WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(AN AUTONOMOUS INSTITUTE)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University, Solapur

CHOICE BASED CREDIT SYSTEM (CBCS)

Syllabus Structure
for
M. Tech. in Electronics Engineering

SCHEME-24

F. Y. M. Tech. Electronics Engineering W.E.F. 2024-25
S. Y. M. Tech. Electronics Engineering W.E.F. 2025-26

Walchand Institute of Technology, Solapur
Department of Electronics Engineering
M. Tech.- Electronics Engineering
Structure - (Scheme 24)

Semester I

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*SA*	*FA*		*Total*
		L	T	*P*		*ESE*	*ISE*	*ICA*	
EEP1CC1	Advanced Embedded System Design	3	-	2	4	60	40	25	125
EEP1CC2	Machine Learning	3	-	2	4	60	40	25	125
EEP1CC3	Advanced Communication Networks and Protocols	3	-	-	3	60	40	-	100
CMP1RM	Research Methodology and IPR	3	1	-	4	60	40	25	125
EEP1CE1N*	Core Elective- I	3	-	-	3	60	40	-	100
EEP1SM1	Seminar-1			4	2	-	-	50	50
	Total	**15**	**1**	**8**	**20**	**300**	**200**	**125**	**625**

N* indicates course serial number of elective offered in the respective category

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*SA*	*FA*		*Total*
		L	T	*P*		*ESE*	*ISE*	*ICA*	
CMP1AC	Yoga for Stress Management	2	-	-	-	-	50	-	50

Core Elective-I

Course Code	Course Title
EEP1CE11	Wireless sensor networks
EEP1CE12	Analog and Digital CMOS VLSI Design
EEP1CE13	Image and Video Processing

Semester II

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*SA*	*FA*		*Total*
		L	T	*P*		*ESE*	*ISE*	*ICA*	
EEP2CC4	Advanced Internet of Things (IoT)	3	-	2	4	60	40	25	125
EEP2CC5	Sensors and Actuators	3	-	2	4	60	40	25	125
EEP2CC6	Wireless cellular and LTE 4G	3	-	-	3	60	40	-	100
EEP2CE2N*	Core Elective-II	3	-	-	3	60	40	-	100
EEP2CE3N*	Core Elective-III	3	-	-	3	60	40	-	100
EEP2SM2	Seminar-2	-	-	6	3	-	-	100	100
Sub Total		**15**	**-**	**10**	**20**	**300**	**200**	**150**	**650**

Note: -*Students has to compulsorily undergo internship of one month after the Semester-II (in the summer vacation). The evaluation of the same will be carried out at the end of semester – III.*

Core Elective-II

Course Code	Course Title
EEP2CE21	Advanced Machine Learning
EEP2CE22	Web and Deep Data Mining
EEP2CE23	Deep Learning for Computer Vision

Core Elective-III

Course Code	Course Title
EEP2CE31	Network and Internet Security
EEP2CE32	Neural Networks & Fuzzy Control Systems
EEP2CE33	Advanced Control Systems

Note: -For Open Elective course, students should enrol for one of the minimum 8 weeks duration course offered by SWAYAM / NPTEL platform. They should complete its assignments and appear for certificate examination conducted by SWAYAM / NPTEL. Students should pass the examination till the end of Semester IV. Based on the marks obtained in the assignments and examination; credits will be transferred in Semester IV. The list of courses will be provided by the Board of Studies.

Semester III

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*SA*	*FA*		*Total*
		L	T	*P*		*ESE*	*ISE*	*ICA*	
CMP3IK	Indian Science and Technology	2	-	-	2	-	50	-	50
EEP3IN	Internship	-	-	-	3	-	-	100	100
EEP3DS1	Dissertation Phase-I	-	-	30	15	-	200	150	350
Total		**2**	**-**	**30**	**20**		**250**	**350**	**500**

As per the instruction provided in Semester II structure, the credits obtained by the students for the SWAYAM / NPTEL course will be transferred in this semester.

Semester IV

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*SA*	*FA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
CMP4OE1N*	Open Elective (SWAYAM/NPTEL MOOC)#	-	-	-	4	-	-	-	-
EEP4DS2	Dissertation Phase –II	-	-	32	16	200	-	200	400
Total		**-**	**-**	**32**	**20**	**200**	**-**	**200**	**400**

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

EEP1CC1 ADVANCED EMBEDDED SYSTEM DESIGN

Teaching Scheme:	**Examination Scheme**
Lectures- 3 Hours / week, 3 Credits	**ESE-** 60 Marks
Practical –2 Hour / week , 1 Credit	**ISE -** 40 Marks
	ICA- 25 Marks

COURSE OUTCOMES:

At the end of the course, students will be able to

1. Understand the embedded systems design process.
2. Define a specification for an advanced embedded system.
3. Discuss methods for implementing reliable embedded systems to solve various problems.
4. Compare and contrast different options for the realization of advanced embedded systems and their suitability for their application domain.

SECTION I

Unit 1: Introduction to Embedded System Design No. of Lectures-09

Introduction, characteristics of embedding computing applications, concept of real time systems, challenges in embedded system design, design process: requirements, specifications, hardware software partitioning and system integration

Unit 2: Embedded System Architecture

Instruction set architectures with examples, memory system architecture: von Neumann, Harvard, caches, virtual memory, memory management, I / O sub system: busy wait I / O, DMA, interrupt driven I/O, co-processor & hardware accelerators, processor performance enhancement: pipelining, superscalar execution, multi core cpus, benchmarking standards: MIPS, MFLOPS, MMACS, Coremark

Unit: 3 Designing Embedded System Hardware –I No. of Lectures-07

CPU bus: bus protocols, bus organization, memory devices and their characteristics: RAM,
EEPROM, flash memory, DRAM; I/O Devices: timers and counters, watchdog timers, interrupt controllers, A/D and D/A converters

SECTION II

Unit: 4 Designing Embedded System Hardware –II No. of Lectures-08

Component interfacing: memory interfacing with case study; I/O device interfacing with case study: programmed IO, memory mapped IO, interfacing protocols: SPI, I2C, reset circuits, FPGA based design, processor selection criteria

Unit 5: Designing Embedded System Software –I No. of Lectures-07

Application software, system software, use of high-level languages: C, C++, programming & integrated development environment tools: editor, compiler, linker, automatic code generators, debugger, board support library, chip support library, analysis and optimization: execution time, energy & power, program size; embedded system coding standards: MISRA C 2012 / CERT

Unit 6: Designing Embedded System Software –II No. of Lectures-08

OS based design, real time kernel, process & thread, inter process communications, synchronization, case study: RTX-ARM, response time calculation, interrupt latency, time loading, memory loading, case study: embedded control applications-software coding of a PID controller

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- **Internal Continuous Assessment**

  ICA shall consist of a minimum of 6 laboratory experiment based upon above curriculum.

- **Reference Books**

1. Embedded Systems – A contemporary Design Tool, James K Peckol, 2nd edition, John Weily, 2008, ISBN: 0-444-51616-6
2. Introduction to Embedded Systems, Shibu K V, 1st edition, Tata McGraw Hill Education Private Limited, 2009, ISBN: 10: 0070678790
3. Embedded Software Primer, David E. Simon, Addison Wesley, 2nd edition, John Weily,
4. 2002, ISBN-13: 978-0201615692
5. The Intel Micro-processors, Architecture, Programming and Interfacing, Barry B.Brey, 6th
6. Edition, Pearson Education, 2008, ISBN-10: 8131726223

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

EEP1CC2 MACHINE LEARNING

Teaching Scheme	**Examination Scheme**
Lectures –3 Hours/week, 3 Credits	**ESE-** 60 Marks
Practical –2 Hours/week, 1 Credit	**ISE-** 40 Marks
	ICA -25Marks

COURSE OUTCOMES:

At the end of the course students will be able to

1. Demonstrate types of machine learning algorithms.
2. Design a model by selecting appropriate machine learning algorithm for a given problem.
3. Validate designed machine learning model.
4. Evaluate and tune machine learning model based on various parameters.
5. Design various applications using machine learning algorithm.

SECTION-I

Unit 1: Introduction to Machine Learning No. of Lectures-06 Machine learning: what and why, supervised learning, unsupervised learning, some basic concepts in machine learning, definition of learning systems, goals and applications of machine learning, aspects of developing a learning system: training data, concept representation, function approximation

Unit 2: Linear and Logistic Regression No. of Lectures-08 Linear regression: introduction, model specification, maximum likelihood estimation (least squares), robust linear regression, ridge regression, Bayesian linear regression, logistic regression: introduction, model specification, model fitting, Bayesian logistic regression, online learning and stochastic optimization, generative vs discriminative classifiers

Unit 3: Decision Tree Learning and Ensemble Methods No. of Lectures-08 Representing concepts as decision trees, recursive induction of decision trees, picking the best splitting attribute: entropy and information gain, searching for simple trees and computational complexity, Occam's razor, overfitting, noisy data, and pruning, ensemble methods: bagging and boosting

SECTION-II

Unit 4: Clustering No. of Lectures-05 Introduction, Dirichlet process mixture models, affinity propagation, spectral clustering, hierarchical clustering, clustering data points and features

Unit 5: Sparse Kernel Machines No. of Lectures-05 Introduction to Support Vector Machines (SVM), maximum margin classifiers, relevance vector machines, applications of Support Vector Machines

Unit 6: Neural Networks and Deep Learning No. of Lectures-08

Feed-forward network functions, network training, error back propagation, regularization in neural networks, deep learning: introduction, deep neural networks, applications of deep networks

Unit 7: Key Ideas in Machine Learning No. of Lectures-04

Introduction, key perspectives on machine learning, key results, where machine learning is headed next

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Internal Continuous Assessment (ICA)

ICA consist of minimum 6 laboratory experiment based upon above curriculum

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Reference Books

1. Machine Learning by Tom Mitchell, McGraw Hill (1st Edition)
2. Machine Learning: a Probabilistic Perspective by Kevin Patrick Murphy
3. Pattern Recognition and Machine Learning (Information Science and Statistics) by Christopher M. Bishop

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

EEP1CC3 ADVANCED COMMUNICATION NETWORKS & PROTOCOLS

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks

COURSE OUTCOMES:

At the end of the course, students will be able to

1. explain the performance of various multiple access protocols.
2. design the network protocol for given specifications of applications.
3. design & develop the scheduling algorithms for various performance metrics.
4. develop various network traffic management and control techniques for given specification

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SECTION I

Unit: 1 Foundation No. of Lectures-06

Building a network, requirements, perspectives, scalable connectivity, - cost effective resource sharing, support for common services, manageability, protocol layering, performance, bandwidth and latency, delay X bandwidth product, perspectives on connecting, classes of links, reliable transmission, stop-and-wait , sliding window, concurrent logical channels

Unit: 2 Internetworking I No. of Lectures-07

Switching and bridging, datagram's, virtual circuit switching, source routing, bridgesand LAN switches, basic internetworking (IP), internetworking- service model, global addresses, datagram forwarding in IP, subnetting and classless addressing, Address Translation (ARP) Host Configuration (DHCP), Error Reporting (ICMP)

Unit: 3 Internetworking- II No. of Lectures-06

Network as a graph, distance vector (RIP), link state (OSPF), metrics, the global internet, routing areas, routing among autonomous systems (BGP), IP Version6(IPv6), mobility and mobile IP

SECTION II

Unit – 4 End-to-End Protocols No. of Lectures-08

Simple demultiplexer (UDP), reliable byte stream (TCP), end-to-end issues, segmentformat, connecting establishment and termination, TCP congestion control, additive increase/ multiplicative decrease, slow start, fast retransmit and fast recovery

Unit – 5 Congestion Control and Resource Allocation No. of Lectures-07

Congestion-avoidance mechanisms, DEC bit, Random Early Detection (RED),source-based congestion avoidance,

Unit – 6 Application layer protocols No. of Lectures-06

Domain Name System (DNS), World Wide Web (HTTP), Electronic mail

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Reference Books

1. Computer Networks: A System Approach, Larry Peterson and Bruce S Davis, 5th Edition , Morgan Kaufmann, 2011, ISBN-10: 9780123850591.
2. Internetworking with TCP/IP, Principles, Protocols and Architecture, Douglas E Comer, 6th Edition, PHI, 2014, ISBN-10: 9332550107.
3. Computer Networks, Protocols, Standards and Interfaces, Uyless Black, 2ndEdition, PHI,1993, ISBN: 0-13-090861-4
4. TCP /IP Protocol Suite, Behrouz A Forouzan , 4th Edition, Tata McGraw-Hill,2009, ISBN- 10: 0073376043

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

CMP1RM RESEARCH METHODOLOGY AND IPR

Teaching Scheme:	**Examination Scheme**
Lectures- 3 Hours / week, 3 Credits	**ESE-** 60 Marks
Tutorial –1 Hour / week , 1 Credit	**ISE -** 40 Marks
	ICA- 25 Marks

Course Outcomes: -

At the end of the course, student will be able to,

1. Propose and distinguish appropriate research designs and methodologies for a specific research project.
2. Develop skills in literature review, qualitative and quantitative data analysis and presentation.
3. Describe the importance of Computers and Information Technology in research and also highlight the significance of ideas, concepts, and creativity in research.
4. Illustrate the importance of Intellectual Property Rights in growth of individuals &nation.
5. Exhibit knowledge about IPR protection, providing an incentive to inventors for further research work leading to the creation of new and better products.

Section-I

1. Introduction: **(6)**

Defining Research, Scientific Enquiry, Hypothesis, Scientific Method, Types of Research, Research Process and steps in it. Research Proposals – Types, contents, sponsor agent's requirements, Ethical, Training, Cooperation and Legal aspects.

2. Research Design: **(6)**

Meaning, Need, Concepts related to it, categories; Literature Survey and Review, Dimensions and issues of Research Design, Research Design Process – Selection of type of research, Measurement and measurement techniques ,Selection of Sample, Selection of Data Collection Procedures, Selection of Methods of Analysis, Errors in Research.

3. Research Problem: **(6)**

Problem Solving – Types, Process and Approaches – Logical, Soft System and Creative; Creative problem-solving process, Development of Creativity, Group Problem Solving Techniques for Idea Generation – Brainstorming and Delphi Method.

Section-II

4. Nature of Intellectual Property: (8)

Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: Technological research, Innovation, Patenting, Development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

5. Patent Rights: (5)

Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

6. New Developments in IPR: (5)

Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR

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1. Vinayak Bairagi, Mousami V. Munot, Vinayak Bairagi, Mousami V. Munot, Research Methodology, A Practical and Scientific Approach, Publisher: Chapman and Hall/CRC ,Year 2019, ISBN 9781351013253.Krishnaswamy, K.N., Sivakumar, AppaIyer & Mathirajan M., (2006) - Management Research Methodology: Integration of Principles, Methods & Techniques (New Delhi, Pearson Education)
2. Montgomery, Douglas C. (2004) – Design & Analysis of Experiments, (New York, John Wiley &Sons)
3. Kothari, C.K. (2004) – Research Methodology, Methods & Techniques, (New Delhi, New Age International Ltd. Publishers).
4. Prabuddha Ganguli, IPR: Unleashing the Knowledge Economy, published by Tata McGraw Hill2001.
5. John W Cresswell, (2009)-Research Design: Qualitative, Quantitative and Mixed Methods Approaches, (Sage Publications Pvt Ltd. 3rd Edition.)
6. Ranjit Kumar, 2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
7. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in New Technological Age”, 2016.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

Core Elective- I

EEP1CE11 WIRELESS SENSOR NETWORKS

Teaching Scheme:	**Examination Scheme**
Lectures- 3 Hours / week, 3 Credits	**ESE-** 60 Marks
	ISE - 40 Marks

COURSE OUTCOMES:

At the end of the course students will be able to

1. Demonstrate types of machine learning algorithms.
2. Design a model by selecting appropriate machine learning algorithm for a givenproblem.
3. Validate designed machine learning model.
4. Evaluate and tune machine learning model based on various parameters.
5. Design various applications using machine learning algorithms.

SECTION-I

Unit 1: Introduction to Wireless Sensor Networks (WSN) No. of Lectures- 06 Motivation, overview, network architecture, protocol stack, design objectives, challenges &constraints, technologies, hardware & software platforms, standards, applications

Unit 2: Medium Access Control (MAC): No. of Lectures- 06 Overview of MAC, MAC for WSN- network characteristics, objectives, energyefficiency, contention MAC, contention free MAC, hybrid MAC

Unit 3: Routing & Clustering: No. of Lectures- 08 Overview, challenges, metrics, data centric routing, proactive routing, on demand routing, hierarchical routing, location-based routing, QoS based routing, introduction to clustering

SECTION-II

Unit 4: Node Architecture: No. of Lectures- 04 Architecture, sensing, processing, communication interface, prototypes, software subsystems

Unit 5: Power Management: : No. of Lectures- 06 Need, classification, passive power conservation mechanism, active power conservation mechanism, power control at different protocol layer

Unit 6: Time Synchronization: : No. of Lectures-04 Clocks and synchronization problems, basics of time synchronization, time synchronization protocols

Unit 7: Localization: No. of Lectures- 04

Ranging techniques, range- b a s e d localization, range free localization, event driven localization

Unit 8: Standards No. of Lectures- 04

IEEE 802.15- Overview, MAC layer, Zigbee- network layer, application layer

- **Reference Books**

1. Wireless Sensor Networks – A Networking Perspective, Jun Zheng, Abbas Jamalipour, Wiley- IEEE
2. Fundamentals of Wireless Sensor Networks- Theory and Practice, Waltenegus Dargie, Chrstian Poellabauer, Wiley
3. Networking Wireless Sensors, Bhaskar Krishnamachari, Cambridge University Press
4. Wireless Sensor Networks- Technology, Protocols and Applications, Kazem Sohraby, Daniel Minoli, Taieb Znati, Wiley India
5. Wireless Sensor Network Designs, Anna Hac, John Wiley and Sons

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

Core Elective- I

EEP1CE12 ANALOG AND DIGITAL CMOS VLSI DESIGN

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks

COURSE OUTCOMES:

At the end of the course students will be able to

1. apply the circuit models to investigate CMOS circuits.
2. design moderately sized CMOS circuits/ sub- systems and compute timing, power and parasitic for various CMOS Logic structures
3. describe small and large signal models for MOS transistors.
4. Demonstrate the use of analog circuit analysis techniques to analyze operation and behavior of various analog integrated circuits

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SECTION I

Unit 1: Review No. of Lectures-07

Basic MOS structure and its static behavior, quality metrics of a digital design: cost, functionality, robustness, power, and delay, stick diagram and layout, wire delay models inverter: static CMOS inverter, switching threshold and noise margin concepts and their evaluation, dynamic behavior, power consumption

Unit 2: Physical Design Flow No. of Lectures-07

Floor planning, placement, routing, CTS, power analysis and IR drop estimation-static and dynamic, ESD protection-human body model, machine model

*Combinational logic***:** Static CMOS design, logic effort, ratioed logic, pass transistor logic, dynamic logic, speed and power dissipation in dynamic logic, cascading dynamic gates, CMOS transmission gate logic

Unit 3: Sequential Logic No. of Lectures-08

Static latches and registers, Bi-stability principle, MUX based latches, static SR flip-flops, master-slave edge-triggered register, dynamic latches and registers, concept of pipelining, pulse registers, non-bistable sequential circuit

Advanced technologies: giga-scale dilemma, short channel effects, high–k, metal gate technology, Fin FET, TFET etc

SECTION II

Unit 4: Single Stage Amplifier No. of Lectures-08

CS stage with resistance load, divide connected load, current source load, triode load, CS stage with source degeneration, source follower, common gate stage, cascade stage, choice of device models

Differential Amplifiers: basic difference pair, common mode response, differential pair with MOS loads, Gilbert cell

Unit 5: Passive and Active Current Mirrors No. of Lectures-06 Basic current mirrors, cascade mirrors, active current mirrors. frequency response of CS stage: source follower, common gate stage, cascade stage and difference pair, noise

Unit 6: Operational Amplifiers No. of Lectures-07
One stage OPAMP, two stage OPAMP, gain boosting, common mode feedback, slew rate, PSRR, compensation of 2 stage OPAMP, other compensation techniques

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Reference Books

1. J P Rabaey, A P Chandrakasan, B Nikolic, "Digital Integrated circuits: A designperspective", Prentice Hall electronics and VLSI series, 2nd Edition.
2. Baker, Li, Boyce, "CMOS Circuit Design, Layout, and Simulation", Wiley, 2nd Edition.
3. BehzadRazavi , "Design of Analog CMOS Integrated Circuits", TMH, 2007.
4. Phillip E. Allen and Douglas R. Holberg, "CMOS Analog Circuit Design", Oxford, 3rdEdition.
5. R J Baker, "CMOS circuit Design, Layout and Simulation", IEEE Inc., 2008.
6. Kang, S. and Leblebici, Y., "CMOS Digital Integrated Circuits, Analysis and Design", TMH, 3rd Edition.
7. Pucknell, D.A. and Eshraghian, K., "Basic VLSI Design", PHI, 3rd Edition.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

Core Elective- I

EEP1CE13 IMAGE AND VIDEO PROCESSING

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks

COURSE OUTCOMES:

At the end of the course students will be able to

1. apply various transforms used in image processing
2. apply various enhancement and restoration techniques for image and videos
3. apply various segmentation techniques for image and videos
4. evaluate various image and video compression standards
5. design and develop small end to end image and video analysis applications

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SECTION I

Unit1: Image and Video Fundamentals No. of Lectures-04

Image and video formats, Sampling in 2-dimension (2-D) and 3-dimension (3-D), image processing operations, digital video basics

Unit 2: Image Transforms No. of Lectures-06

2D orthogonal & unitary transforms, discrete Fourier transform (DFT), discrete cosine transform (DCT), Hadamard transform, Haar transform, wavelet transform, Karhunen-Loeve transform (KLT), Singular value decomposition (SVD) transform

Unit 3: Image and Video Enhancement No. of Lectures-06

Histogram, Point processing, spatial operations, transform operations, multi-spectral image enhancement, fundamentals of 2-D motion estimation and motion compensation, algorithms for 2-D motion estimation, motion-compensated filtering, frame rate conversion, deinterlacing

Unit 4: Image and Video Restoration No. of Lectures-06

Image observation models, inverse & Wiener filtering, generalized inverse, SVD and iterative methods, maximum entropy restoration, Bayesian methods, blind de-convolution, modeling in case of video restoration, intraframe shift invariant restoration, multi-frame restoration

SECTION– II

Unit 5: Image and Video Segmentation No. of Lectures-06

Discontinuity based segmentation- line detection, edge detection, thresholding, region base de-segmentation, scene change detection, spatiotemporal change detection, motion segmentation, simultaneous motion estimation and segmentation, semantic video

Object segmentation

Unit 6: Image and Video Compression No. of Lectures-06

Lossless image compression including entropy coding, lossy image compression, video compression techniques, international standards for image and video compression (JPEG, JPEG 2000, MPEG-2/4, H.264, HEVC), video quality assessment

Unit 7: Image analysis & computer vision No. of Lectures-06

Spatial feature extraction, transform features, edge detection, boundary extraction, boundary representation, region representation, moment representation, structure, shape features, texture, scene matching & detection, image segmentation, classification technique

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Reference Books

1. Fundamentals of Digital Image Processing, K. Jain, Pearson education(Asia) Pte. Ltd. /Prentice Hall of India, 2004
2. Handbook of Image & Video Processing, Al Bovik, Elsevier Academic Press, 2nd Edition
3. Multidimensional Signal, Image and Video Processing and Coding, John W. Woods, Academic Press, Elsevier, 2006.
4. Fundamentals of Multimedia, Z. Li, M.S. Drew, Pearson education (Asia) Pte.Ltd., 2004
5. Digital Image Processing. C. Gonzalez, R. E. Woods, Pearson education (Asia) Pte. Ltd. /Prentice Hall of India, 2004, 2nd Edition
6. Digital Video Processing, M. Tekalp, Prentice Hall, USA, 1995

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

EEP1SM1 Seminar-1

Teaching Scheme:	**Examination Scheme**
Practical- 4 Hours / week, 2 Credits	**ICA-** 50 Marks

Student must deliver a seminar based on the relevant topic based on recent research. The seminar topic shall be finalized in consultation with allotted supervisor. The seminar delivery shall be in front of the panel of PG faculty.

The student must submit a seminar report on topic selected.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

CMP1AC YOGA FOR STRESS MANAGEMENT

Teaching Scheme:	**Examination Scheme**
Lectures- 2 Hours / week	**ESE-** 50 Marks

Course Objectives:-

1. To train the students in the fields of Yoga and Stress management
2. To promote awareness for positive health and personality development in the student through Yoga
3. To achieve overall Good Health of Body and Mind.
4. To increase the levels of happiness.

Course Outcomes: -

At the end of the course, students will be able to

1. Manage stress through breathing, awareness, meditation, and healthy movement.
2. Achieve overall health of body and mind by overcoming stress
3. Use their bodies in a healthy way and perform well in sports and academics.
4. Build concentration, confidence, and positive self-image.

Unit 1:	Stress & Yoga Philosophy	**(3)**
Unit 2:	Managing Stress	**(3)**
Unit 3:	Worthy Tips For Gracious Living	**(3)**
Unit 4:	Panch Kosha, Trikaya & Abha (Five Sheaths, Three Bodies & Aura)	**(3)**
Unit 5:	Antahkarana Chatusthya Aur Nigrah (Four-Fold Mind & its Control)	**(3)**
Unit 6:	Introduction to Yoga	**(3)**
Unit 7:	Conditioning The Mind	**(3)**
Unit 8:	Pranayama (Breath Control)	**(3)**
Unit 9:	Dhaarna, Dhyana & Samadhi (Concentration, Meditation & Super-Consciousness)	**(3)**

Textbook:

1) Acharya Yatendra, Yoga & Stress Management, Divya Yog Niketan Trust, Finger-Print! Life, An imprint of Prakash Books India Pvt. Ltd., New Delhi

Reference Books:

1) H R Nagendra and R Nagarathna. Yoga for Promotion of Positive Health. Swami Vivekananda Yoga Prakashana.
2) Contrada, R., & Baum, A. (Eds.). The handbook of stress science: Biology, psychology, and health. SpringerPublishing Company.
3) Van den Bergh, O. Principles and Practice of Stress Management. Guilford Publications.
4) Swami Muktibodhananda, Hatha Yoga Pradipika, , Bihar School of Yoga
5) Swami Satyananda Saraswati, Four Chapters on Freedom, Bihar School of Yoga
6) Swami Tapasyananda, Srimad Bhagavat Gita, Sri Ramakrishna Math

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-II

EEP2CC4 ADVANCED INTERNET OF THINGS (IoT)

Teaching Scheme	**Examination Scheme**
Lectures –3 Hours/week, 3 Credits	**ESE-** 60 Marks
Practical –2 Hours/week, 1 Credit	**ISE-** 40 Marks
	ICA -25Marks

Course Outcomes:

At the end of the course student will be able to –

1. build IoT nodes using different sensors, microcontrollers and processors.
2. implement different communication protocols like GPRS and Wi-Fi for connecting IoT nodes to server.
3. use the internet communications like IP, TCP.UDP, the server application and user interface software.
4. use database and database management software for IoT applications

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SECTION- I

Unit 1: Introduction to IoT No. of Lectures-07

Smart cities and IoT revolution, fractal cities, From IT to IoT, M2M and peer networkingconcepts, Ipv4 and IPV6

Unit 2: **Communication Protocols** No. of Lectures-07

Software defined networks SDN, from cloud to fog and MIST networking for IoT communications, principles of edge/P2P networking, protocols to support IoT communications, modular design and abstraction, security and privacy in fog

Unit 3: **Wireless Sensor Networks** No. of Lectures-06

Introduction, IOT networks (PAN, LAN and WAN), edge resource pooling and caching, clientside control and configuration

SECTION II

Unit 4: IoT Platforms No. of Lectures-06

Smart objects as building blocks for IoT, open source hardware and embedded systems platforms for IoT, edge/gateway, IO drivers, C Programming, multithreading concepts

Unit 5: IoT Operating Systems No. of Lectures-07

Operating systems requirement of IoT environment, study of Mbed, RIoT, and Contiki operating systems, introductory concepts of big data for IoT applications

Unit 6: Applications of IoT No. of Lectures-06

Connected cars IoT transportation, smart grid and healthcare sectors using IoT, security and legal considerations

Internal Continuous Assessment (ICA)

ICA shall consist of minimum 6 laboratory experiment based upon above curriculum.

6. Reference Books

1. A Bahaga, V. Madisetti, “Internet of Things- Hands on approach”, VPTpublisher, 2014.
2. The Internet of Things: Enabling Technologies, Platforms, and Use Cases",by PethuruRaj and Anupama C. Raman (CRC Press)
3. Industry 4.0: The Industrial Internet of Things”, by Alasdair Gilchrist (Apress)
4. A. McEwen, H. Cassimally, “Designing the Internet of Things”, Wiley, 2013.
5. CunoPfister, “Getting started with Internet of Things”, Maker Media, 1st edition,2011.
6. Samuel Greenguard, “Internet of things”, MIT Press, 2015.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-II

EEP2CC5 SENSORS AND ACTUATORS

Teaching Scheme:	**Examination Scheme**
Lectures- 3 Hours / week, 3 Credits	**ESE-** 60 Marks
Practical –2 Hour / week , 1 Credit	**ISE -** 40 Marks
	ICA- 25 Marks

Course Outcomes:

At the end of the course student will be able to –

1. characterize mechanical and Electromechanical sensors
2. analyze thermal and radiation sensors
3. understand principle of smart sensors
4. describe pneumatic & hydraulic actuators.

SECTION-I

Unit 1: No of lectures-06

Sensors / transducers- principles – classification – parameters – characteristics - Environmental Parameters (EP) – characterization, mechanical and electromechanical sensors introduction – resistive potentiometer – strain gauge – resistance strain gauge – semiconductor strain gauges -inductive sensors: sensitivity and linearity of the sensor –types-capacitive sensors: – electrostatic transducer– force/stress sensors using quartz resonators – ultrasonic sensors

Unit 2: No of lectures-08

Thermal Sensors: introduction – gas thermometric sensors – thermal expansion type thermometric sensors – acoustic temperature sensor – dielectric constant and refractive index thermo-sensors – helium low temperature thermometer – nuclear thermometer – magnetic thermometer – resistance change type thermometric sensors –thermo-emf sensors– junction semiconductor types– thermal radiation sensors –quartz crystal thermoelectric sensors – NQR thermometry – spectroscopic thermometry –noise thermometry – heat flux sensors, magnetic sensors: introduction – sensors and the principles behind – magneto-resistive sensors – anisotropic magneto resistive sensing – semiconductor magneto resistors– hall effect and sensors – inductance and eddy current sensors– angular/rotary movement transducers – synchro's – synchro-resolvers – eddy current sensors – electromagnetic flowmeter – Switching Magnetic Sensors SQUID Sensors

Unit 3: No of lectures-06

Radiation Sensors : introduction – basic characteristics – types of photoresistors/photo detectors– X-ray and nuclear radiation sensors– fiber optic sensors, electro analytical sensors : introduction – the electrochemical cell – the cell potential - Standard Hydrogen Electrode (SHE) –liquid junction and other potentials – polarization – concentration polarization-– reference electrodes - sensor electrodes – electro ceramics in gas media

SECTION-II

Unit 4: No of lectures- 06

Smart Sensors -introduction – primary sensors – excitation – amplification – filters – converters – compensation– information coding/processing - data communication – standards for smart sensor interface – the automation

Unit 5: No of lectures- 06

Sensors –Applications introduction – on-board automobile sensors (automotive sensors)– home appliance sensors – aerospace sensors — sensors for manufacturing –sensors for environmental monitoring

Unit 6: No of lectures- 10

Actuators: pneumatic and hydraulic actuation systems- actuation systems – pneumatic and hydraulic systems -directional control valves – pressure control valves – cylinders - servo and proportional control valves – process control valves – rotary actuators, mechanical actuation systems- types of motion – kinematic chains – cams – gears – ratchet and pawl – belt and chain drives – bearings – mechanical aspects of motor selection, electrical actuation systems-electrical systems -mechanical switches – solid- state switches solenoids – D.C. motors – A.C. motors – stepper motors

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1. **Internal Continuous Assessment (ICA)**
   ICA shall consist of minimum 6 laboratory experiment based upon above curriculum.

- **Textbooks**

1. Patranabis – "Sensors and Transducers" –PHI Learning Private Limited.
2. W. Bolton – "Mechatronics" –Pearson Education Limited.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-II

EEP2CC6 WIRELESS CELLULAR AND LTE 4G

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks

Course Outcomes:

At the end of the course student will be able to –

1. Derive the basic scripts of WML and style sheets to attain the cognizance of Wireless scripting languages and Implement the XML Schema for acquiring the knowledge of user databases
2. Describe 3G GSM and CDMA 95 in detail with architecture, protocol, signal processing and security and also evaluate the channels
3. Analyze the system architecture and the functional standard specified in LTE 4G and the role of LTE radio interface protocols and EPS Data convergence protocols to set up, reconfigure and release data and voice from users. ·
4. Demonstrate the UTRAN and EPS handling processes from set up to release including mobility management for a variety of data call scenarios. ·
5. Test and Evaluate the Performance of resource management and packet data processing and transport algorithms.

Section I

Unit 1: Wireless Application Protocol (WAP): No. of Lectures-06

Model, gateway, protocol, user agent profile and caching, wireless bearers, development toolkit, network and application environments, wireless markup language, telephony applications, MMS, other applications

Unit 2: Wireless Wide Area Networks No. of Lectures-10

GSM, 3G wireless systems : Concept of Spread Spectrum - System Processing Gain - Direct-Sequence Spread Spectrum - Frequency-Hopping Spread Spectrum Systems - Requirements of Spreading Codes- evolution of IS 95 to CDMA 2000- Downlink (Forward) (BS to MS) - Uplink (Reverse) (MS to BS) - Power Control in CDMA – WCDMA

Unit 3: BEYOND 3G No. of Lectures-06

LTE Standardization Phases, Evolution Beyond Release 8, LTE-Advanced for IMT-Advanced, LTE Specifications and 3GPP Structure. System Architecture Based on 3GPP SAE- Basic System Architecture Configuration with only E-UTRAN Access Network, System Architecture with E-UTRAN and Legacy 3GPP Access Networks, System Architecture with E-UTRAN and Non-3GPPAccess Networks, Architecture Configuration IMS Architecture PCC and QoS

Section II

Unit 4: OFDMA No. of Lectures-06

SC-FDMA and MIMO in LTE, LTE Multiple Access Background, OFDMA Basics SC-FDMA Basics MIMO Basics, Physical Layer- Transport Channels and their Mapping to the Physical channels, Modulation Uplink User Data Transmission Downlink User Data Transmission, Uplink Physical Layer Signalling Transmission PRACH Structure, Downlink Physical Layer Signalling Transmission Physical Layer Procedures, UE Capability Classes and Supported Features Physical Layer Measurements, Physical Layer Parameter Configuration

Unit 5: LTE Radio Protocols No. of Lectures-06

Protocol Architecture, The Medium Access Control The Radio Link Control Layer, Packet Data Convergence Protocol, Radio Resource Control (RRC) X2 Interface Protocols Understanding the RRCASN.1 Protocol Definition Early UE Handling in LT

Unit 6: Mobility No. of Lectures-04

Mobility Management in Idle State, Intra-LTE Handovers 190, Inter-system Handovers Differences in EUTRAN and UTRAN Mobility

Unit 7: Radio Resource Management No. of Lectures-06

Overview of RRM Algorithms, Admission Control and QoS Parameters, Downlink Dynamic Scheduling and Link Adaptation, Uplink Dynamic Scheduling and Link Adaptation, Interference Management and Power Settings, Discontinuous Transmission and Reception (DTX/DRX), RRC Connection Maintenance, Performance- Layer 1 Peak Bit Rates, Terminal Categories Link Level Performance, Link Budgets Spectral Efficiency Latency, LTE Reframing to GSM Spectrum, Dimensioning, Capacity Management Examples from HSPA Networks

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Reference Books

1. Mobile Computing, Technology, applications and Service Creation, Asoke K. Talukder, Hasan Ahmed, Rupa R. Yavagal, Tata McGraw Hill Education Pvt. Ltd., 2nd Edition
2. Clint Smith and Daniel Collins, “3G Wireless Networks”, 2nd Edition, Tata McGraw Hill, 2007.
3. Amitabha Ghosh and Rapeepat Ratasuk, “Essentials of LTE and LTE-A,”Cambridge University Press, 2011.
4. Fundamentals of LTE, Arunabha Ghosh, Jan Zhang, Jefferey Andrews, Riaz Mohammed, 2010, Prentice Hall, Communications Engg and Emerging Technologies, ISBN: 978-9-35-306239-2.
5. LTE for UMTS Evolution to LTE-Advanced, HarriHolma and Antti Toskala, 2nd

Edition, 2011, John Wiley & Sons, Ltd, ISBN: 978-0-47-066000-3.
6. Evolved Packet System (EPS); The LTE and SAE Evolution of 3G UMTS, Pierre L and Thierry Lucidarme, 2008, John Wiley & Sons, Ltd. ISBN:978-0-470-05976-0.
7. LTE – The UMTS Long Term Evolution ; From Theory to Practice, Stefania Sesia, Issam Toufik, and Matthew Baker, 2009, John Wiley & Sons Ltd, ISBN: 978-0-470-69716-0.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-II

EEP2CE21 Core Elective II

ADVANCED MACHINE LEARNING

Teaching Scheme:	**Examination Scheme**
Lectures- 3 Hours / week, 3 Credits	**ESE-** 60 Marks
	ISE - 40 Marks

COURSE OUTCOMES:

At the end of the course, students will be able to

1. Solve various clustering examples
2. Apply frequent pattern mining algorithms
3. Explain advanced **predictive methods and techniques**
4. Explain machine learning applications for text, web and social media

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Unit: 1 Clustering No. of Lectures-06

Cluster analysis, partitioning methods, hierarchical methods, density-based methods, Evaluation of clustering

Unit: 2 Frequent Pattern Mining No. of Lectures-06

Frequent item sets, association rules, behind support and confidence, other types of pattern

Unit: 3 Additional Predictive Methods No. of Lectures-06

Search-based algorithms, optimization-based algorithms

Unit: 4 Advanced Predictive Topics No. of Lectures-08

Ensemble learning, algorithm bias, non-binary classification tasks, advanced data preparation techniques for prediction, description and prediction with supervised interpretable techniques

Unit: 5 Applications for Text, Web and Social Media No. of Lectures-08

Working with texts, recommender systems, social network analysis, visual and audio data mining

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Reference Books

1. A General Introduction to Data Analytics, João Mendes Moreira, André C. P. L. F. de Carvalho, Tomáš Horváth, JohnWiley & Sons, Inc.

2. Data Mining- Concepts and Techniques, Third Edition, Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann

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M. Tech. (Electronics Engineering) Semester-II

Core Elective III

EEP2CE31- NETWORK AND INTERNET SECURITY

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits

Examination Scheme
ESE- 60 Marks
ISE- 40 Marks

Course Outcomes:

At the end of the course student will be able to –

1. describe Concept of Security needed in communication of data through computers and networks along with various possible attacks
2. interpret various encryption mechanisms for secure transmission of data and management
3. justify authentication requirements and various authentication mechanisms
4. underline network security concepts and describe different Web security mechanisms.

SECTION-I

Unit 1: Introduction

Overview of ISO's OSI model and TCP/IP model, key management, public-key infrastructure (PKI), remote user authentication using symmetric key encryption, Kerberos, remote user authentication using asymmetric key encryption, federated identity management, biometrics

Unit 2: Wireless Network Security

IEEE 802.11 wireless LAN overview: IEEE 802.11 network components, architectural model, IEEE 802.11 services; IEEE 802.11i wireless LAN security: IEEE 802.11i services, IEEE 802.11i phases of operation, discovery phase, authentication phase, key management phase & protected data transfer phase, IEEE 802.11i pseudorandom function

Unit 3: WAP Security

Wireless application protocol (WAP): WAP architecture, wireless application environment, WAP protocol architecture; wireless transport layer security (WTLS): WTLS sessions and connections, WTLS protocol architecture, cryptographic algorithms**,** WAP end-to-end security

SECTION II

Unit 4: Electronic Mail Security

Pretty good privacy (PGP): notation, operational description, cryptographic keys and key rings, public-key management, S/MIME: RFC 5322, multipurpose internet mail extensions, S/MIME functionality, S/MIME messages, S/MIME certificate processing, enhanced security services, domain keys identified mail**:** internet mail architecture, e-mail threats, DKIM strategy, DKIM functional flow

Unit 5: Web and IP Security

Web security: web security requirements, secure sockets layer (SSL), transport layer security (TLS), and secure electronic transaction (SET), HTTPS, secure shell (SSH), IP security: IPsecurity overview, architecture, authentication, encapsulating security payload, combining security associations, key management

Unit 6: System Security

Intruders, intrusion detection; password management, malicious software, viruses and related threats, virus countermeasures, distributed denial of service attacks, firewalls: firewall design, principles, trusted systems

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1. Internal Continuous Assessment (ICA)

ICA shall consist of minimum six assignments based upon above syllabus

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a. Text Books:

1. Cryptography and Network Security: Principles and Practice, 5th Edition, WilliamStallings, Pearson Education, ISBN: 978-81-317-6166-3
2. Cryptography and Network Security, Behrouz A. Forouzan, Tata McGraw-Hill. 2007,ISBN: 978-00-706-6046-5

b. Reference Books:

1. Network Security And Cryptography, Bernard Menezes, Cengage Learning, 2010,ISBN : 978-81-315-1349
2. Applied Cryptography, 2nd Edition, Schneier B, Wiley & Sons. 2002, ISBN: 0-471-11709-9

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M. Tech. (Electronics Engineering) Semester-II

EEP2SM2 Seminar-2

Practical- 6 Hours / week, 3 Credits

Examination Scheme
ICA- 100 Marks

Student must deliver a seminar based on the relevant topic based on recent research. The seminar topic shall be finalized in consultation with allotted supervisor. The seminar delivery shall be in front of the panel of PG faculty.

The student must submit a seminar report on topic selected.