



SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

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

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School of Electrical & Electronics

Department of Electronics & Communication Engineering

1.2.1 New Courses Introduced in 2022- 2023

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SECA1704	CONTEMPORARY WIRELESS COMMUNICATION	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- To impart knowledge on evolution of mobile communication and standards.
- To understand current trends in wireless LAN protocols.
- To study about personal area network and M2M communication standards.
- To impart knowledge on role of satellites in mobile and internet services.
- To study about underwater wireless communication techniques.

UNIT 1 EVOLUTION OF CELLULAR MOBILE NETWORKS

9 hrs

UMTS and CDMA 2000 (3G) - Wideband CDMA (WCDMA) - LTE and LTE advanced (4G) - Network architecture

– Modulation – Coding schemes – 5G systems: specifications and applications.

UNIT 2 WIRELESS LAN STANDARDS

9 hrs

IEEE 802 Standards – IEEE 802.11 WLAN Standards – Comparison of IEEE 802.11 a, b and g standards, WiFi-5 and WiGig - Concepts of MIMO, Massive MIMO and MU MIMO -Principle of Li-Fi based WLAN.

UNIT 3 PERSONAL AREA NETWORK PROTOCOLS

9 hrs

Bluetooth -Piconet, Scatternet- Bluetooth Low Energy(BLE) - Zig-Bee- Z-wave – UWB- LoRA Wireless Standards, LoRA WAN Gateway, LORA Applications.

UNIT 4 SATELLITE MOBILE AND SPECIALIZED SERVICES

9 hrs

Types of Satellites – LEO, MEO and GEO – Satellite services in Cellular Mobile communication - Satellite Phones

– Satellite IoT services - Satellite Internet Service: Starlink and Viasat – GPS Services: GLONASS, IRNSS and NAVIC.

UNIT 5 UNDERWATER WIRELESS COMMUNICATION

9 hrs

Underwater Communication: IEEE Standards, Modulation techniques, Frequency Spectrum, Modulation Techniques - Underwater Channel models for wireless Communication – Role of Digital signal processing in Underwater Communication- Underwater localization

Max. 45 hrs

COURSE OUTCOMES:

On completion of this course, students are able to

CO1	Classify various generations of wireless communication and standards
CO2	Demonstrate the applications of different international standards in wireless LAN and PAN
CO3	Develop an energy efficient system level model for IoT applications
CO4	Appraise and report on advances in higher generations of wireless communication systems.
CO5	Design conceptually a mobile communication system according to the required standard.
CO6	Develop system level models for underwater communication.

TEXT / REFERENCE BOOKS:

- [1] William C.Y. Lee., "Wireless and Cellular Telecommunications", 3rd Edition revised reprint McGraw Hill.2011.
- [2] Iti saha Mishra , "Wireless Communications and Networks: 3G and Beyond" 2nd Edition McGraw Hill 2013.
- [3] Nishith D. Tripathi and Jeffrey H. Reed,"Cellular Communications A Comprehensive and Practical Guide" Wiley 2014.
- [4] Rajpandya " Mobile and Personal Communication Services and Systems", IEEE Inc., New York, 2014.
- [5] Nitin Goyal, Luxmi Sapra, Jasminder Kaur Sandhu," Energy-Efficient Underwater Wireless Communications and Networking", 1st Edition, Business Science Reference , 2020

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:** 5 questions from each unit with internal choice, each carrying 16 marks**80 Marks**

S13AEPICS	ENGINEERING PROJECTS IN COMMUNITY SERVICE	I	T	P	Cre dits	Total marks
						100

Course Objectives

To Properly define and scope a problem; To Identify and analyze relevant factors;

To apply appropriate industrial engineering methodologies and computational tools; To Generate and evaluate alternative solutions;

To Improve skills in

- Technical writing, ▪ Public speaking, ▪ Working within a team (when applicable), and ▪ Project and time management.

Unit I	Multidisciplinary Design: Learn how to be better designers, gain design knowledge and skills; learn how to apply disciplinary knowledge to real and possibly ill-defined problems; learn how to identify and acquire new knowledge; learn to collaborate with people from other disciplines and develop an appreciation for cross-disciplinary contributions in design.	9hrs
Unit II	Professional Preparation: Develop the broad set of skills needed to be successful in the changing global workplace and world:	9hrs
Unit III	Service-Learning: Provide significant service to the community while learning; gain an understanding of the role that engineering (and their discipline) can play in society and the broader issues related to the needs we are addressing.	9hrs
Unit IV	Case studies on community service	9hrs
Unit V	Identification of engineering solutions to a real world problem	9hrs

The students will be able

CO1: To investigate the real -world problems

CO 2: To illustrate the real -world problems with community service

CO 3: To demonstrate design the solutions using multi- disciplinary approach CO 4: To investigate the processes

CO 5: To analyze the solutions given CO 6:

To develop empathy

SECA303	AI in ROBOTICS	L	T	P	Credits	Total Marks
		3	0	0	3	100

COURSE OBJECTIVES

- The objective of this course is to impart knowledge about robots with respect to its control and design.
- To simulate robots with artificial intelligence techniques and implement it for specific applications

UNIT 1 Introduction to Robotics

9 Hrs

Basics of robotics, Classification and components of a robot, Links and joints, Laws of robotics, Configurations of robot, work volume, spatial resolution, repeatability of a robot, speed of motion, load carrying capacity, Robot wrist, Drive systems of robot, Sensors and actuators used in robots, Power transmission system used in robots.

UNIT 2 Robot Kinematics and Dynamics

9 Hrs

Robot Kinematics: Position analysis, Dynamic analysis and forces, Translation and Rotation representation, Coordinate transformation, D-H parameters, Requirements of a robot programming language, problems peculiar to robot programming languages, three levels of robot programming.

UNIT 3 Problem solving and Scope of AI

9Hrs

Introduction to Artificial Intelligence, Applications: Games, theorem proving, natural language processing, vision and speech processing, robotics, expert systems. AI techniques: search knowledge, abstraction. Problem Solving: State space search: Production systems, search space control: depth-first, breadth-first search. Heuristic search - Hill climbing, best-first search, branch and bound. Problem Reduction, Constraint Satisfaction End, Means-End Analysis. LA* Algorithm, L(AO*) Algorithm.

UNIT 4 Knowledge Representation

9Hrs

Knowledge Representation issues, first order predicate calculus, Horn Clauses, Resolution, Semantic Nets, Frames, Partitioned Nets, Procedural Vs Declarative knowledge, Forward Vs Backward Reasoning.

UNIT 5 Applications of AI in Robotics

9Hrs

Introduction to NLP, Basics of Syntactic Processing, Semantic Analysis and Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Concept of learning, learning automation, learning by inductions and neural nets
Introduction to programming languages, LISP and PROLOG, leading role of NLP in Robotic Process Automation with farming robots, navigation robots and automobile manufacturing robots.

COURSE OUTCOMES

On completion of the course the student will be able to

- CO1:** Perform kinematic and dynamic analyses of robots with simulation.
- CO2:** Implement AI techniques in robotics.
- CO3:** Analyze various AI techniques for game console, problem solving.
- CO4:** Create a robotic system with dynamic programming approach.
- CO5:** Create a robotic system with syntactic and semantic processing.

TEXT/REFERENCE BOOKS

1. Saha, S.K., "Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014.
2. Ghosal, A., "Robotics", Oxford, New Delhi, 2006.
3. Richard D. Klafter, Thomas A. Chmielewski, Michael Negin, "Robotic Engineering – An integrated approach", PHI Publication, 1993
4. John J. Craig, "Introduction to Robotics", Addison Wesley Publication, 1989.
5. M. Sasikumar, S. Ramani, "A Practical Introduction to Rule Based Expert Systems", Narosa Publishing House, 1994
6. Elaine Rich and Kevin Knight, "Artificial intelligence", Tata McGraw Hill Pub., 2nd ed., 1992.
7. N.J. Nilsson, "Principles of Artificial Intelligence", Narosa Publishing House, 1990.
8. Robert.J. Schalkoff, "Artificial Intelligence - an Engineering Approach", McGraw Hill Int.Ed., Singapore, 1992.

SECA704	ARTIFICIAL INTELLIGENCE FOR INDUSTRIAL APPLICATIONS	L	T	P	Credit s	Total marks
		2	0	2	3	100
Pre requisite: NIL			Co Requisite: NIL			
Course Objectives ● To explore the fundamental concepts of Artificial Intelligence (AI) ● To assess the applicability, strengths, and weaknesses of the basic knowledge representation ● To impart machine learning techniques ● To understand various CNNs ● To develop the solutions for real world problems using AI						
UNIT	CONTENTS					HOURS
I	OVERVIEW OF AI Evolution of AI, Applications of AI, Classification of AI systems, Knowledge Inferring systems and Planning, Uncertainty and towards Learning Systems, Problem solving by Search, Problem space, State space, Blind Search, Types, Performance measurement.					9
II	KNOWLEDGE REPRESENTATION First Order Predicate Logic, Prolog Programming, Unification, Forward Chaining, Backward Chaining, Resolution, Knowledge Representation, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.					9
III	FOUNDATIONS FOR MACHINE LEARNING ML Techniques overview, Dimensionality Reduction, Clustering, Regression, Classification –Naïve Bayes; K-nearest Neighbours; SVM; Decision Trees, Ensemble methods					9
IV	UNDERSTANDING DEEP LEARNING Perceptron, Activation Functions, Artificial Neural Networks, Training Neural Networks, Convolutional Neural Networks, Evolution of CNN Architectures: AlexNet, VGG, ResNets,DenseNets, Recurrent Neural Networks.					9
V	APPLICATIONS AI applications, Information Retrieval, Machine Translation, Classification, Object Detection, Artificial Intelligence Techniques for Cyber-Physical, Digital Twin Systems and Engineering Applications					9

Maximum Hours: 45

Course Outcomes

On completion of the course, the student will be able to CO1-
Evaluate Artificial Intelligence methods.

CO2- Demonstrate knowledge of reasoning and knowledge representation for solving real world problems CO3-
Analyze various machine learning techniques

CO4-Identify suitable deep learning techniques for real world problems

CO5-Implement image classification and object detection systems CO6-

Solve real world problems in cyber physical systems using AI

TEXT / REFERENCE BOOKS

1. Phil Kim. “MATLAB Deep Learning: With Machine Learning, Neural Networks and Artificial Intelligence”, Apress, 2017.
2. Jan Erik Solem, “Programming Computer Vision with Python”, Creative Commons, 2012.
3. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach, Prentice Hall, 3rd Edition, 2015.
4. Alpaydin, E., “Introduction to Machine Learning”, 2nd edition, MIT Press, 2010.
5. Nils J. Nilsson, “The Quest for Artificial Intelligence”, Cambridge University Press, 2009.
6. M. Tim Jones, “Artificial Intelligence: A Systems Approach (Computer Science)”, Jones and Bartlett Publishers, Inc.; 1st Edition, 2008.
7. William F. Clocksin and Christopher S. Mellish, “Programming in Prolog: Using the ISO Standard”, 5th Edition, Springer, 2003.

SECA1406 (NEW)	INDUSTRY 5.0 FOR ELECTRONICS ENGINEERS	L	T	P	Credits	Total marks
		2	0	0		
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 ● To develop the concept of electronics manufacturing beyond automation and optimization						
UNIT	CONTENTS					HOURS
1	INDUSTRY 4.0 Introduction to Industry 4.0, Industry 4.0: The Fourth Industrial Revolution, History of Industry 4.0, Industry 4.0 by definition, Component of Industry 4.0, The opportunities in Industry 4.0, Industrial Internet, Smart Factory, Smart Buildings, Smart Manufacturing, Smart Farming.					9
2	INDUSTRY 5.0 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.					9
3	DIGITAL TRANSFORMATION TO SOCIETY 5.0 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.					9
4	SMART WORLD 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.					9

5	CYBER SECURITY IN INDUSTRY 5.0 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) : Case Studies- Augmented Reality Virtual Reality	9
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Maximum Hours: 4

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Identify the digital transformation power of Industry 5.0 to achieve societal goals beyond jobs and growth

CO2 – Analyze enhanced new production models in electronics

CO3 – Implement various electronics manufacturing technologies beyond automation and optimization CO4 – Design suitable sensors for smart world real time applications

CO5 – Evaluate the performance of various cyber physical systems

CO6 – 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, 2020. Introduction to IoT. Cambridge University Press. Availability: https://www.amazon.in/Introduction-IoT-Sudip-Misra/dp/1108959741/ref=sr_1_1?dchild=1&keywords=sudip+misra&qid=1627359928&sr=8-1.
2. S. Misra, C. Roy, and A. Mukherjee, 2020. Introduction to Industrial Internet of Things and Industry 4.0. CRC Press.
availability: https://www.amazon.in/dp/1032146753/ref=sr_1_3?dchild=1&keywords=sudip+misra&qid=1627359971&sr=8-3
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 ApplicationTechnologies”, Studylab Publications, 2016.
5. Alasdair Gilchrist, “INDUSTRY 4.0: Industrial Internet of Things”, Apress, 2016.

SECA3034	6G WIRELESS TECHNOLOGY	L	T	P	Cre dits	Total mark s
		2	0	2	3	100
Prerequisite: Wireless Communication			Co-Requisite: NIL			
Course Objectives • Learning the Basics of 5G and Beyond Wireless communication • Providing a basic understanding of the channel methods and enablers of 5G and beyond communication systems. • Study of 5G wireless channel models. • Learning 5G techniques like massive MIMO, mmWave. • Study of 6G Key Enablers..						
UNI T	CONTEN TS					HOURS
I	INTRODUCTION AND FUNDAMENTALS OF WIRELESS COMMUNICATIONS Evolution of cellular systems requirements, goals, and vision of the next generation wireless communication systems fading, digital modulations.					9
II	5G CHANNEL METHODS OFDM and OFDMA, MIMO OFDM, Generalized Frequency Division Multiplexing (GFDM), Non-Orthogonal Multiple Access (NOMA), Universal Filtered OFDM.					9
III	mmWAVE mmWave Communications, Device-to-Device (D2D) Communication, 5G for Massive Machine Type Communication and Massive IoT, V2X Communication, Full Duplex and Green Communication, Massive MIMO and Beam forming techniques.					9

IV	6G KEY ENABLERS Wireless energy harvesting, machine learning, visible light communication, Intelligent reflecting surface (IRS), Extremely Large Aperture Massive MIMO.	9
V	WIRELESS ENERGY HARVESTING Energy-rate, trade-off, Simultaneous wireless information and power transfer (SWIPT), time-switching, power splitting Wireless powered communication networks.	9

Maximum Hours: 45

Course Outcomes

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

CO1- Distinguish and understand the major cellular communication standards (1G/2G/3G/4G/5G/6G systems) and

Wireless communications networks.

CO2-Understand the various 5G techniques

CO3- Understand the use of mm waves for the design of communication systems.

CO4- Characterize and analyze various 6G Key Enablers.

CO5-Implement the Machine Learning algorithms in 5G Wireless Communications

CO6-Design Wireless powered Communication Network.

TEXT/REFERENCE BOOKS

1. T. S. Rappaport, R. W. Heath Jr., R. C. Daniels, and J. M. Murdock, *Millimeter Wave Wireless Communication*, Pearson Education , 2015.
2. M. Manish, G. Devendra, P. Pattanayak, and N. Ha, *5G and Beyond Wireless Systems PHY Layer Perspective*, Springer Series in Wireless Technology
3. M. Vaezi, Z. Ding, and H. V. Poor, *Multiple Access techniques for 5G Wireless Networks and Beyond*, Springer Nature , Switzerland, 2019.
4. R. Heath and A. Lozano, *Foundations of MIMO Communication*, Cambridge University Press , 2018.
5. Goldsmith Andrea, *Wireless Communications*, Cambridge University Press, First Edition ,2005
6. L.Hanzo,M.Munster, B.J.Choi and T.Keller, *OFDM and MC-CDMA for Broadband Multi-user Communications, WLANs and Broadcasting*, John Wiley & Sons,2003.

SECA3036	MEDICAL INSTRUMENTATION AND IMAGING TECHNIQUE	L	T	P	Cred its	Total marks
		2	0	2	3	100
Pre requisite: Electronics Circuits		Co Requisite: NIL				
Course Objectives						
• To explore the characteristics of biomedical signals and systems. • To analyze the various electronics circuits used for medical signals conditioning • To study and understand various assistive devices and monitors used in medical instrumentation • To analysis the operation of various imaging equipments • To implement various imaging techniques for real time medical applications						
UNI T	CONTENTS					HOURS
I	BIOPOTENTIAL MEASUREMENTS Sources of biomedical signals, Basic medical instrumentation system, Bio signals characteristics – frequency and amplitude ranges. ECG – Einthoven’s triangle, Standard lead system, Principles of vector cardiography. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG- unipolar and bipolar mode. Recording of ERG and EOG.					9
II	SIGNAL CONDITIONING CIRCUITS Need for bio-amplifier – single ended bio-amplifier, differential bio-amplifier, Impedance matching circuit, isolation amplifiers – transformer and optical isolation – isolated DC amplifier and AC carrier amplifier, Power line interference, Right leg driven ECG amplifier, Band pass filtering.					9
III	ASSISTIVE DEVICES AND MONITORS Cardiac Pacemakers, Heart lung machine- Oxygenators - Pumps, Monitoring Process. Hemodialyzer- Principle of Haemodialysis, Membranes, Dialysate, Different types of hemodialyzer’s, Wearable Artificial Kidney, Defibrillators, Implantable defibrillators, Functional electrical stimulator (FES)					9
IV	IMAGING EQUIPMENTS X-Ray machine, CT - Scanning system, processing unit, viewing part & storage unit. MRI - The magnet, RF transmitter system, Gradient system, imager system, Advantages. Ultrasonic imaging systems - A Scan, B Scan, TM Mode Scan, Echocardiography.					9
V	RECENT ADVANCES IN IMAGING TECHNIQUES Biomedical Applications Thermographic Equipment, Mobile units of Computer Radiography & Digital Radiography system, 3D/4D Sonography systems, Mammography, Angiography, Endoscopy, Capsule Endoscopy, Laparoscopy. Foetal Monitoring System.					9

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Maximum Hours: 45

Course Outcomes

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

CO1- Apply Suitable biomedical signals for medical instruments

CO2-Analyze suitable signal conditioning circuits for the medical instruments

CO3-Analyze Various assistive devices and monitors used for medical instrumentation

CO4-Identify the techniques used in various imaging systems

CO5-Implement various imaging techniques for real time medical applications on real time imaging system

CO6-Design an instrument for real time medical application

TEXT / REFERENCE BOOKS

1. Rafael C. Gonzalez, Richard E. Woods,” Digital Image Processing”, Pearson , Second Edition, 2004
2. John G. Webster, Medical Instrumentation Application and Design, 4th edition, Wiley India Pvt Ltd, New Delhi, 2015.
3. Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment Technology, Pearson Education, 2004.
4. Myer Kutz, Standard Handbook of Biomedical Engineering and Design, McGraw Hill Publisher, 2003.
5. Khandpur R.S, Handbook of Biomedical Instrumentation, 3rd edition, Tata McGrawHill New Delhi, 2014
6. Step by Step CT; Step by Step MRI and MRI made Easy for beginners – Govind B. Chavhan – Jaypee brothers and Medical Publishers (p) Ltd, New Delhi CT & MRI protocol – Satish K. Bhargava, CBS publishers.
7. R. Ananda Natarajan, Biomedical Instrumentation and Measurements, 2nd Edition, PHI, 2016.

SECA3035	CRYPTOGRAPHY AND CYBER SECURITY	L	T	P	Credits	Total marks
		3	0	0	3	100
Pre Requisite: NIL		Co Requisite:NIL				
Course Objectives - To analyze basics of Cryptography. - To apply the concepts of public key cryptography - To implement the methods for authentication, access control, intrusion detection and prevention. - To introduce the basic concepts of cyber crime and security - To acquire knowledge on cyber threats and attacks						
UNIT	CONTENTS					HOURS
I	INTRODUCTION AND MATHEMATICAL FOUNDATIONS Services, Mechanisms and attacks-the OSI security architecture-network Security model-Classical encryption techniques. Finite fields and Number theory: - Introduction to group,ring and field - Prime numbers – Modular arithmetic - The Chinese Remainder Theorem – Discrete Logarithms.					9
II	SYMMETRIC KEY CIPHERS AND ASYMMETRIC KEY CIPHERS Symmetric key ciphers: Block Cipher principles, DES, AES, Block cipher operation, Stream ciphers, RC4. Asymmetric key ciphers: Principles of public key cryptosystems, RSA algorithm, ElGamal Cryptography, Diffie-Hellman Key Exchange, Knapsack Algorithm.					9
III	HASH FUNCTIONS, KEY MANAGEMENT AND DISTRIBUTION Cryptographic Hash Functions: Message Authentication, Secure Hash Algorithm (SHA-512), Message authentication codes: Authentication requirements, HMAC, CMAC, Digital signatures. Key Management and Distribution: Symmetric Key Distribution Using Symmetric & Asymmetric Encryption, Distribution of Public Keys, Kerberos, X.509, Public – Key Infrastructure					9
IV	INTRODUCTION TO CYBER SECURITY AND CYBER CRIME Introduction to Cyber Security – Goals – Need for Security – Security Approaches– Principles of Security – Balancing Security & Access – Software Development Life Cycle – Security Systems Development Life Cycle – Security Professionals and the organization. Introduction to Cyber Crime and Security: Cyber Crimes, types of Cyber Crime, Cyber Space and criminal behavior, traditional problems associated with Cyber Crime, Introduction to Incident Response, Digital Forensics – Phishing.					9
V	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.	9
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Maximum Hours:45

Course Outcomes

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

- CO1: Understand the various Cryptographic Technique.
- CO2: Apply the various Symmetric and Asymmetric key Ciphers
- CO3: Implement Hashing and Digital Signature techniques
- CO4: Analyze the basic concepts of cyber security and cyber crime
- CO5: Scrutinize the various cyber threats and attacks
- CO6: Explore the significant aspects of cyber security

TEXT/REFERENCE BOOKS

1. Michael E. Whitman, Herbert J. Mattord, "Principles of Information Security", CENGAGE Learning, 4th Edition.
2. William Stallings, "Cryptography and Network Security—Principles and Practice", Pearson Education, 7th Edition.
3. Atul Kahate, "Cryptography and Network Security", McGraw Hill, 4th Edition.
4. Neal Koblitz "A course in Number Theory and Cryptography" Springer-Verlag 1994
5. Alfred J Menzies, Paul C Van Oorshot and Scott A. Vanstone "Handbook of Applied Cryptography", CBC Press, 1996
6. Matthew P. Barrett, Cybersecurity, Critical Infrastructure. "Framework for Improving Critical Infrastructure Cybersecurity." Framework 1 (2014): 11

SECA3037	ANTI DRONE SYSTEMS	L	T	F	Credits	Total marks
		2	0	2		
Pre requisite: NIL			Co Requisite: NIL			
Course Objectives						
● To introduce anatomy of Drones and their types. ● To familiarize the Student's with communication standards for Drones. ● To understand the fundamentals of drone detection and tracking. ● To familiarize the student with various drone interdiction techniques. ● To study different anti drone systems deployed in various countries						
UNIT	CONTENTS					HOURS
I	ANATOMY OF DRONE Drones - Definition and Classifications - Anatomy of Drone - Mechanical Structures, Flight Controller, Sensors and Actuators, Electronic Speed Controller, Brushless Motors-Mechanical Design - Batteries and Power supply unit.					9
II	DRONE COMMUNICATION SYSTEMS Radio Frequency Regulation - Communication Protocols – Blockchain for Drone Communication - RF Transceiver architectures.					9
III	DRONE DECTION AND TRACKING Detection Techniques – Radars, Radio Frequency Scanning, Electro-Optical (EO) sensors for Visual Signature Identification, Infrared sensors based Heat Signature Detection, Acoustic signature detection -Threat Identification.					9
IV	DRONE INTERDICTION RF Jamming, Spoofing, Lazer Dazziling, Nets, High power microwave beams, Collision drones - System Architecture for coordinated Drone Interdiction.					9
V	UNIT V CASE STUDY Drone Dome - Sky Drone – Drone Gun – ADRIAN – Laser Directed Energy Weapon (DEW) .					9

Maximum Hours: 45

COURSE OUTCOMES:

On completion of the course, student will be able to

CO1 — Apply the engineering concepts in building drones.

CO2 — Analyze the communication protocols used in drones.

CO3 — Apply appropriate technique to detect drones.

CO4 — Apply appropriate technique to interdict unanimous drones.

CO5 — Appraise the performance of different drone detection systems.

TEXT / REFERENCE BOOKS

- [1] Aaron Asadi, “Drones The Complete Manual. The essential handbook for drone enthusiasts”, Imagine Publishing Limited, 2016.
- [2] Neeraj Kumar Singh, Porselvan Muthukrishnan, Satyanarayana Sanpini, “Industrial System Engineering for Drones: A Guide with Best Practices for Designing”, Apress, 2019.
- [3] Garik Markarian, Andrew Staniforth, “Counter measures for Aerial Drones, Artech House, 2020.
- [4] Arthur Holland Michel, “Counter-drone Systems”, Center for the Study of the Drone at Bard College, 2018.

SECA5209	STRATEGIES IN INDUSTRY 5.0	L	T	P	Credits	Total marks
		2	0	0	2	100
Pre requisite: INDUSTRY 4.0			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	CONTENTS					HOURS
1	INDUSTRY 5.0 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.					9
2	DIGITAL TRANSFORMATION TO INDUSTRY 5.0 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.					9
3	SMART WORLD 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.					9
4	CYBER SECURITY IN INDUSTRY 5.0 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).					9
5	AR/VR IN INDUSTRY 5.0					9

	Unity, Basics of Unity, Understanding different panels in Unity, Moving, rotating & scaling Gameobjects in Unity, Game Panel in Unity, Physics in Unity, Increasing the light intensity, Adding colors to Gameobject, Adding textures to Gameobject, Parent and child Gameobjects in Unity. Case Studies- Development of AR/VR Models in Unity.	
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Maximum Hours: 45

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 – Identify the digital transformation power of Industry 5.0 to achieve societal goals beyond jobs and growth

CO2 – Analyze enhanced new production models in electronics

CO3 – Implement various electronics manufacturing technologies of augmented reality beyond automation and optimization

CO4 – Design suitable sensors for smart world real time applications with virtual reality experience

CO5 – Evaluate the performance of various cyber physical systems

CO6 – Create personalized electronics products combining the various industry 5.0 Applications with deep knowledge on Intellectual Property Rights

TEXT / REFERENCE BOOKS

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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.
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SATHYABAMA

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SCHOOL OF ELECTRICAL AND ELECTRONICS

Minutes of Board of Studies Meeting held on 7th May 2022 (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 (07.05.2022, 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.

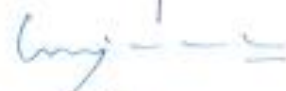
Agenda : Syllabus submitted for suggestions and approval for the following courses (ECE) (syllabus revision for the existing courses and newly framed syllabus for the new courses)

- Dr.P.Kavipriya presented the revision carried out in the course Machine Learning Techniques. Dr.M.D.Selvaraj Associate Professor, IIITDM accepted the changes and suggested topics such as Occam learning, accuracy and confidence boosting.
- Dr.E.Annadevi suggested to introduce 'IoT in Logistics Sector' in the course IoT for Real Time Application. Dr.N.Sivakumaran Prof.,NIT, Tiruchy accepted the inclusion and also suggested to include Healthcare monitoring Technique for Diabetes Patients.
- Dr.P.Chitra suggested to include the topics 'Machine learning, Artificial neural networks and deep Architectures' in the course Digital Image Processing for Real Time Applications. Dr.N.Sivakumaran accepted the changes for both the courses.
- Dr.Anbarasi presented the revision carried out in the subject "Electromagnetic Interference and Compatibility" . Dr. Senthil Arunachalam suggested to include software and simulation topics in the course.
- Dr.Sugudev presented the syllabus revision carried in the course "Network Oriented OS". Mr.J.Visweswaran suggested to include the topic Securing web services in the syllabus.
- Having discussed the revisions in the existing courses, faculty then presented the syllabus for the new courses. Dr.T.Ravi presented the syllabus, 'Contemporary Wireless Communication', 'AI for Robotics', 'Engineering Projects in Community Service' and 'Industry 5.0 for Electronics Engineers' for UG courses. The new syllabus introduced for PG 'Artificial Intelligence for Industrial Applications' and Autonomous Drone Technology is also briefed by HOD. Dr.M.D.Selvaraj accepted the syllabus for all the courses.

BoS members are happy that the new and the revised courses enhance employability/ Entrepreneurship/Skills of the students.

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. V.Vijaya Baskar 
6. Dr.P.Chitra 
7. Dr.P.Kavipriya 
8. Dr.S.Barani 
9. Dr.S.Poorna Pushpa Kala 
10. Dr.E.Annadevi 

External Members

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

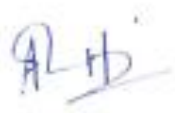


Dr.M.D.Selvaraj
Associate Professor
IIITDM, kancheepuram.

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



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





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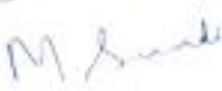
Minutes of Board of Studies Meeting held on 26th Nov 2022

(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 (26.11.2022, 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 meetings is to introduce Problem Based Learning Approach courses to the final year students. Dr.T.Ravi put forth the subjects such as 6G Wireless Technology, Medical Instrumentation and Imaging techniques and Cryptography in cybersecurity.
- Dr.K.Srilatha presented the syllabus for the course '6G Wireless Technology'. Dr.M.D.Selvaraj Associate Professor, IIITDM accepted new syllabus and suggested topics such as Extremely Large Aperture Massive MIMO and IoT, V2X Communication.
- Dr.S.Emelda Roslin presented the syllabus for Medical Instrumentation and Imaging techniques. Dr.N.Sivakumaran Prof., NIT Tiruchy suggested to include 3D/4D Sonography systems in the syllabus.
- Dr..A. Aranganathan discusses the course titled "Cryptography in cyber security" to the board members. Dr.Krishnamoorthy explained the need for inclusion of key management and distribution topic in cyber 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 Anti Drone Systems. The members appreciated the introduction of the current technology course. Dr.M.D.Selvaraj suggested to include Drone Dome - Sky Drone – Drone Gun – ADRIAN – Laser Directed Energy Weapon (DEW) topics as case study.
- Having discussed the new course and the existing courses. Dr.T.Ravi presented the new syllabus introduced for PG 'Strategies in Industry 5.0' is also briefed by HOD. Dr.M.D.Selvaraj accepted the syllabus for all the courses.

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. V.Vijaya Baskar 
6. Dr.P.Chitra 
7. Dr.P.Kavipriya 
8. Dr.S.Barani 
9. Dr.S.Poorna Pushpa Kala 
10. Dr.E.Annadevi 

External Members

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



Dr.M.D.Selvaraj
Associate Professor
IIITDM, kancheepuram.

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



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