canonical POS - Karnaugh Map - Simplifications of Boolean functions using Karnaugh Map and implementation using Logic function – Advantages and limitations of K-Map –Tabulation method, Design and Experimental verification of Boolean function.

UNIT 3 COMBINATIONAL CIRCUITS
12 Hrs.

Introduction to Combinational circuits – Half Adder, Full Adder - Half Subtractor, Full Subtractor- Parallel binary Adder, Parallel binary Subtractor - Carry look ahead Adder- BCD Adder- Decoders- Encoders - Multiplexers- Demultiplexers- Code convertors- Magnitude Comparator, Design and experimental verification of Adders, Subtractors, Encoders, Decoders, Multiplexers, Demultiplexers and Code convertors.

UNIT 4 SEQUENTIAL CIRCUITS
12 Hrs.

Introduction to Sequential circuits – Flip flops – SR, JK, D and T flip flops, Master-Slave flip flop, Characteristic and excitation table –Registers – Shift registers – Counters – Synchronous and Asynchronous counters – Modulus counters –State diagram, State table, State minimization – Hazards, Design and experimental verification of Flip flops, Shift registers and Counters.

UNIT 5 DIGITAL LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES
12 Hrs.

Classification and characteristics of logic family – Bipolar logic family – Saturated logic family – Non saturated family – Unipolar family – TTL, MOS and CMOS logic families. Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA), Implementation of logic circuits in FPGA.

**New Courses****Deleted Content****Added**

COURSE OUTCOMES

On completion of the course, student will be able to

- CO1** Minimize Boolean functions for computationally less complex implementations.
- CO2** Apply K map and tabulation method for minimization of Boolean functions.
- CO3** Implement combinational logic circuits for Real World Problems.
- CO4** Implement sequential logic circuits for Real World Problems.
- CO5** Analyze the performance of various logic families.
- CO6** Implement memory units with Programmable logic devices.

TEXT / REFERENCE BOOKS

1. Morris Mano, "Digital design", 5th Edition, Prentice Hall of India, 2016.
2. Milos Ercegovic, Tomas Lang, "Introduction to Digital Systems", Wiley publications, 2013.
3. John M. Yarbrough, "Digital logic: Applications and Design", Thomas – Vikas Publishing House, 2002.
4. R.P.Jain, "Modern digital Electronics", 3rd Edition, TMH, 2003.
5. William H. Gothmann, "Digital Electronics", Prentice Hall, 2001.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A MCQ Questions

20 Marks

PART B Laboratory Practical

80 Marks

S35PB11	ANALOG INTEGRATED CIRCUIT DESIGN	L	T	P	EL	Credits	Total Marks
		2	0	2	0	3	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- To understand the concepts of small signal models of BJTs and MOSFETs.
- To identify the design and analysis of single stage and multistage amplifier.
- Be familiar the performance of operational amplifier.
- To focus on analog multiplier.
- Be familiar with the Analog Design.

UNIT 1 INTEGRATED CIRCUIT BJT AND MOSFET MODELING**9 Hrs.**

Small signal models of BJTs and MOSFETs, short channel effects and scaling, and its impact on small signal parameters, biasing and operating regimes, parasitic elements, Frequency response of BJTs and MOSFETs.

UNIT 2 SINGLE AND MULTISTAGE AMPLIFIERS**9 Hrs.**

Small signal single stage amplifier such as Common Emitter stage, Common source stage, Source follower, Common gate stage, Cascode stage configurations and properties, multistage amplifier stages such as Darlington and cascade configurations, Small signal analysis of differential amplifiers, Balanced differential amplifiers.

UNIT 3 CURRENT MIRRORS AND LOADS**9 Hrs.**

Basic current mirrors, cascode current mirrors, active current mirrors, current mirror configurations, current matching considerations, active load configurations, Miller effect, voltage references, supply independent biasing, temperature independent references, input bias current.

UNIT 4 OPERATIONAL AMPLIFIERS**9 Hrs.**

Concept of negative feedback, Effect of loading in feedback networks, Operational amplifier performance parameters, analysis of the simple op amp, Two-stage Op Amps, Input range limitations, Gain boosting, slew rate, power supply rejection, design considerations of integrated op-amps, Statistical characteristics of noise, noise in single stage amplifiers, noise in differential amplifiers, noise figure and noise temperature.

UNIT 5 ANALOG MULTIPLIER AND IC DESIGN**9 Hrs.**

Bipolar analog multiplier, simple emitter coupled multiplier, a complete analog multiplier, Gilbert multiplier, Analysis of four quadrant and variable trans conductance multiplier, Low Power Analog Design, Introduction to Switched Capacitor Circuits, Analog Layout Considerations and Packaging Issues.

Max. 45 Hrs.**New Courses****Deleted Content****Added**

COURSE OUTCOMES

On completion of the course, student will be able to

- C01** - Analyze the characteristics of various small signal models of BJT and MOSFETs.
- C02** - Analyze the performance of single stage and multistage amplifiers.
- C03** - Design current mirrors circuits for given specifications.
- C04** - Analyze the performance of Operational amplifiers in closed loop and open loop configurations.
- C05** - Design analog multiplier circuits using BJT and MOSFETs.
- C06** - Design various filters using switched capacitor circuit techniques.

TEXT / REFERENCE BOOKS

1. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", 5th Edition, Wiley, 2009.
2. Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill, 2012
3. Willey M.C. Sansen, "Analog design essentials", Springer, 2014.
4. Grebene, "Bipolar and MOS Analog Integrated circuit design", John Wiley & Sons, Inc., 2015.
5. Phillip E.Allen, Douglas R.Holberg, "CMOS Analog Circuit Design", 2nd Edition, Oxford University Press, 2012.
6. P.E.Allen and D.R.Holberg, "CMOS Analog Circuit Design", Oxford University Press, 2011.

**New Courses****Deleted Content****Added**

S35BLH11	SOFTWARE FOR EMBEDDED SYSTEMS (For AE and Embedded & IoT)	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- Introduce the students to the issues and challenges in developing software for embedded systems.
- Educate the students in formal modeling, design and development methodologies.
- Expose the students to software tools and techniques used in the development process.

UNIT 1 EMBEDDED PROGRAMMING**9 Hrs.**

C and Assembly - Programming Style - Declarations and Expressions - Arrays, Qualifiers and Reading Numbers - Decision and Control Statements - Programming Process - More Control Statements - Variable Scope and Functions - C Preprocessor - Advanced Types - Simple Pointers – Experiment Debugging and Optimization of C Programs.

UNIT 2 C PROGRAMMING TOOLCHAIN IN LINUX**9 Hrs.**

C preprocessor - Stages of Compilation - Introduction to GCC - Debugging with GDB - The Make utility - GNU Configure and Build System - GNU Binary utilities - Profiling - using gprof -Memory Leak Detection with val grind - Introduction to GNU C Library – Develop Embedded C programs in Linux platforms.

UNIT 3 EMBEDDED C AND EMBEDDED OS**9 Hrs.**

Adding Structure to 'C' Code: Object oriented programming with C, Header files for Project and Port, Examples. Meeting Real-time constraints: Creating hardware delays - Need for timeout mechanism - Creating loop timeouts - Creating hardware timeouts. Basis of embedded OS, Introduction to sEOS, Using Timer 0 and Timer 1, Portability issue- Creating real-time applications using sEOS.

UNIT 4 MODEL BASED DESIGN OF EMBEDDED SYSTEMS**9 Hrs.**

System-level design methodologies - UML basics, Object state behavior - UML state charts - Role of scenarios in the definition of behavior - Timing diagrams - Sequence diagrams - Event hierarchies - types and strategies of operations - Architectural design in UML - threads in UML- Develop UML model for Real World Problems.

UNIT 5 EMBEDDED JAVA**9 Hrs.**

Introduction to Embedded Java and J2ME – Smart Card basics – Java card technology overview – Java card objects – Java card applets – working with APDUs – Web Technology for Embedded Systems- Smart Programming using Javacard tool chain.

Max. 45Hrs.**COURSE OUTCOMES**

On completion of the course, students will be able to

- CO1** - Develop Assembly and C programs for 8-bit microcontrollers.
- CO2** - Analyze Embedded C programs and debug the software faults.
- CO3** - Apply embedded C programming tool chain available in Linux platforms.
- CO4** - Develop applications with sEOS embedded operating system.
- CO5** - Apply UML based modeling in design of embedded applications.
- CO6** - Develop embedded applications with Embedded Java and J2ME tool chain.

TEXT / REFERENCE BOOKS**New Courses****Deleted Content****Added**

1. Steve Oualline, 'Practical C Programming 3rd Edition', O'Reilly Media, Inc, 2016.
2. Hassan Gomma, "Designing concurrent, distributed, and real time applications with UML", 2nd Edition, Pearson Education, 2012.
3. Michael J Pont, "Embedded C", Pearson Education, 2017.
4. Zhiqun Chen, 'Java Card Technology for Smart Cards: Architecture and Programmer's Guide', Addison-Wesley Professional, 2020.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 20 Questions - MCQs

20 Marks

PART B: Practical Laboratory

80 Marks



New Courses



Deleted Content



Added

SECB5103	MICROCONTROLLERS (For AE and Embedded Systems & IoT)	L	T	P	EL	Credits	Total Marks
		3	0	0	1	3	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- To learn the internal architecture of ARM Cortex M3/M4 core.
- To study about different communication protocols.
- Discuss in detail about peripheral interfacing with MCUs.
- To learn STM32 cube MX IDE for ARM Cortex M3 / M4 processors.
- To learn API level coding with STM32fxxxboards.

UNIT 1 INTRODUCTION TO MICROCONTROLLER**9 Hrs.**

Microprocessors and Microcontrollers – CISC and RISC - Fundamentals of Assembly language Programming – Instruction to Assembler – C Programming for Microcontrollers – Compiler and IDE.

UNIT 2 INTRODUCTION TO ARM CORTEX-M**9 Hrs.**

Introduction to various versions of ARM Cortex M series - Debugging Features -Thumb Instruction Set - Memory Management - Comparison of various Cortex-M microcontrollers: LPC2148, STM32 series.

UNIT 3 CORTEX M4 CORE**9 Hrs.**

Cortex M4 Architecture – Features – CPU Registers, Operating Modes - Instruction set – Addressing modes – I/O Programming - Vector Table.

UNIT 4 Cortex M4 MICROCONTROLLER**9 Hrs.**

STM32F3/4 Series Microcontrollers - Timers and Counters – Interrupts /Exception Handling - Phase Locked Loops – Communication Protocols - I2C, SPI, USB, CAN and LIN.

UNIT 5 STM32F3/4 SERIES PROGRAMMING**9 Hrs.**

Introduction to Cortex M4 microcontroller boards – GPIO, Timers, EEPROM, ADC, PWM, SPI and I2C interface programming with STM32cube IDE.

Max. 45 Hrs.**COURSE OUTCOMES**

Upon completion of the course, the students will be able to

- C01** - Choose appropriate microcontrollers or processor core for different applications
- C02** - Demonstrate Host/Target Development build tools for Embedded System development
- C03** - Design circuits with ARM cortex-M family microcontrollers
- C04** - Analyze the performance of various communication protocols.
- C05** - Develop Embedded System applications using STM microcontrollers
- C06** - Demonstrate Hardware Abstraction Layer based microcontroller peripheral programming

**New Courses****Deleted Content****Added**

TEXT / REFERENCE BOOKS

1. Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", Newnes, 2nd Edition, 2009.
2. Mark Fisher, "ARM Cortex M4 Cookbook, Packt Publishing, 2016.
3. Lyla B. Das, "Architecture, Programming, and Interfacing of Low-power Processors-ARM 7, Cortex-M", Cengage, 1st Edition, 2017.
4. Steve Furber, "ARM System-on-Chip Architecture" Pearson, 2nd Edition, 2015.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 5 Questions of 6 marks each - No choice**30 Marks****PART B:** 2 Questions from each unit of internal choice, each carrying 14 marks**70 Marks**

SECA3001 (Old)	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- Understand OSI security architecture and classical encryption techniques.
- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- Understand various block cipher and stream cipher models.
- Describe the principles of public key cryptosystems, hash functions and digital signature.
- To provide basic concept of network and security system.

UNIT 1 FUNDAMENTALS**9 Hrs.**

The OSI security architecture-Network security model-Principles of Security - Confidentiality, Authentication, Integrity, Nonrepudiation, Access Control, Availability: Types of Attacks - Active and Passive: Classical Encryption Techniques: Substitution Cipher - Caesar Cipher, Play Fair Cipher, Hill cipher, One Time Pad: Transposition Cipher - Rail Fence and Simple Columnar Techniques.

UNIT 2 SYMMETRIC KEY CRYPTOGRAPHY**9 Hrs.**

Symmetric Key Cryptosystems: Comparison of Stream Ciphers and Block Ciphers: Feistel Block Cipher: Block Cipher Modes of Operation: Data Encryption Standard - Details of one round in DES: Advanced Encryption Standard.

UNIT 3 PUBLIC KEY CRYPTOGRAPHY**9 Hrs.**

Modular Arithmetic: Euclidean Algorithm: Fermat's and Euler's Theorem; Chinese Remainder Theorem: Principles of Public Key Cryptosystems; Key Management - Distribution of Public Keys, Use of Public Key Encryption to Distribute Secret Keys: RSA Algorithm, Diffie-Hellman Key Exchange; Concepts of Elliptic Curve Cryptography.

UNIT 4 SECURITY FUNCTIONS AND APPLICATIONS**9 Hrs.**

Authentication Requirements: Message Authentication Codes - Requirements for MAC, Basic Uses of MAC: Hash Functions HMAC - Requirements for a Hash function, MD-5 SHA 1 Kerberos: X.509 Authentication Service - Certificate: E-Mail Security - Pretty good Privacy, S/MIME.

UNIT 5 NETWORK AND SYSTEM SECURITY**9 Hrs.**

IP Security - IP Security Architecture, Authentication Header, Encapsulating Security Payload, Benefits, Applications; Web Security - Secure Socket Layer, Secure Electronic Transaction -SSL Vs SET, Firewalls - Design Principles, Characteristics, Types of Firewalls: Virus and Antivirus approaches.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Analyze the vulnerabilities in any computing system and hence be able to design a security solution.
- CO2 - Identify the security issues in the network and resolve it.
- CO3 - Evaluate security mechanisms using rigorous approaches, including theoretical.
- CO4 - Compare and Contrast different IEEE standards and electronic mail security. CO5
- Understand the various symmetric key cryptographic techniques.
- CO6 - Apply the various cryptographic algorithm for emails and web security.

TEXT / REFERENCE BOOKS

- Atul Kahate, "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill Education Pvt.Ltd., New Delhi, 2011.
- William Stallings, "Cryptography and Network Security - Principles and Practices", 4th Edition, Prentice-Hall of India Pvt.Ltd., New Delhi, 2006.
- Behrouz A. Forouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.
- Niels Ferguson and Bruce Schneier, "Practical Cryptography", John Wiley and Sons, 2003.
- Niels Ferguson, Bruce Schneier, Tadayoshi Kohno, "Cryptography Engineering- Design Principles and Practical Applications", Wiley Publishing, Inc, Indiana, 2010.
- Douglas R Simson "Cryptography - Theory and practice", 1st Edition, CRC Press, 1995.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A:** 10 Questions of 2 marks each – No choice**20 Marks****PART B:** 2 Questions from each unit of internal choice; each carrying 16 marks**80 Marks****New Courses****Deleted Content****Added**

SECA3050 (Revised)	CRYPTOGRAPHY AND NETWORK SECURITY	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- Understand OSI security architecture and classical encryption techniques.
- Acquire fundamental knowledge on the concepts of finite fields and number theory.
- Understand various block cipher and stream cipher models.
- Describe the principles of public key cryptosystems, hash functions and digital signature.
- To provide basic concept of network and security system.

UNIT 1 FUNDAMENTALS**9 Hrs.**

The OSI security architecture-Network security model-Principles of Security - Confidentiality, Authentication, Integrity, Nonrepudiation, Access Control, Availability: Types of Attacks - Active and Passive: Classical Encryption Techniques: Substitution Cipher - Caesar Cipher, Play Fair Cipher, Hill cipher, One Time Pad: Transposition Cipher - Rail Fence and Simple Columnar Techniques.

UNIT 2 SYMMETRIC KEY CRYPTOGRAPHY**9 Hrs.**

Symmetric Key Cryptosystems: Comparison of Stream Ciphers and Block Ciphers: Feistel Block Cipher: Block Cipher Modes of Operation: Data Encryption Standard - Details of one round in DES: Advanced Encryption Standard.

UNIT 3 PUBLIC KEY CRYPTOGRAPHY**9 Hrs.**

Modular Arithmetic: Euclidean Algorithm: Fermat's and Euler's Theorem; Chinese Remainder Theorem: Principles of Public Key Cryptosystems; Key Management - Distribution of Public Keys, Use of Public Key Encryption to Distribute Secret Keys: RSA Algorithm, Diffie-Hellman Key Exchange; Concepts of Elliptic Curve Cryptography.

UNIT 4 SECURITY FUNCTIONS AND APPLICATIONS**9 Hrs.**

Authentication Requirements: Message Authentication Codes - Requirements for MAC, Basic Uses of MAC: Hash Functions HMAC - Requirements for a Hash function, MD-5 SHA 1 Kerberos: X.509 Authentication Service - Certificate: E-Mail Security - Pretty good Privacy, S/MIME.

UNIT 5 CYBER SECURITY-THREATS AND ATTACKS

Threats: Intellectual Property – Types of Cyber Attacks – Deviations in QoS – Espionage – Forces of Nature – Human Error – Information Extortion – Missing, inadequate or incomplete organization policy – Missing, inadequate or incomplete controls – sabotage – Theft – Hardware Failures – Software Failures Attacks: Malicious Code – Hoaxes – Back Doors – Password Crack – Brute Force – Spoofing – Man-in-the-Middle – Spam – Email Bombing – Sniffers – Social Engineering – Pharming – Timing Attack

.Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Analyze the vulnerabilities in any computing system and hence be able to design a security solution.

CO2 - Identify the security issues in the network and resolve it.

CO3 - Evaluate security mechanisms using rigorous approaches, including theoretical.

CO4 - Compare and Contrast different IEEE standards and electronic mail security. CO5

- Understand the various symmetric key cryptographic techniques.

CO6 - Apply the various cryptographic algorithm for emails and web security.

TEXT / REFERENCE BOOKS

7. Atul Kahate, "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill Education Pvt.Ltd., New Delhi, 2011.
8. William Stallings, "Cryptography and Network Security - Principles and Practices", 4th Edition, Prentice-Hall of India Pvt.Ltd., New Delhi, 2006.
9. Behrouz A. Forouzan, "Cryptography & Network Security", Tata Mc Graw Hill, 2007.
10. Niels Ferguson and Bruce Schneier, "Practical Cryptography", John Wiley and Sons, 2003.
11. Niels Ferguson, Bruce Schneier, Tadayoshi Kohno, "Cryptography Engineering- Design Principles and Practical Applications", Wiley Publishing, Inc, Indiana, 2010.
12. Douglas R Simson "Cryptography – Theory and practice", 1st Edition, CRC Press, 1995.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****PART A:** 10 Questions of 2 marks each – No choice**PART B:** 2 Questions from each unit of internal choice; each carrying 16 marks**Exam Duration: 3 Hrs.****20 Marks****80 Marks****New Courses****Deleted Content****Added**

SECA3012 (Old)	CELLULAR MOBILE NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study the overview of cellular system concept.
- To understand the concept of GSM and GPRS.
- To introduce various technologies involved in mobile communication.
- Examine Theory and Systems Research in Mobility.

UNIT 1 INTRODUCTION TO CELLULAR MOBILE WIRELESS NETWORKS

9 Hrs.

Basics of Cellular system - Performance, Mobile radio environment and its uniqueness, Frequency Spectrum, Operation and planning of cellular systems, planning of cellular system, overview of generations of cellular systems, - Cellular Communications from 1G to 3G - Road Map for Higher Data Rate Capability in 3G - Wireless 4G Systems - Future Wireless Networks – Standardization Activities for Cellular Systems.

UNIT 2 FUNDAMENTALS OF CELLULAR RADIO SYSTEMS DESIGN

9 Hrs.

Challenges in cellular and mobile networks, Frequency reuse, Co channel interference, reduction factor, Omni directional antenna systems, Required carrier to interference ratio, cell splitting, consideration of the components of cellular systems, co- channel measurement design of antenna system, antenna parameter and their effects.

UNIT 3 MODULATION METHODS

9 Hrs.

Digital modulation techniques - OFDM, FDMA, TDMA, CDMA, CDMA capacity, probability of bit error considerations, CDMA compared with TDMA Spread spectrum Techniques – DSSS, FHSS.

UNIT 4 MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATIONS

9 Hrs.

Packet radio – Pure ALOHA, Slotted ALOHA, CSMA, Reservation ALOHA, PRMA - Capacity of Cellular Systems. Wireless systems and standards – I – AMPS and ETACS – IS 54 and IS 136 – GSM features – Architecture – Radio subsystems – Traffic channels – call processing.

UNIT 5 WIRELESS SYSTEMS AND STANDARDS

9 Hrs.

CDMA features – Architecture – IS 95 – Forward and reverse channels – power control - system capacity., Wireless Networking – WLAN – PAN – Mobile network layer – Mobile Transport layer – Wireless data services, Common channel signalling. Wireless Networking – Satellite data communication - cellular data communications, third generation UMTS system features – WiMAX – RF.

Max. 45 Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Gain of knowledge about the evolution of communication systems.

CO2 - Identify the challenges in wireless communication and impact of antenna. CO3

- Choose proper multiple accessing methods depending on channel model. CO4 -

Identify traffic channels for call processing.

CO5 - Calculate key performance metrics of a cellular communication system. CO6

- Acquire practical knowledge on wireless networks.

TEXT / REFERENCE BOOKS

1. C.Y.Lee, "Mobile Communication Design Fundamentals", 2nd Edition-2010.
2. Jochen H.Schiller, "Mobile Communication" Addison Wesley, 2003.
3. Mobile Communications Handbook, 3rd Edition, CRC PRESS-2013.
4. Theodore S. Rappaport, "Wireless Communication" 2nd Edition, Pearson-2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each – No choice

20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks



New Courses



Deleted Content



Added

SECA3051 (Revised)	CELLULAR MOBILE NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To study the overview of cellular system concept.
- To understand the concept of GSM and GPRS.
- To introduce various technologies involved in mobile communication.
- Examine Theory and Systems Research in Mobility.

UNIT 1 INTRODUCTION TO CELLULAR MOBILE WIRELESS NETWORKS**9 Hrs.**

Basics of Cellular system - Performance, Mobile radio environment and its uniqueness, Frequency Spectrum, Operation and planning of cellular systems, planning of cellular system, overview of generations of cellular systems, - Cellular Communications from 1G to 3G - Road Map for Higher Data Rate Capability in 3G - Wireless 4G Systems - Future Wireless Networks – Standardization Activities for Cellular Systems.

UNIT 2 FUNDAMENTALS OF CELLULAR RADIO SYSTEMS DESIGN**9 Hrs.**

Challenges in cellular and mobile networks, Frequency reuse, Co channel interference, reduction factor, Omni directional antenna systems, Required carrier to interference ratio, cell splitting, consideration of the components of cellular systems, co-channel measurement design of antenna system, antenna parameter and their effects.

UNIT 3 MODULATION METHODS**9 Hrs.**

Digital modulation techniques - OFDM, FDMA, TDMA, CDMA, CDMA capacity, probability of bit error considerations, CDMA compared with TDMA Spread spectrum Techniques – DSSS, FHSS.

UNIT 4 WIRELESS ENERGY HARVESTING

Energy-rate, trade-off, Simultaneous wireless information and power transfer (SWIPT), time-switching, power splitting Wireless powered communication networks.

UNIT 5 WIRELESS SYSTEMS AND STANDARDS**9 Hrs.**

CDMA features – Architecture – IS 95 – Forward and reverse channels – power control - system capacity., Wireless Networking – WLAN – PAN – Mobile network layer – Mobile Transport layer – Wireless data services, Common channelsignalling. Wireless Networking – Satellite data communication - cellular data communications, third generation UMTS system features – WiMAX – RF.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Gain of knowledge about the evolution of communication systems.
 CO2 - Identify the challenges in wireless communication and impact of antenna. CO3
 - Choose proper multiple accessing methods depending on channel model. CO4
 -Identify traffic channels for call processing.
 CO5 - Calculate key performance metrics of a cellular communication system. CO6
 - Acquire practical knowledge on wireless networks.

TEXT / REFERENCE BOOKS

5. C.Y.Lee, "Mobile Communication Design Fundamentals", 2nd Edition-2010.
6. Jochen H.Schiller, "Mobile Communication" Addison Wesley, 2003.
7. Mobile Communications Handbook, 3rd Edition, CRC PRESS-2013.
8. Theodore S. Rappaport, "Wireless Communication" 2nd Edition, Pearson-2010.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****PART A:** 10 Questions of 2 marks each – No choice**PART B:** 2 Questions from each unit of internal choice; each carrying 16 marks**Exam Duration: 3 Hrs.****20 Marks****80 Marks****New Courses****Deleted Content****Added**



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)

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SCHOOL OF ELECTRICAL AND ELECTRONICS

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ACADEMIC YEAR 2023 – 2024

BoS conducted on 25th Nov 2023

SL. NO	COURSE CODE	SUBJECT COURSE NAME	NEW COURSE / REVISED COURSE	FOCUS ON
1.	S11BLH22	Python Programming	New Course	Skill Development
2.	SECB3002	Knowledge Engineering and Expert System	New Course	Skill Development
3.	SECA3016	Mobile Adhoc Networks	Revised Course	Skill Development
4.	SECA3017	Optical Networks	Revised Course	Skill Development
5.	SECB5202	Real Time Operating Systems	New Course	Skill Development
6.	S35BLH21	Real Time Signal and Color Image Processing	New Course	Employability Skill , Development
7.	S35BPB21	Strategies In Industry 5.0	New Course	Employability Skill , Development

Dr.T.Ravi
HOD / ECE



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S11BLH22	PYTHON PROGRAMMING	L	T	P	EL	Credits	Total Marks
		2	0	2	0	3	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- To study the concept of data types
- To study basics of python programing
- To study GUI programing

UNIT 1 INTRODUCTION

9 Hrs.

Introduction, History, Features of Python, Data types, Variables, Expressions, Conditional Statements, Operators, Looping, Control Statements

Practice Programs

1. Develop a python program to find the best of two test average marks out of three test's marks accepted from the user and compute the overall pass percentage for their placements.
2. Write a class Money with attributes Rupees and Paise. Overload operators +=, -=, and >= so that they may be used on two objects. Also write functions so that a desired amount of money can be either added or subtracted from Money.

UNIT 2 FUNCTIONS AND STRINGS

9 Hrs.

Function Calls, Conversion of functions, Arguments, Fruitful Functions, Boolean functions, Strings, Looping and Counting, String Operations.

Practice Programs

1. Defined as a function F as $F_n = F_{n-1} + F_{n-2}$. Write a Python program which accepts a value for N (where $N > 0$) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed.
2. Analyze the string similarity between two given strings using Python program

Sample Output: Original string: Python Exercises Python Exercise	Sample Output: Original string: Python Exercises Python Exercises
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UNIT 3 LIST, TUPLES AND DICTIONARIES

9 Hrs.

List, List Operations Built in List functions, Tuple, Tuple Operations, Dictionary, Operations in Dictionary, Built in Dictionary Methods.

Practice Programs

1. A hospital has received a set of lab reports. Totally five tests are conducted in the lab and the report is prepared in such a way that the 'nth' number correspond to value of test_n. Given the details of a test made for a patient, write an algorithm and the subsequent Python program to print if the test result is normal or not normal by referring the values in Table 1. Since the value is sensitive, provide a mechanism so that the values do not get altered.



New Courses



Deleted Content



Added

Name of the Test	Minimum Value	Maximum Value
Test1	20	30
Test2	35.5	40
Test3	12	15
Test4	120	150
Test5	80	120

2. An University has published the results of the term end examination conducted in April. List of failures in physics, mathematics, chemistry and computer science is available. Write a program to find the number of failures in the examination. This includes the count of failures in one or more subjects.
3. Write a program to maintain a telephone directory of the employees of an organization. If the employee has more than one number store all the numbers. Write a program to print the mobile numbers given full or part of the name of the employee. Eg: Given name of the employee as 'John' the program must print phone numbers of 'John Paul' and 'Michel John'.

UNIT 4 FILES AND REGULAR EXPRESSIONS

9 Hrs.

Files, File Handling Operations, User Defined Exceptions, Regular Expression, Types using Match function, Postfix, Infix, prefix conversion.

Practice Programs

1. A proctor of our university wants a student to write a program that calculates the average of marks scored by her wards in CAT1. She has the details such as name, register number, mark1, mark2 and mark3 of her proctees. The constraint given by the faculty is that any of the details must not be altered by mistake. Help the student to develop a Python program.
2. Consider the following scenario for finding the number of students who secured centum in mathematics in their examination. A total of 6 lakhs students appeared for the examinations and their results are generated automatically and updates to the portal using file.

UNIT 5 CREATING GUI FORM, CLASSES AND OBJECTS

9 Hrs.

Creating a GUI Window, Widgets, Buttons, Canvas, Layout Management, Designing GUI Applications using Tkinter module, Overview of OOP, class Definitions, Built in Class Attributes, Real time Examples using Classes and objects.

Practice Programs

1. A farmer with a fox, a goose, and a sack of corn needs to cross a river. Now he is on the east side of the river and wants to go to west side. The farmer has a rowboat, but there is room for only the farmer and one of his three items. Unfortunately, both the fox and the goose are hungry. The fox cannot be left alone with the goose, or the fox will eat the goose. Likewise, the goose cannot be left alone with the sack of corn, or the goose will eat the corn. Given a sequence of moves find if all the three items fox, goose and corn are safe. The input sequence indicate the item carried by the farmer along with him in the boat. 'F' – Fox, 'C' – Corn, 'G' – Goose, N- Nothing. As he is now on the eastern side the first move is to west and direction alternates for each step.
2. An university is setting up a new lab at their premises. Design an algorithm and write Python code to determine the approximate cost to be spent for setting up the lab. Cost for setting the lab is sum of cost of computers, cost of furnitures and labour cost. Use the following formulae for solving the problem:

COURSE OUTCOMES

Max.45 Hrs.

On completion of the course, student will be able to

- CO1** Apply the concept of Data types, conditional statements and looping in Python programming
- CO2** Apply functions in Python for real time problems.
- CO3** Analyze the use of List, Tuples and Dictionaries in Python programming



New Courses



Deleted Content



Added

C04 Develop python programming for web applications using regular expression

C05 Design GUI in Python for various applications

C06 Develop solution in Python for any specific real time problem

TEXT / REFERENCE BOOKS

1. Introduction to Programming Using Python by Y. Daniel Liang (Pearson Publishing), ISBN 9780132747189
2. <http://www.pythontutor.com/visualize.html>
3. <https://docs.python.org/2/tutorial>
4. The Practice of Computing Using Python, by W. Punch and R. Enbody, 3-rd edition, Pearson Publishing, ISBN 978-0-13-437976-0

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A MCQ Questions

20 Marks

PART B Laboratory Practical

80 Marks



New Courses



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Added

SECB3002	KNOWLEDGE ENGINEERING AND EXPERT SYSTEM	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- To get introduced to the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence.
- To solve problems in Artificial Intelligence using Python.
- To familiarize with Fuzzy Logic and knowledge processing in expert systems.

UNIT 1 INTRODUCTION TO PYTHON**9 Hrs.**

Python-Introduction to Python- Lists Dictionaries & Tuples in Python- Python implementation of Hill Climbing.

UNIT 2 PROBLEM IDENTIFICATION**9 Hrs.**

What is Artificial Intelligence, The AI Problems, Defining the Problem as a State Space Search, Problem Characteristics Searching strategies – Generate and Test.

UNIT 3 HEURISTIC SEARCH TECHNIQUES**9 Hrs.**

Heuristic Search Techniques- Breadth-First Search (BFS) and Depth First Search (DFS), Bidirectional Search, A* search Simulated Annealing, Hill climbing.

UNIT 4 KNOWLEDGE REPRESENTATION**9 Hrs.**

Using Predicate logic -representing facts in logic, functions and predicates, Conversion to clause form, Resolution in propositional logic, Resolution in predicate logic, Unification. Representing Knowledge Using Rules: Procedural Versus Declarative knowledge, Logic Programming, forward versus Backward Reasoning.

UNIT 5 CONNECTIONIST MODELS AND EXPERT SYSTEM**9 Hrs.**

Hopfield Networks, Learning in Neural Networks, Applications of Neural Networks, Recurrent Networks. Connectionist AI and Symbolic AI - Representing and using Domain Knowledge – Reasoning with knowledge– Expert System Shells –Support for explanation- examples –Knowledge acquisition-examples.

COURSE OUTCOMES**Max.45 Hrs.**

On completion of the course, student will be able to

- CO1** - Develop Python programs for implementing AI algorithms
- CO2** - Analyze various searching Strategies in AI
- CO3** - Analyze the methods used for Knowledge representation
- CO4** - Analyze the knowledge processing in Expert System
- CO5** - Design and implement algorithms for Connectionist Models
- CO6** - Implement of Search methods using Python

**New Courses****Deleted Content****Added**

TEXT / REFERENCE BOOKS

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill Publishing Company Ltd., New Delhi, Third Edition, ISBN: 13:978-0-07-008770-5, 2010.
2. Stuart Russell, Peter Norvig, "Artificial Intelligence- A modern approach", Pearson Education Asia, Second Edition, ISBN:81-297-0041-7
3. Akshar Bharati, Vineet Chaitanya, Rajeev Sangal, "Natural Language Processing: A Paninian Perspective", Prentice Hall India Ltd., New Delhi, 1996, ISBN 10: 8120309219
4. Amit Konar, Artificial Intelligence and Soft Computing, CRC Press.
5. Dan W.Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall India Ltd., New Delhi, 2009, ISBN: 81-203-0777-1.
6. Rajendra Akerkar, Introduction to Artificial Intelligence, PHI Learning Pvt. Ltd., 2005, ISBN: 81-203- 2864-7.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A** 10 Questions of 2 marks each-No choice**20 Marks****PART B** 2 Questions from each unit of internal choice; each carrying 16 marks**80 Marks****8****0 Marks****New Courses****Deleted Content****Added**

SEC B5202	REAL TIME OPERATING SYSTEMS (For AE and Embedded Systems & IoT)	L	T	P	EL	Credits	Total Marks
		3	0	0	0	3	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- To learn about the fundamental difference between general purpose and real time operating systems.
- To learn about the scheduling algorithms used in RTOS.
- To learn about the porting and configuration of RTOS to different hardware targets.
- To learn programming with RTOS.

UNIT 1 INTRODUCTION AND INTERNALS**9 Hrs.**

Introduction to Real-Time Systems, Classification of real time systems, Difference between GPOS and RTOS- Real Time Kernels - RTOS Architecture- Features of RTOS- POSIX-RT standard

UNIT 2 PERFORMANCE METRICS AND SCHEDULING ALGORITHMS**9 Hrs.**

Performance Metrics of RTOS, Task Specifications-Task state - Real Time Scheduling algorithms: Cyclic executive, Rate monotonic, IRIS and Least laxity scheduling- Schedulability Analysis.

UNIT 3 RESOURCE SHARING FOR REAL TIME TASKS**9 Hrs.**

Resource sharing among tasks- Priority inversion Problem- Priority inheritance and Priority ceiling Protocols – Features of commercial and open source real time operating systems: Vxworks, QNX, Micrium OS, RT Linux and Free RTOS

UNIT 4 APPLICATION PROGRAMMING USING RTOS**9 Hrs.**

Task synchronization using semaphores, Inter task communication: message queues and pipes, Remote procedure call- Timers and Interrupts-Memory management and I/O management.

UNIT 5 RTOS IMAGE BUILDING FOR DIFFERENT TARGET PLATFORMS**9 Hrs.**

Porting of RTOS, Configuring RTOS for minimizing RAM consumption and increasing Throughput- Building RTOS Image for Target platforms

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to:

- C01** - Analyze the hardware and software issues in real-time computing
- C02** - Demonstrate real-time scheduling and schedulability analysis of priority-driven scheduling algorithms.
- C03** - Analyze the situation of fault occurrence and provide feasible solutions accordingly.
- C04** - Demonstrate porting of RTOS to embedded hardware target platforms.
- C05** - Develop real-time applications using RTOS software.
- C06** - Attain improved employability and entrepreneurship capacity due to knowledge upgradation on recent trends in embedded systems design.

TEXT/REFERENCE BOOKS

1. Jane W. S Liu, "Real Time Systems" Pearson Higher Education, 3rd Edition, 2010.
2. Raj Kamal, "Embedded Systems- Architecture, Programming and Design" Tata McGraw Hill, 2nd Edition, 2014.
3. Jean J. Labrosse, "Micro C/OS-II : The real time kernel" CMP Books, 2nd Edition, 2015.

**New Courses****Deleted Content****Added**

REGULATIONS-2023

4. Warren Gay, "Beginning STM32: Developing with Free RTOS", Apress, 1st Edition, 2018.
5. Richard Barry, "Mastering the Free RTOS: Real Time Kernel", Real Time Engineers Ltd, 1st Edition, 2016.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 5 Questions of 6 marks each - No choice

30 Marks

PART B: 2 Questions from each unit of internal choice, each carrying 14 marks

70 Marks



New Courses



Deleted Content

15



Added

REGULATIONS-2023

S35BLH21	REAL TIME SIGNAL AND COLOR IMAGE PROCESSING (FOR AE and Embedded Systems & IoT)	L	T	P	EL	Credits	Total Marks
		3	0	2	0	4	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- To introduce the principles of optimum filters such as Wiener and Kalman filters
- To introduce the principles of adaptive filters and their applications to communication engineering
- To introduce the concepts of multi-resolution analysis

UNIT 1 DESIGN OF OPTIMUM FILTERS**9 Hrs.**

Wiener filters - FIR Wiener filter - discrete Wiener Hopf equation, Applications - filtering, linear prediction. IIR Wiener filter - causal and non-causal filters. Recursive estimators - discrete Kalman filter applications.

UNIT 2 DESIGN OF ADAPTIVE FILTERS**9 Hrs.**

Principles and properties of adaptive filters - FIR adaptive filters. Adaptive algorithms - steepest descent algorithm, the LMS algorithm - convergence. Applications of adaptive filtering - noise cancellation, channel equalization.

UNIT 3 APPLICATIONS OF WAVELETS**9 Hrs.**

Short-time Fourier transform - Heisenberg uncertainty principle. Principles of multi-resolution analysis - sub-band coding, the continuous and discrete wavelet transform - properties. Applications of wavelet transform - noise reduction, image compression.

UNIT 4 COLOR IMAGE PROCESSING**9 Hrs.**

Colour Models and Spaces- RGB and CMYK Spaces, Scalar Processing of Colour Images-Vector Processing of Colour Images- Noise Removal using Vector Filters-Vector Edge Detection- Colour Filter Arrays and Demosaicking

UNIT 5 3D IMAGE VISUALIZATION**9 Hrs.**

Sources of 3D Data sets, Slicing the Data set, Arbitrary section planes, The use of color, Volumetric display, Stereo Viewing, Ray tracing, Reflection, Image processing in 3D, Measurements on 3D images.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

C01 - Apply optimum filters appropriately for a given communication application.

C02 - Design appropriate adaptive algorithm for processing non-stationary signals.

C03 - Analyse wavelet transforms for signal and image processing based applications.

C04 - Demonstrate filtering of color images.

C05 - Perform vector operations on color images.

C06 - Develop code for 3D image processing.

**New Courses****Deleted Content****Added**

REGULATIONS-2023

TEXT / REFERENCE BOOKS

1. Monson H. Hayes, "Statistical digital signal processing and modeling", John Wiley and Sons Inc. New York, Indian reprint 2018.
2. P. P. Vaidyanathan, "Multirate systems and filter banks", Prentice Hall Inc. 2009.
3. Andreas Koschan, MongiAbidi. Digital color image processing, John Wiley and Sons, 2008.
4. Gaurav Sharma (Ed). Digital colorimaging handbook, CRC Press, 2013.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN**Max. Marks: 100****Exam Duration: 3 Hrs.****PART A: 20 Questions MCQs****20 Marks****PART B: Practical Laboratory****80 Marks****New Courses****Deleted Content**

19

**Added**

REGULATIONS-2023

S35BPB21	STRATEGIES IN INDUSTRY 5.0 (For AE and Embedded Systems & IoT)	L	T	P	EL	Credits	Total Marks
		2	0	2	0	3	100

Pre requisite: Nil

Co requisite: Nil

COURSE OBJECTIVES

- To acquaint with the digital transformation of Industry 5.0
- To recognize the power of industry to achieve societal goals beyond jobs and growth
- To understand the design of personalized electronics products
- To focus on methods of interaction between humans and machines in virtual reality
- To develop the concept of augmented reality in electronics manufacturing beyond automation and optimization

UNIT 1 INDUSTRY 5.0**9 Hrs.**

Evolution from Industry 1.0 to 5.0, Introduction to Industry 5.0, Globalization and Emerging Issues, LEAN Production Systems, Smart and Connected Business Perspective, Smart Factories, Healthcare and Human computer interactions, Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Big Data and Advanced Analysis.

UNIT 2 DIGITAL TRANSFORMATION TO INDUSTRY 5.0**9 Hrs.**

Digital Transformation, Introduction to Digital Transformation, Digital business transformation, Causes of disruption and transformation, Digital transformation myths and realities, Digital transformation across various industries, Retail industry, Urban Development, e-Governance and the public sector, Insurance industry, Healthcare, Food, Manufacturing, Disaster Control, Elements of Society 5.0, Data Driven to Society, Humanity Vs Society 5.0.

UNIT 3 SMART WORLD**9 Hrs.**

Introduction: Sensing & actuation, Communication, Electronics in Smart city, 5G Technology, Communication protocols, Integration of Sensors in Robots and Artificial Intelligence, Human-Machine Interaction, Industrial IoT- Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management., Intellectual Property Rights- Case Studies - Milk Processing and Packaging Industries.

UNIT 4 CYBER SECURITY IN INDUSTRY 5.0**9 Hrs.**

Introduction to Cyber Physical Systems (CPS), Architecture of CPS, Data science and technology for CPS, Prototypes of CPS, Emerging applications in CPS including social space, crowd sourcing, Networking systems for CPS applications, Wearable cyber physical systems and applications, Domain applications of CPS: Agriculture, Infrastructure, Disaster management, Energy, Intellectual Property Rights (IPR).

UNIT 5 AR/VR IN INDUSTRY 5.0**9 Hrs.**

Unity, Basics of Unity, Understanding different panels in Unity, Moving, rotating & scaling Game objects in Unity, Game Panel in Unity, Physics in Unity, Increasing the light intensity, Adding colors to Game object, Adding textures to Game object, Parent and child Game objects in Unity. Case Studies- Development of AR/VR Models in Unity.

Max. 45 Hrs.**New Courses****Deleted Content**

20

**Added**

REGULATIONS-2023

COURSE OUTCOMES

On completion of the course, student will be able to

- C01** - Identify the digital transformation power of Industry 5.0 to achieve societal goals beyond jobs and growth.
- C02** - Analyze the effectiveness of various enhanced production models in electronics.
- C03** - Implement various electronics manufacturing technologies of augmented reality beyond automation and optimization.
- C04** - Design suitable sensors for smart world real time applications with virtual reality experience.
- C05** - Evaluate the performance of various cyber physical systems.
- C06** - Create personalized electronics products combining the various industry 5.0 Applications with deep knowledge on Intellectual Property Rights.

TEXT / REFERENCE BOOKS

1. S. Misra, A. Mukherjee, and A. Roy, Introduction to IoT, Cambridge University Press, 2020.
2. S. Misra, C. Roy, and A. Mukherjee, Introduction to Industrial Internet of Things and Industry, CRC Press, 2020.
3. Klaus Schwab, "Fourth Industrial Revolution", Random House USA Inc, New York, USA, 2017.
4. Oliver Grunow, SMART FACTORY AND INDUSTRY 4.0. The current state of Application Technologies, Studylab Publications, 2016.
5. Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.
6. Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
7. Grigore C. Burdea, Philippe Coiffed, Virtual Reality Technology, Wiley 2016.



SECA3017 (Old)	OPTICAL NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To acquaint the students with basic optical communication components, topologies and types of networks.
- To familiarize on the principle of optical amplification and coupling.
- To make the students knowledgeable of various optical network topologies operations, limitations and its practical applications.
- To understand the choice of networks in optical communication.

UNIT 1 INTRODUCTION TO OPTICAL FIBRE**9 Hrs.**

Ray diagram, different types of optical fibre, step index, graded index. Mode Cut-Off wavelength, Mode-field Diameter, Equivalent Step-Index (ESI) Profile, Dispersion Measurements, Mechanical Strength of Optical Fibre. WDM network evolution, WDM network construction, broadcast and select optical WDM network, wavelength routed optical WDM network, Challenges of optical WDM network, OFDM.

UNIT 2 OPTICAL NETWORKING COMPONENTS / BUILDING BLOCKS**9 Hrs.**

Advantages of optical network, telecom network overview and architecture, WDM optical networks, WDM network evolution, WDM network construction, broadcast and select optical WDM network, wavelength routed optical WDM network, Challenges of optical WDM network. Optical transmitters, semiconductor laser diode, tunable and fixed laser, laser characteristics, photodetectors, tunable and fixed optical filters, channel equalizers, optical amplifiers and its characteristics, semiconductor laser amplifier, Raman amplifier, doped fiber amplifier, various Switching elements, OADM, OXC, CLOS architecture, MEMS, wavelength converters.

UNIT 3 NETWORK TOPOLOGIES**9 Hrs.**

Robust networks, Line and path protection switching, Types of topology, Point to point topology, bi-directional line-switched ring (BLSR), meshed topology, Passive optical networks, Metro optical networks 28 MPLS and Optical Networks: IS label switching, Forwarding equivalence class (FEC), Types of MPLS nodes, Label distribution and binding, label swapping and traffic forwarding, MPLS support of Virtual Private Networks (VPN), MPLS traffic engineering, Multi-protocol Lambda switching (MPIS).

UNIT 4 SINGLE AND MULTIHOP NETWORKS**9 Hrs.**

Introduction to single and multi-hop networks, Characteristics of single and multi-hop networks, Experimental single hop networks: LAMBDANET, STARNET, SONATA, Rainbow, experimental multi-hop networks: Shuffle net, De Bruijn Graph, Hypercube.

UNIT 5 OPTICAL ACCESS AND METRO NETWORK**9 Hrs.**

Introduction to access network, PON, EPON and WDM EPON: overview, principal of operation, architecture; dynamic wavelength allocation, STARGATE: overview, need, architecture, operation and application, gigabit Ethernet, radio over fiber network. Introduction to metro network, overview of traffic grooming in SONET ring, traffic grooming in WDM ring, Interconnected WDM networks, packet communication using tunable WADM, RINGOSTAR: architecture, proxy stripping, protection and network lifetime.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Identify the various causes for signal degradation and estimate the different types of losses occurring in transmission of energy.

CO2 - Illustrate the necessity of using couplers and connectors in energy transmission.

CO3 - Explain the Wavelength Division Multiplexing. (WDM) principles and concepts and apply the principles to advanced devices.

CO4 - Analyse the optical communication link using various types of network topologies. CO5 - Evaluate the dynamic wavelength allocation for

**New Courses****Deleted Content****Added**

Access networks.

CO6 - Perform characteristics of optical metro networks like SONET ring and RINGOSTAR.

TEXT/REFERENCE BOOKS

1. Olivier Bouchet, HerveSizun, Christian Boisrobert and Frederique De Forne, "Free-Space Optics: Propagation and Communication", John Wiley and Sons, 2010.
2. Rajiv Ramaswami and Kumar Sivarajan, "Optical Networks – Practical Perspective", 3rd Edition, Morgan - Kaufmann Publishers.
3. Larry Peterson and Bruce Davie, "Computer Networks, A Systems Approach", 5th Edition, 2011, Morgan Kaufmann.
4. B. Mukherjee, "Optical WDM Networks," Springer, 2006.
5. R. C. Sivamurthy, G. Mohan, "WDM Optical Networks: Concepts, Design And Algorithms," PHI Learning Pvt Ltd, 2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100
Hrs.

Exam Duration: 3

PART A: 10 Questions of 2marks each-No choice

20 Marks

PARTB: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks



New Courses



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Added

SECA3053 (Revised)	OPTICAL NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To acquaint the students with basic optical communication components, topologies and types of networks.
- To familiarize on the principle of optical amplification and coupling.
- To make the students knowledgeable of various optical network topologies operations, limitations and its practical applications.
- To understand the choice of networks in optical communication.

UNIT 1 INTRODUCTION TO OPTICAL FIBRE**9 Hrs.**

Ray diagram, different types of optical fibre, step index, graded index. Mode Cut-Off wavelength, Mode-field Diameter, Equivalent Step-Index (ESI) Profile, Dispersion Measurements, Mechanical Strength of Optical Fibre. WDM network evolution, WDM network construction, broadcast and select optical WDM network, wavelength routed optical WDM network, Challenges of optical WDM network, OFDM.

UNIT 2 OPTICAL NETWORKING COMPONENTS / BUILDING BLOCKS**9 Hrs.**

Advantages of optical network, telecom network overview and architecture, WDM optical networks, WDM network evolution, WDM network construction, broadcast and select optical WDM network, wavelength routed optical WDM network, Challenges of optical WDM network. Optical transmitters, semiconductor laser diode, tunable and fixed laser, laser characteristics, photodetectors, tunable and fixed optical filters, channel equalizers, optical amplifiers and its characteristics, semiconductor laser amplifier, Raman amplifier, doped fiber.

UNIT 3 NETWORK TOPOLOGIES**9 Hrs.**

Robust networks, Line and path protection switching, Types of topology, Point to point topology, bi-directional line-switched ring (BLSR), meshed topology, Passive optical networks, Metro optical networks 28 MPLS and Optical Networks: IS label switching, Forwarding equivalence class (FEC), Types of MPLS nodes, Label distribution and binding, label swapping and traffic forwarding, MPLS support of Virtual Private Networks (VPN), MPLS traffic engineering, Multi-protocol Lambda switching (MPIS).

UNIT 4 SINGLE AND MULTIHOP NETWORKS**9 Hrs.**

Introduction to single and multi-hop networks, Characteristics of single and multi-hop networks, Experimental single hop networks: LAMBDANET, STARNET, SONATA, Rainbow, experimental multi-hop networks: Shuffle net, De Bruijn Graph, Hypercube.

UNIT V HIGH CAPACITY NETWORKS

SDM, TDM, and WDM approaches, Application areas, Optical TDM Networks: Multiplexing and demultiplexing, Synchronization, Broadcast networks, Switch-based networks, OTDM test beds.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

- CO1 - Identify the various causes for signal degradation and estimate the different types of losses occurring in transmission of energy.
- CO2 - Illustrate the necessity of using couplers and connectors in energy transmission.
- CO3 - Explain the Wavelength Division Multiplexing. (WDM) principles and concepts and apply the principles to advanced devices.
- CO4 - Analyse the optical communication link using various types of network topologies. CO5 - Evaluate the dynamic wavelength allocation for Access networks.
- CO6 - Perform characteristics of optical metro networks like SONET ring and RINGOSTAR.

**New Courses****Deleted Content****Added**

TEXT/REFERENCE BOOKS

6. Olivier Bouchet, HerveSizun, Christian Boisrobert and Frederique De Forne, "Free-Space Optics: Propagation and Communication", John Wiley and Sons, 2010.
7. Rajiv Ramaswami and Kumar Sivarajan, "Optical Networks – Practical Perspective", 3rd Edition, Morgan - Kaufmann Publishers.
8. Larry Peterson and Bruce Davie, "Computer Networks, A Systems Approach", 5th Edition, 2011, Morgan Kaufmann.
9. B. Mukherjee, "Optical WDM Networks," Springer, 2006.
10. R. C. Sivamurthy, G. Mohan, "WDM Optical Networks: Concepts, Design And Algorithms," PHI Learning Pvt Ltd, 2002.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

**Max. Marks: 100
Hrs.**

Exam Duration: 3

PART A: 10 Questions of 2marks each-No choice

20 Marks

PARTB: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks



New Courses



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Added

SECA3016 (Old)	MOBILE ADHOC NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To acquire knowledge about Adhoc networks and mobility models.
- To understand IEEE standards and thereby the design issues and classifications of MAC protocols.
- To understand algorithm/protocols, environments and communication systems in mobile computing.
- To acquire knowledge about the QOS issues, Energy Management issues and challenges in AdHoc Networks.
- To study about Adhoc networks application and to explore the concepts of wireless mesh and vehicular networks.

UNIT 1 INTRODUCTION

9 Hrs.

Origin of Adhoc network :Packet Radio Networks - Technical Challenges - Architecture of PRNETs - Components of Packet Radios - Introduction to mobile Ad hoc network – MANET - Definition, characteristics features - Issues in Mobile Ad Hoc networks- Types of Ad hoc Mobile Communications - Types of Mobile Host Movements - Ad hoc wireless Internet. **Characteristics of Wireless channel** **Mobility models - Indoor and Outdoor**

UNIT 2 MEDIUM ACCESS PROTOCOLS

9 Hrs.

MAC protocols: Design issues, goals and classification. Contention based protocols - With reservation, scheduling algorithms, protocols using direction antennas - Distributed packet reservation - Multiple access protocol, collision avoidance time allocation protocol. IEEE standards: 802.11a, **802.11b**, **802.11g**

UNIT 3 ROUTING PROTOCOLS AND MULTICAST ROUTING IN ADHOC

9 Hrs.

Networks Introduction - Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks - Classifications of Routing Protocols Table Driven routing protocols: Destination Sequenced Distance Vector Routing Protocol - Cluster head Gateway switched routing protocol. On Demand routing protocol: Dynamic source routing protocol, AODV routing protocol, temporarily ordered routing algorithm. Hybrid routing protocols: Zone routing protocol, Classifications of Multicast Routing Protocols - Tree Based Multicast Routing Protocols - Mesh-Based Multicast Routing Protocols - **Energy-Efficient Multicasting** - **Comparisons of Multicast Routing Protocols**

UNIT 4 QOS AND ENERGY MANAGEMENT

9 Hrs.

Quality of service in Ad hoc wireless Networks: Introduction-Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks - Classifications of QoS Solutions - MAC Layer Solutions - Network Layer Solutions. Need for Energy Management in Ad Hoc Wireless Networks - Classification of Energy Management Schemes - Battery Management Schemes - **Transmission Power Management Schemes** - **System Power Management Schemes**

UNIT 5 ADHOC APPLICATIONS

9 Hrs.

In the Office, While Traveling, Arriving Home, In the Car, Shopping Malls, The Modern battlefield, Car-to-Car Mobile Communications, Mobile Collaborative Applications - Location/context based mobile services - Introduction to wireless mesh networks and vehicular adhoc networks- architectures- Applications.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Acquire Knowledge about technical issue related to these new thrust areas and come up with a

**New Courses****Deleted Content****Added**

- CO2 - Gained an understanding of the current topics in MANETs and WSNs, both from an industry and research point of views.
- CO3 - Have an understanding of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
- CO4 - Understand how proactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
- CO5 - Energy Management issues and challenges in Ad Hoc Networks.
- CO6 - Developing algorithms and routing protocols for Manet Vanet and Mesh network.

TEXT / REFERENCE BOOKS

1. C.Siva Ram Murthy and B.Smanoj, " Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2nd Edition ,2006.
2. Jonathan Loo, Jaime Lloret Mauri, Jesús Hamilton Ortiz "Mobile Ad Hoc Networks: Current Status and Future Trends", CRC Press, 1st Edition, 2011.
3. K Toh, "Adhoc mobile wireless networks, Protocols and Systems", Pearson Education, 2nd Edition, 2015.
4. George Aggelou "Mobile Ad Hoc Networks", McGrawHill, 1st Edition, 2010.
5. Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", OReilly Publishers, 2nd Edition, 2009.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100	Exam Duration:	3 Hrs.
PART A: 10 Questions of 2 marks each - No choice		20 Marks
PART B: 2 Questions from each unit of internal choice; each carrying 16 marks		80 Marks



New Courses



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Added

SECA3054 (Revised)	MOBILE ADHOC NETWORKS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To acquire knowledge about Adhoc networks and mobility models.
- To understand IEEE standards and thereby the design issues and classifications of MAC protocols.
- To understand algorithm/protocols, environments and communication systems in mobile computing.
- To acquire knowledge about the QOS issues, Energy Management issues and challenges in AdHoc Networks.
- To study about Adhoc networks application and to explore the concepts of wireless mesh and vehicular networks.

UNIT 1 INTRODUCTION

9 Hrs.

Origin of Adhoc network :Packet Radio Networks - Technical Challenges - Architecture of PRNETs - Components of Packet Radios - Introduction to mobile Ad hoc network – MANET - Definition, characteristics features - Issues in Mobile Ad Hoc networks- Types of Ad hoc Mobile Communications - Types of Mobile Host Movements - Ad hoc wireless Internet. **Self organizing behaviour of wireless sensor network.**

UNIT 2 MEDIUM ACCESS PROTOCOLS

9 Hrs.

MAC protocols: Design issues, goals and classification. Contention based protocols - With reservation, scheduling algorithms, protocols using direction antennas - Distributed packet reservation - Multiple access protocol, collision avoidance time allocation protocol. IEEE standards: 802.11a, **Security in Ad-hoc Wireless Network**

UNIT 3 ROUTING PROTOCOLS AND MULTICAST ROUTING IN ADHOC

9 Hrs.

Networks Introduction - Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks - Classifications of Routing Protocols Table Driven routing protocols: Destination Sequenced Distance Vector Routing Protocol - Cluster head Gateway switched routing protocol. On Demand routing protocol: Dynamic source routing protocol, AODV routing protocol, temporarily ordered routing algorithm. Hybrid routing protocols: Zone routing protocol, Classifications of Multicast Routing Protocols - Tree Based Multicast Routing Protocols - Mesh-Based Multicast Routing Protocols, , **Contention-Based Protocols with Scheduling Mechanisms**

UNIT 4 QOS AND ENERGY MANAGEMENT

9 Hrs.

Quality of service in Ad hoc wireless Networks: Introduction-Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks - Classifications of QoS Solutions - MAC Layer Solutions - Network Layer Solutions. Need for Energy Management in Ad Hoc Wireless Networks - Classification of Energy Management Schemes - Battery Management Schemes **Network Security Attacks, Key Management and Secure Routing Ad-hoc Wireless Networks.**

UNIT 5 ADHOC APPLICATIONS

9 Hrs.

In the Office, While Traveling, Arriving Home, In the Car, Shopping Malls, The Modern battlefield, Car-to-Car Mobile Communications, Mobile Collaborative Applications - Location/context based mobile services - Introduction to wireless mesh networks and vehicular adhoc networks- architectures-Applications.

Max. 45 Hrs.**COURSE OUTCOMES**

On completion of the course, student will be able to

CO1 - Acquire Knowledge about technical issue related to these new thrust areas and come up with a solution(s).

**New Courses****Deleted Content****Added**

- CO2 - Gained an understanding of the current topics in MANETs and WSNS, both from an industry and research point of views.
- CO3 - Have an understanding of the principles of mobile ad hoc networks (MANETs) and what distinguishes them from infrastructure-based networks.
- CO4 - Understand how proactive routing protocols function and their implications on data transmission delay and bandwidth consumption.
- CO5 - Energy Management issues and challenges in Ad Hoc Networks.
- CO6 - Developing algorithms and routing protocols for Manet Vanet and Mesh network.

TEXT / REFERENCE BOOKS

6. C.Siva Ram Murthy and B.Smanoj, " Ad Hoc Wireless Networks – Architectures and Protocols", Pearson Education, 2nd Edition ,2006.
7. Jonathan Loo, Jaime Lloret Mauri, Jesús Hamilton Ortiz "Mobile Ad Hoc Networks: Current Status and Future Trends", CRC Press, 1st Edition, 2011.
8. K Toh, "Adhoc mobile wireless networks, Protocols and Systems", Pearson Education, 2nd Edition, 2015.
9. George Aggelou "Mobile Ad Hoc Networks", McGrawHill, 1st Edition, 2010.
10. Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", OReilly Publishers, 2nd Edition, 2009.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100

Exam Duration: 3 Hrs.

PART A: 10 Questions of 2 marks each - No choice

20 Marks

PART B: 2 Questions from each unit of internal choice; each carrying 16 marks

80 Marks



New Courses



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