WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(AN AUTONOMOUS INSTITUTE)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University, Solapur

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure and Syllabus
For

M. Tech. in Electronics Engineering

W.E.F. 2021-22

Electronics Engineering Department

Department Vision

To be a distinguished center for nurturing the holistic development of competent young engineers in the electronics and Information Technology fields

Department Mission

1. To inculcate and stimulate Electronics & Computer proficiency amongst students through quality education and innovative educational practices
2. To create engineering professionals with social consciousness
3. To foster technical skills of students through creativity and critical thinking
4. To enhance soft skill set of students which is crucial for career success through effectual training

Electronics and Computer Engineering
Postgraduate Program
Program Educational Objectives (PEOs)

1. Graduate will succeed in employment, profession or pursue research in Electronics Engineering
2. Graduate will exhibit professional ethics, team spirit and effective communication skills to be successful leader and manager with a holistic approach.
3. Graduate will exhibit higher ethical and professional attitude, effective communication skill and teamwork

Program Outcomes (POs)

The program outcomes of M. Tech. Electronics Engineering are summarized as following:

PO-1	Independently carry out research /investigation and development work to solve practical problems
PO-2	Write and present a substantial technical report/document
PO-3	Able to demonstrate a degree of mastery (at a level higher than the requirements in the bachelor's degree) in the area of Electronics Engineering.
PO-4	Propose and develop optimal solutions for Electronics Engineering problems
PO-5	Apply appropriate methodology and modern engineering / IT tools to solve complex Electronics Engineering

Legends used–

L	Lecture Hours / week
T	Tutorial Hours / week
P	Practical Hours / week
FA	Formative Assessment
SA	Summative Assessment
ESE	End Semester Examination
ISE	In Semester Evaluation
ICA	Internal Continuous Assessment
POE	Practical and Oral Exam
OE	Oral Exam
MOOC	Massive Open Online Course
HSS	Humanities and Social Sciences
NPTEL	National Program on Technology Enhanced Learning
F.Y.	First Year
S.Y.	Second Year
T.Y.	Third Year
M.Tech.	Master of Technology

Course Codes	
CC	Core Compulsory Course
SN*	Self-Learning **N*** *indicates the serial number of electives offered in the respective category*
EN*	Core Elective **N*** *indicates the serial number of electives offered in the respective category*
SM	Seminar
PR	Project

Course Code Format:

2	**1**	**E**	**T**	**U/P**	**2**	**C**	**C**	**1**	**T/L**
Year of Syllabus revision		Branch Code		U-Under Graduate, P-Post Graduate	Semester No. / I-First Year / II-Second Year	Course Code		Course Serial No 1-9	T-Theory, L-Practical

EE	Electronics Engineering

Course Codes	
BS	Basic Science
ES	Engineering Science
HU	Humanities & Social Science
MC	Mandatory Course
CC	Core Compulsory Course
SN*	Self-Learning **N*** *indicates the serial number of electives offered in the respective category*
EN*	Core Elective **N*** *indicates the serial number of electives offered in the respective category*
SM	Seminar
MP	Mini project
PR	Project
IN	Internship

Sample Course Code:

21EEP1CC1T/L	Advanced Embedded system Design

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Structure of M.Tech Electronics Engineering

(W.E.F. 2021-22)

Semester I

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
21EEP1CC1T	Advanced embedded system design	3	-	-	3	60	40	-	100
21EEP1CC2T	Advanced Digital Signal Processing	3	-	-	3	60	40	-	100
21EEP1CC3T	Advanced communication networks and protocols	3	1	-	4	60	40	25	125
21EEP1CC4T	Machine learning	3	-	-	3	60	40	-	100
21EEP1EN*5T	Elective I	3	1	-	4	60	40	25	125
Total		**15**	**02**		**17**	**300**	**200**	**50**	**550**

Semester I: Laboratory Courses

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
21EEP1CC1L	Advanced embedded system design	-	-	2	1	-	-	25	25
21EEP1CC2L	Advanced Digital Signal Processing	-	-	2	1	-	-	25	25
21EEP1CC4L	Machine learning	-	-	2	1	-	-	25	25
21EEP1SM6L	Seminar- I	-	-	2	2	-	-	50	50
	Total			08	05	-	-	125	125
Grand Total		**15**	**02**	**08**	**22**	**300**	**200**	**175**	**675**

Note : L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment

$$ - This Course is common for M. Tech. (Electronics Engineering) and M. Tech. (Computer Science and Engineering)

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Structure of M.Tech Electronics Engineering
(W.E.F. 2021-22)
Semester II

- **Semester II: Theory Courses**

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
21EEP2CC1T	Research Methodology & IPR	3	1	-	4	60	40	25	100
21EEP2CC2T	Embeded networks	3	-	-	3	60	40	-	100
21EEP2CC3T	Advanced IoT	3	-	-	3	60	40	-	125
21EEP2CC4T	Sensorsand actuators	3	-	-	3	60	40	-	100
21EEP2EN*5T	Elective II	3	1	-	4	60	40	25	125
Total		**15**	**02**		**17**	**300**	**200**	**50**	**550**

- **Semester II: Laboratory Courses**

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
21EEP2CC2L	Embeded networks	-	-	2	1	-	-	25	25
21EEP2CC3L	Advanced IoT	-	-	2	1	-	-	25	25
21EEP2CC4L	Sensorsand actuators	-	-	2	1	-	-	25	25
21EEP2SM6L	Seminar- II	-	-	2	2	-	-	50	50
	Total			08	05	-	-	125	125
Grand Total		**15**	**02**	**08**	**22**	**300**	**200**	**175**	**675**

Note : L- Lectures, P-Practical, T-Tutorial, ISE- In Semester Evaluation, ESE- End Semester Evaluation, ICA- Internal Continuous Assessment
$$ - This Course is common for M. Tech. (Electronics Engineering) and M. Tech. (Computer Science & Engineering)

- Seminar I shall be delivered on a topic related to students' broad area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student shall deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

- Seminar II shall be delivered on a topic related to students' particular area of interest for dissertation work selected in consultation with the advisor after compiling the information from the latest literature. Student shall deliver seminar using modern presentation tools. A hard copy of the report (as per format specified by the department) shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.

Elective Pool-

Course code	Elective -I	Course code	Elective -II
21EEP1E15T	Wireless Sensor Networks	21EEP2E15T	Wireless cellular and LTE 4G broadband
21EEP1E25T	Analog and digital CMOS VLSI design	21EEP2E25T	Real Time operating Systems
21EEP1E35T	Image and video processing	21EEP2E35T	VLSI in Signal processing
21EEP1E45T	Neural Networks & Fuzzy Control Systems	21EEP2E45T	Advanced Control Systems

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Semester III

- **Semester III: Theory Courses**

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
21EEP3SN*1T	Self-Learning Course	-	-	-	3	60	40	-	100
21EEP3ON*2T	Open Elective course #	3	-	-	3	60	40	-	100
Total		**03**	**-**	**-**	**06**	**120**	**80**	**-**	**200**

- **Semester III: Laboratory Courses**

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
21EEP3SM3L	Dissertation Phase I: Synopsis Submission Seminar*	-	-	4	3	-	-	100	100
21EEP3SM4L	Dissertation Phase II: ICA*	-	-	-	3	-	-	100	100
21EEP3SM5L	Dissertation Phase II Progress Seminar*	-	-	-	3	-	-	100	100
	Total	-		04	09	-	-	300	300
Grand Total		**03**	**-**	**04**	**15**	**120**	**80**	**300**	**500**

Note -

- $- Being a Self-Learning Course, student shall prepare for examination as per specified syllabus
- *- For all activities related to dissertation Phase I (synopsis submission seminar and progress seminar) student must interactregularly every week with the advisor.
- # - This course is common for all branches of Technology (i.e., for all MTech. Programs)

List Self Learning Courses :

Course code	*Self -Learning Courses*
21EEP3S11T	Network and Internet Security
21EEP3S21T	Programmable System on Chip (PSoC)
21EEP3S31T	Advanced Process Control

List of open Elective Courses :

Course Code	*Open Elective Subject*
21EEP3O11T	Business Analytics
21EEP3O21T	Operation Research
21EEP3O31T	Cost Management of Engineering Projects
21EEP3O41T	Non-conventional Energy

- New Self Learning Courses and New Open Elective Courses may be added as and when required

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Structure of M.Tech Electronics Engineering
(W.E.F. 2021-22)
Semester IV

- **Semester IV: Laboratory Courses**

Course Code	Name of the Course	Engagement Hours			Credits	FA	SA		Total
		L	T	P		ESE	ISE	ICA	
21EEP4SM1L	Dissertation Phase III : Progress Seminar #	--	--	4@	3.0	--	---	100	100
21EEP4SM2L	Dissertation Phase IV: #	--	--	2@	6.0	--	--	200	200
21EEP4SM3L	Final Submission of the Dissertation and Viva –Voce	--	--	--	6.0	200	--	--	200
Total					**15.0**				**500**

Note –

- #- For all activities related to dissertation Phase III & IV student must interact regularly every week with the advisor.
- Progress seminar shall be delivered capturing details of the work done by student for dissertation
- Student shall deliver all seminars using modern presentation tools. A hard copy of the report shall be submitted to the Department before delivering the seminar. A PDF copy of the report must be submitted to the advisor along with other details if any.
- Student must submit a hard copy of Project Report to the department
- @ indicates contact hours of the student for interaction with the advisor
- Details of modes of assessment of seminar and dissertation shall be as specified in 7 (III) of PG Engineering Ordinance of Solapur University, Solapur.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

21EEP1CC1 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 organisation, 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 minimum 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

21EEP1CC2 ADVANCED DIGITAL SIGNAL PROCESSING

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

COURSE OUTCOMES:

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

1. Solve problems based on FIR, IIR filter
2. Analyze multi-rate digital signal processing
3. Calculate prediction coefficient
4. Apply the methods for power spectrum estimation.
5. Apply concepts of DSP in various applications.

SECTION-I

Unit 1: Design of Digital Filters No. of Lectures-07

Overview of DSP, characterization in time and frequency, FFT Algorithms, digital filter design and structures: basic FIR/IIR filter design & Structures, design techniques of linear phase FIR filters, IIR filters by Impulse invariance, bilinear transformation, FIR / IIR cascaded lattice structures

Unit 2: Multi-rate Digital Signal Processing No. of Lectures-07

Multi rate DSP, decimators and interpolators, sampling rate conversion, multistage decimator & interpolator, poly phase filters, QMF, digital filter banks, applications in sub band coding

Unit 3: Linear Prediction & Optimum Linear Filters No. of Lectures-07

Linear prediction & optimum linear filters, stationary random process, forward-backward linear prediction filters, solution of normal equations, AR lattice and ARMA lattice-ladder filters, Wiener Filters for filtering and prediction

SECTION-II

Unit 4: Adaptive Filters No. of Lectures-07

Adaptive filters, applications, gradient adaptive lattice, minimum mean square criterion, LMS algorithm, recursive least square algorithm

Unit 5: Power Spectrum Estimation No. of Lectures-07

Estimation of spectra from finite-duration observations of signals, non-parametric methods for power spectrum estimation, parametric methods for power spectrum estimation, minimum- variance spectral estimation, Eigen analysis, algorithms for spectrum estimation

Unit 6: Wavelet Transform & Application of DSP No. of Lectures-07

Application of DSP & multi rate DSP, application to radar, introduction to Wavelets,

applicationto image processing, design of phase shifters, DSP in speech processing & other applications

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- **Internal Continuous Assessment**

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

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1. **Reference Books**

1. J. G. Proakis and D. G. Manolakis, "Digital signal processing: Principles, Algorithm andApplications", 4th Edition, Prentice Hall, 2007
2. N. J. Fliege, "Multirate Digital Signal Processing: Multirate Systems -Filter Banks –Wavelets", 1st Edition, John Wiley and Sons Ltd, 1999
3. Sanjit K Mitra ,"Digital Signal Processing-A Computer Bases Approach",3rd EditionMcGraw Hill,2009
4. M. H. Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley & SonsInc., 2002
5. S. Haykin, "Adaptive Filter Theory", 4th Edition, Prentice Hall, 2001
6. D. G. Manolakis, V.K. Ingle and S.M.Kogon, "Statistical and Adaptive SignalProcessing", McGraw Hill, 2000

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

21EEP1CC3T ADVANCED COMMUNICATION NETWORKS & PROTOCOLS

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, 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

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, bridges and 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 Version 6(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, segment format, 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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- **Internal Continuous Assessment**

ICA shall consist of minimum 6 tutorials based upon above curriculum.

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, 2nd Edition,
   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

21EEP1CC4 MACHINE LEARNING

Teaching Scheme	**Examination Scheme**
Lectures –3Hours/week, 3 Credits	**ESE-** 60 Marks
Practical –2Hours/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 vectormachines, 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 inneural networks, deep learning: introduction, deep neural networks, applications of deepnetworks

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

Introduction, key perspectives on machine learning, key results, where machine learning isheaded next

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

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3. **Reference Books**
   1. Book 1: Machine Learning by Tom Mitchell, McGraw Hill (1st Edition)
   2. Draft content of chapter 14 of upcoming 2nd Edition of Book 1http://www.cs.cmu.edu/~tom/mlbook/keyIdeas.pdf
   3. Book 2: Machine Learning: a Probabilistic Perspective by Kevin Patrick Murphy
   4. Book 3: Pattern Recognition and Machine Learning (Information Science and Statistics)by Christopher M. Bishop

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Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

Elective- I 21EEP1E15T WIRELESS SENSOR NETWORKS

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Tutorial –1 Hour / week, 1 Credit

Examination Scheme
ESE- 60 Marks
ISE - 40 Marks
ICA- 25 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 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 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, energy efficiency,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 synchronizationprotocols

Unit 7: Localization: No. of Lectures- 04
Ranging techniques, range based 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

- **Internal Continuous Assessment (ICA)**

  ICA consist of minimum 6 tutorials based upon above curriculum

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- **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, TaiebZnati, Wiley India
5. Wireless Sensor Network Designs, Anna Hac, John Wiley and Sons

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Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-I

ELECTIVE I: 21EEP1E25T ANALOG AND DIGITAL CMOS VLSI DESIGN

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

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

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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4. **Internal Continuous Assessment (ICA)**

   ICA consist of minimum 6 tutorials based upon above curriculum

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5. **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

:CTIVE I: 21EEP1E35T - IMAGE AND VIDEO PROCESSING

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

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

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, multiframe 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, motionsegmentation, simultaneous motion estimation and segmentation, semantic video

objectsegmentation

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

6. **Internal Continuous Assessment (ICA)**

   ICA consist of minimum 6 tutorials based upon above curriculum

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7. **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

ELECTIVE I: 21EEP1E45T - NEURAL NETWORKS AND FUZZY CONTROL SYSTEMS

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

COURSE OUTCOMES:

At the end of the course students will be able to

1. evaluate use of feed-forward ANN for small applications
2. evaluate use of recurrent ANN for small applications
3. explain how ANN can be used for system identification, estimation and control applications
4. evaluate fuzzy control and other systems
5. simulate various ANN and fuzzy paradigms for small applications

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SECTION I

Unit1: Artificial Neural System-Preliminaries No. of Lectures-04

Neural computations, models of artificial neural networks (ANN), neural processing, learningand adaptation, learning rules, applications of ANN

Unit2: Feed-forward ANN and supervised learning: No. of Lectures-07

Single layer perception classifiers- continuous, discrete, multi category, multilayer feed-forward, error back propagation, learning factors, variants of back propagation, ANN as a statistical recognizer

Unit 3: Recurrent Neuro-Dynamical Systems No. of Lectures-05

Discrete time Hopfield ANN, gradient type Hopfield ANN, content addressable memory, simulated annealing, Boltzmann machine, bidirectional associative memory

Unit 4: Identification, Control and Estimation Using ANN No. of Lectures-04

Linear system identification, autoregressive model, ARMA model, nonlinear system modeling, identification of control of nonlinear dynamical systems, independent component analysis, spectrum estimation, case studies

SECTION- II

Unit 5: Fuzzy Control-Preliminaries No. of Lectures-07

Fuzzy sets, fuzzy relations, approximate reasoning, representing a set of rules, membership functions, fuzzy controller from industrial perspective, knowledge-based system for process control, knowledge representation, applications of fuzzy logic

Unit 6: Fuzzy Controller Design No. of Lectures-07

Structure of fuzzy controller, rule base, data base, inference engine, fuzzification and defuzzification, nonlinear fuzzy control, PID like fuzzy controller

Unit 7: Fuzzy Nonlinear Simulation No. of Lectures-06

Relational equations, partitioning, nonlinear simulation using fuzzy rule-based systems, fuzzy associative memories

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8. **Internal Continuous Assessment (ICA)**
   ICA consist of minimum 6 tutorials based upon above curriculum

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9. **Reference Books**

1. Neural Networks- Classroom Approach, Satish Kumar, Tata McGraw-Hill PublishingCompany Ltd.
2. Introduction to Artificial Neural Systems, Jacek M Zurada, Jaico Publishing House
3. Principles of Neurocomputing for Science and Engineering, Fredric M Ham, IvicaKostanic, Tata McGraw-Hill Edition
4. Neural Networks and Learning Machines, Simon Haykin, Prentice Hall of India Pvt. Ltd.
5. An Introduction to Fuzzy Control, DimiterDriankov, Hans Hellendoorn, MichaelReinfrank, Narosa Publishing House
6. Fuzzy Logic with Engineering Applications, Timothy J. Ross, McGraw Hill, Inc

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Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-II

21EEP2CC1T RESEARCH METHODOLOGY& IPR

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

Course Outcomes:

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

1. Search for, select and critically analyze research articles and papers
2. Prepare a literature review
3. Formulate and evaluate research problem with experience with instrument development and data collection methods
4. Gain adequate knowledge on patent and copyright for their innovative research works

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SECTION-I

Unit 1: Research Fundamentals No. of Lectures-06

Definition, objectives, motivation, types of research and approaches, research-descriptive,conceptual, theoretical, applied and experimental

Unit 2: The Initial Research Process No. of Lectures-06

Literature review, research design, assortment of the problem, identification of problem, defininga problem, objective, sub objective and scope, assumptions, validation criteria, researchproposal(synopsis)

Unit 3: Report Writing and Presentation of Results No. of Lectures-05

Need, report structure, formulation, sections, protocols, graphs, tables, IEEE format, evaluation of report, writing abstract, writing technical paper

Unit 4: Information Communication Technology No. of Lectures-03

Introduction, e-research, indices, virtual lab, digital lab, ethical issues in research

SECTION-II

Unit 5: Mathematical Modeling And Simulation No. of Lectures-07

Mathematical modeling – need, techniques and classification, system models –types, static, dynamic, system simulation – why to simulate, technique of simulation, Monte Carlo simulation, types, continuous modeling, discrete model, role of probability and statistics in simulation, statistical distributions

Unit 6: Nature of Intellectual Property No. of Lectures-07

Patents, designs, trade 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

Unit 7: Patent Rights No. of Lectures-06

Scope of patent rights, licensing and transfer of technology, patent information and databases,geographical indications

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10. **Internal Continuous Assessment (ICA)**

ICA consist of minimum seven assignments based upon above syllabus

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11. **Reference Books**

1. Fundamental of Research Methodology and Statistics, Yogesh Kumar Sing, New AgeInternational Publishers
2. Research Methodology: Methods and Techniques, C.R. Kothari, New Age InternationalPublishers, 2nd revised Edition
3. Research Methodology, Concepts and Cases, Deepak Chawla, Neena Sondhi, Vikas
4. Intellectual Property in New Technological Age, Robert P. Merges, Peter S. Menell,Mark A. Lemley, 2016.
5. Intellectual Property Rights by Neeraj Pandey And Khushdeep Dharn
6. Intellectual Property Rights Under WTO,T. Ramappa, S. Chand, 2008
7. Intellectual Property Rights Journal by CSIR-National institute of science Communication and Information Resources. (*January 2017 and March-May-2018).*

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-II

21EEP2CC2 EMBEDDED NETWORKS

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. analyze serial and parallel communication protocol related to embedded networking.
2. illustrate the concepts of USB & CAN bus.
3. implement the basics of Ethernet communication
4. recognize the need for wireless protocols to indulge in real world interfacing.

SECTION- I

Unit 1: Embedded Communication Protocols No of lectures-08

Embedded networking: introduction – serial/parallel communication – serial communication
protocols -RS232 standard – RS485 – synchronous serial protocols -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – PC Parallel port programming - ISA/PCI bus protocols – firewire

Unit 2: Embedded Communication Protocols No of lectures-06

USB and CAN Bus, USB bus – Introduction – Speed Identification on the bus – USB States USB bus, communication packets –data flow types –enumeration –descriptors – PIC 18 microcontroller, USB Interface – C Programs –CAN Bus – introduction - frames –bit stuffing –types of errors –nominal bit timing – PIC microcontroller CAN interface –a simple application with CAN

Unit 3: Ethernet: No of lectures-07

Ethernet basics elements of a network – inside ethernet – building a network: hardware options – cables, connections and network speed – design choices: selecting components –ethernet controllers – using the internet in local and internet communications – inside the internet protocol

SECTION- II

Unit 4: No of lectures-10

Embedded ethernet exchanging messages using UDP and TCP – serving web pages with dynamic data – serving web pages that respond to user input – email for embedded systems – using FTP – keeping devices and network secure

Unit 5: No of lectures-10

Wireless embedded networking, wireless sensor networks – introduction – applications – network topology – localization – time synchronization - energy efficient MAC protocols –SMAC – energy efficient and robust routing – data centric routing

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12. **Internal Continuous Assessment (ICA)**

ICA consist of minimum seven assignments based upon above syllabus

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- **Text Books**
  1. Embedded Systems Design: A Unified Hardware/Software Introduction - Frank Vahid, Tony Givargis, John & Wiley Publications, 2002.
  2. Parallel Port Complete: Programming, interfacing and using the PCs parallel printer port - Jan Axelson, Penram Publications, 1996.

- **References**
  1. Advanced PIC microcontroller projects in C: from USB to RTOS with the PIC18F series -
     Dogan Ibrahim, Elsevier 2008.
  2. Embedded Ethernet and Internet Complete - Jan Axelson, Penram publications, 2003.
  3. Networking Wireless Sensors - Bhaskar Krishnamachari , Cambridge press 2005.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-II

21EEP2CC3 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.

13. **Reference Books**

1. A Bahaga, V. Madisetti, “Internet of Things- Hands on approach”, VPT publisher, 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

21EEP2CC4 SENSORS AND ACTUATORS

Teaching Scheme:
Lectures- 3 Hours / week, 3 Credits
Practical –2 Hour / week , 1 Credit

Examination Scheme
ESE- 60 Marks
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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14. **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

Elective -II 21EEP2E15T WIRELESS CELLULAR AND LTE 4G BROADBAND

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. 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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15. **Internal Continuous Assessment (ICA)**

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

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. AmitabhaGhosh and RapeepatRatasuk, “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, JohnWiley & 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, IssamToufik, andMatthew Baker, 2009, John Wiley & Sons Ltd, ISBN: 978-0-470-69716-0.

Walchand Institute of Technology
(An Autonomous Institute)
M. Tech. (Electronics Engineering) Semester-II
ELECTIVE-II: 21EEP2E25T - REAL TIME SYSTEMS

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

Course Outcomes:
At the end of the course student will be able to –

1. analyze real time scheduling
2. describe resource management including potential problems and its resolution
3. understand programming and databases
4. analyze real time communication.

SECTION I

Unit 1: Introduction No. of Lectures 06
Introduction, issues in real time computing , structure & application of a real time system , task classes ,performance measures for real time systems, estimating program run times, task assignment and scheduling, classical uniprocessor scheduling algorithms, uniprocessor scheduling of iris tasks, task assignment ,modelling timing constraints

Unit 2: Programming Languages and Tools- I No. of Lectures 07
Programming languages and tools, desired language characteristics, data typing, control &conditional structures, facilitating hierarchical decomposition, packages

Unit 3: Programming Languages and Tools –II No. of Lectures 07
Run time (exception) error handling, overloading and generics, multitasking, low level programming, task scheduling, timing specifications, programming environments, run time support

SECTION II

Unit 4: Real Time Databases No. of Lectures 07
Real time databases ,basic definition, real time vs general purpose databases, main memory databases, temporal data, transaction priorities, transaction aborts, concurrency control issues, disk scheduling algorithms, two phase approach to improve predictability , serialization consistency , databases for hard real time systems

Unit 5: Real –Time Communication No. of Lectures 07
Real time communication, communications media, network topologies protocols, fault tolerant routing, fault tolerance techniques, fault types, fault detection, fault error containment redundancy, data diversity, reversal checks, integrated failure handling

Unit 6: Evaluation techniques No. of Lectures 07

Reliability evaluation techniques, obtaining parameter values, reliability models for hardware redundancy, software error models, clock synchronization, clock, anon fault, tolerant synchronization algorithm, impact of faults, fault tolerant synchronization in hardware, faulttolerant synchronization in software

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16. **Internal Continuous Assessment (ICA)**

ICA shall consist of minimum six assignments based upon above syllabus

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17. **Reference Books**

1. C.M. Krishna, Kang G. Shin, "Real – Time Systems", McGraw – Hill InternationalEditions, 1997.
2. Rajib Mall, "Real-time systems: theory and practice", Pearson Education, 2007
3. S. T. Allworth and R. N. Zobel, " Introduction to real time software design", McMillan,2nd Edition, 1987
4. R.J.A Buhur, D.L Bailey, "An Introduction to Real – Time Systems", Prentice – HallInternational, 1999.
5. Philip.A.Laplante, "Real Time System Design and Analysis", Prentice Hall of India, 3rd

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Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-II

LECTIVE II- 21EEP2E35T VLSI IN SIGNAL PROCESSING

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

Course Outcomes:

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

1. compute iteration bound using longest path matrix and minimum cycle mean method.
2. apply pipelining, retiming, unfolding and folding transformations to a DSP system.
3. design systolic arrays using linear mapping techniques and matrix –matrix multiplication
4. explain various design blocks required for bit level arithmetic architectures.

SECTION- I

Unit1: DFG Representation and Iteration Bound No. of Lectures 06

Representations of DSP algorithms, data flow graph representations, critical path, loop bound,iteration bound, algorithms for computing iteration bound

Unit2: Pipelining and Parallel Processing No. of Lectures 06

Pipelining approach to reduce critical path, parallel processing to handle higher sample rates, power reduction computations, combined pipelining and parallel processing

Unit 3: Retiming No. of Lectures 08

Introduction to retiming, definitions and properties, solving system of inequalities, cut set retiming and pipelining, retiming for clock period minimization, retiming for register minimization

SECTION II

Unit 4: Unfolding No. of Lectures 06

Introduction to unfolding, algorithm for unfolding, properties of unfolding, applications ofunfolding

Unit 5: Folding No. of Lectures 06

Introduction to folding, folding transformation, lifetime analysis for register minimization infolded architecture

Unit 6: Systolic Array Design No. of Lectures 06

Methodologies, family of systolic arrays (FIR filter) using linear mapping techniques, matrix –matrix multiplication

Unit 7: Bit Level Arithmetic Architectures No. of Lectures 04

Parallel multiplication with sign extension**,** parallel carry ripple array multipliers, parallel carry save array multipliers, parallel multipliers with modified booth recording

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1. **Internal Continuous Assessment (ICA)**
   ICA shall consist of minimum seven assignments based upon above syllabus

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2. **Reference Books:**

1. VLSI Digital Signal Processing Systems- Design and Implementation, Keshav K. Parhi,Wiely (India)
2. Architecture for Digital Signal Processing, Peter Pirsch, Wiley India
3. Digital Signal Processing in VLSI,Richard J. Higgins
4. VLSI Synthesis of DSP Kernels-Algorithmic and Architectural Transformations,Mahesh Mehendale, Sunil D. Sherlekar

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Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-II

ELECTIVE II – 21EEP2E45T ADVANCED CONTROL SYSTEMS

Teaching Scheme	**Examination Scheme**
Lectures –3 Hours/week, 3 Credits	**ESE-** 60 Marks
Tutorial –1 Hours/week, 1 Credit	**ISE-** 40 Marks
	ICA – 5Marks

Course Outcomes:

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

1. determine controllability and observability of control system
2. analyze stability of digital control systems
3. design pole placement technique and state observer.
4. analyze robustness of control systems

SECTION- I

Unit 1: State Space Analysis No. of Lectures 07

State space representation, state transition matrix, response of LTI system, controllability &observability, state representation of discrete system, transfer function of z-domain

Unit 2: Digital Control System No. of Lectures 07

Sampling and quantization effects, zero order hold-block, frequency domain consideration,difference domain representation, analysis in Z domain, transfer function, & complete response

Unit 3: Stability Analysis No. of Lectures 07

Mapping between S-plane &Z-plane, justify stability criteria, steady state error and errorconstant, root locus, bode and analytical methods of design, Lyapunov stability

SECTION- II

Unit 4: Pole Placement And Observer Design No. of Lectures 07

State feedback gain, design via pole placement, state observers, observer design, servo systems,design of state & output regulations

Unit 5: MIMO Control No. of Lectures 07

Models for multivariable systems, basic MIMO control loop, closed loop stability, pairing ofinputs and outputs, converting MIMO problems to SISO problems

Unit 6: Robust Control System No. of Lectures 07

Introduction, system sensitivity, analysis of robustness, system within certain parameter, design of robust control system, design examples, robust internal model control system

Internal Continuous Assessment (ICA)

ICA shall consist of minimum six assignments based upon above syllabus

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Reference Books:

1. Adaptive and Robust Control, Karl Astorm, Wittenmark, Pearson Education, 1995.
2. Robust Control, PatrosIonnav, Jing Sun, Prentice Hall of India Pvt. Ltd., 1996.
3. Discrete Time Control System, K.Ogata, Pearson Education, 2nd Edition,2001
4. Control System Design, G.C.Goodwin, Graebe , Salgado Prantice Hall of India Pvt.Ltd.2002.
5. Digital Control and State Variable Methods, M. Gopal, Tata Mc Graw Hill, 2 nd Edition,2005
6. Digital Control Systems, V. I. George, C. P. Kurian, Cengage Learning, 1st Impression2012

WALCHAND INSTITUTE OF TECHNOLOGY, SOLAPUR
(AN AUTONOMOUS INSTITUTE)

Affiliated to
Punyashlok Ahilyadevi Holkar Solapur University,
Solapur

CHOICE BASED CREDIT SYSTEM (CBCS)

Structure and Syllabus
For

M. Tech-II in Electronics Engineering

W.E.F. 2021-22

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

Self Learning Course

21EEP3S11T - NETWORK AND INTERNET SECURITY

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

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

Self-Learning Course

21EEP3S21T - PROGRMMABLE SYSTEM ON CHIP (PSoC)

Examination Scheme
ESE- 60 Marks
ISE- 40 Marks

Course Outcomes:

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

1. analyze hardware/software tradeoffs, algorithms, and architectures to optimize the system based on requirements and implementation constraints.
2. understand hardware, software, and interface synthesis.
3. describe examples of applications and systems developed using a co-design approach.

SECTION-I

Unit 1: Introduction to PSoC

PSoC technology, programmable routing and interconnect, configurable analog and digital blocks, cpu sub system, families of PSoC (PSoC 1, PSoC 3, PSoC 5), difference between PSoC and conventional MCU

Unit 2: Introduction to PSoC 3/5

PSoC 3/5, architecture – block diagram, system wide resources, I/O interfaces, CPU sub system, memory organization, digital sub systems, analog sub systems

Unit 3: PSoC Design Modules

Why cypress PSoC, structure of PSoC, PSoC designer suit, limitations of PSoC, improvementsof the PSoC, PSoC sub system design, PSoC memory management

SECTION-II

Unit 4: Mixed-Signal Embedded Design

Overview of mixed-signal embedded system designs, hardware and software subsystems of mixed-signal architecture, PSoC hardware components, PSoC software components, PSoC interrupt sub system, introduction to PSoC express, system design using PSoC express

Unit 5: PSoC components

Universal digital blocks (UDB), UDB arrays and digital system interconnect (DSI), timer, counter and PWM, digital filter blocks (DFB), $\Delta\sum$ ADC topologies and circuits, programmable gain amplifiers, switched capacitor / continuous time, analog routing, flash temperature sensors, DTMF dialers, sleep timers, UART, I2 C, SPI, USB, CAN buses

Unit 6: System design using PSoC

Interfacing of temperature sensors and tachometers, SPI and UART based task communications, lower noise continuous time signal processing with PSoC, data acquisition and control system with PSoC, ultra wide-based RADAR, serial bit receiver with hardware Manchester decoder, DTMF detector, ultrasonic vehicle parking assistant, universal wide-range signal generator

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Internal Continuous Assessment (ICA)

ICA shall consist of minimum six assignments based upon above syllabus

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- **Text Books:**

1. PSoC 3, PSoC 5 Architecture technical reference manual, Cypress website
2. My First Five PSoC 3 design (e-book), Robert Asbhby, Cypress website

Reference Books:

1. Designer Guide to the Cypress PSoC, Robort Ashby, Elsevier Publications
2. Introduction to Mixed Signal Embedded Design, Alex Doboli, Springer
3. The Beginners Guide to Using PSoC Express: Mixed-Signal Microcontroller Development without Code, Oliver H. Bailey, Timelines Industries Incorporated, 2007
4. PSoC Mikrocontroller by Fredi Kruger Franzis, 2006

Web References:

1. www.cypress.com/go/psoc
2. www.cypress.com/go/trainning
3. www.cypress.com/go/support
4. www.psocdeveloper.com

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

Self-Learning Course

21EEP3S31T ADVANCED PROCESS CONTROL

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: Process dynamics and mathematical modeling

Modeling procedure, linearization, numerical solutions of ordinary differential equations, input-output models and transfer functions, dynamic behavior of typical process systems, serial & parallel structures of simple systems, multiple input-multiple output systems

Unit 2: Empirical model identification

An empirical model building procedure, process reaction curve methods, statistical modelidentification

Unit 3: Conventional feedback control system

Desired features of a PID controller, PID controller tuning for dynamic performance, stability analysis of control systems, controller tuning based on stability: Ziegler–Nichols closed loop method, digital implementation of process control, effects of digital control on stability, tuning and performance, performance of feedback control systems

Unit 4: Cascade & feed forward control

Cascade control: design criterion, cascade performance, controller algorithm tuning, implementation issues; feed forward control: design criterion, feedforward performance, controller algorithm and tuning, implementation issues; analyzing an on linear process with linear feedback control, different issues in improving nonlinear process performance

SECTION-II

Unit 5: Model based control

The structure of model-based control, modeling approaches, internal model control (IMC), the Smith predictor, model predictive control (MPC), process model-based control (PMBC), implementation guidelines

Unit 6: Nonlinear adaptive control
Adaptation of feedback parameters, programmed adaptation, switching controller gains and self-tuning controllers: model based methods, model reference adaptive control, patternrecognition controllers

Unit 7: Multivariable control
Multi-loop control, effects of interaction, performance analysis, multivariable predictive control and dynamic matrix control (DMC) approach for signal variable and multivariable,implementation issues in DMC

Unit 8: Statistical process control
Shewhart chart, interpretation of chart, distinction between automatic process control (APC) & statistical process control (SPC), implementing SPC concepts

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- **Internal Continuous Assessment(ICA):**
  ICA consist of minimum 6 tutorials based upon above curriculum

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- **Reference Books:**

  1. Process Control: Designing Processes & Control Systems for Dynamic Performance, Thom as E. Marlin, McGraw Hill International Edition.
  2. Process Control: Instrument Engineers Handbook, Editor, Bela G. Liptak, Butterworth- Heinemann Publishers.
  3. Process Dynamics: Modeling, Analysis & Simulation, B. Wayne Bequette, Prentice HallInternational Edition.
  4. Process Modeling, Simulation and Control for Chemical Engineers, William Luben, McGraw Hill International Edition.
  5. Process control systems: Application, Design and Turning,F. G. Sinskey, McGraw Hill Publication
  6. Applied Process Control by M. Chidambaram, Allied Publishers Ltd

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Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

Open Elective Course

21EEP3O11T - BUSINESS ANALYTICS

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

COURSE OUTCOMES:

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

1. Understand the concepts and methods of business analytics
2. Identify and describe complex business problems in terms of analytical models.
3. Apply appropriate analytical methods to find solutions to business problems.

SECTION-I

Unit 1: Introduction No. of Lectures 04

What is Business analytics? business analytics process, relation of ba processand organization decision making process what is data mining? data mining and related terms, big data, data science, terminologyand notation in data mining

Unit 2: Overview of the Data Mining Process No. of Lectures 04

Core Ideas in data mining, classification, prediction, association rules and recommendation systems, predictive analytics, data reduction and dimension reduction, data exploration and visualization, supervised and unsupervised learning, steps in data mining, organization of data sets

Unit 3 Data Visualization No. of Lectures 04

Uses of data visualization, basic charts: bar charts, line graphs, and scatter plots, distribution plots: box plots and histograms, heat maps: visualizing correlations and missing values multidimensional visualization: adding variables: color, size, shape, multiple panels, and animation manipulations: rescaling, aggregation and hierarchies, zooming, filtering, reference: trend lines and labels, scaling up to large datasets

Unit 4: Dimension Reduction No. of Lectures 04

Introduction, curse of dimensionality, data summaries, summary introduction, curse of dimensionality, data summaries, summary statistics, aggregation and pivot tables, correlation analysis, reducing the number of categories in categorical variables, converting a categorical variable to a numerical variable, principal components analysis

SECTION II

Unit 5: Performance Evaluation No. of Lectures 05

Evaluating predictive performance, naive benchmark: the average,prediction accuracy measures comparing training and validation performance, lift chart, judging classifier performance, benchmark: the naive rule, class separation, confusion (classification) matrix, using the validation data, accuracy measures

Unit 6: Multiple Linear Regression No. of Lectures 05

Explanatory vs. predictive modeling, estimating the regression equation and prediction, variable selection in linear regression, reducing the number of predictors

Unit 7: **Classification & Regression Trees** No. of Lectures 05

Introduction, classification trees, recursive partitioning, measures of impurity, tree structure, classifying a new record, evaluating the performance ofa classification tree, Naive Bayes classifier regression trees: prediction, measuring impurity, evaluating performance advantages and weaknesses of a tree

Unit 8: Clustering No. of Lectures 04

Introduction, feature selection for clustering: filter models and wrapper models, k-means algorithm

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2. **Internal Continuous Assessment (ICA):**
   ICA consist of minimum 6 tutorials based upon above curriculum

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3. **Reference Books**

1. Data Mining for Business Analytics - Concepts, Techniques, And Applications InR, Galit Shmueli Peter C. Bruce Inbal Yahav Nitin R.Patel Kenneth C. Lichtendahl, Jr., Wiley Publication https://edu.kpfu.ru/pluginfile.php/274079/mod_resource/content/2/DatMiningBus Analytics.pdf
2. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing andPresenting Data by EMC Education Services(2015)
3. Business Analytics – Principles, Concepts and Applications, Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson Education Limited
4. Data Mining : The Textbook, Charu C. Agrawal, SpringerPublications

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Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

Open Elective Course

21EEP3O21T - OPERATION RESERACH

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

COURSE OUTCOMES :

At the end of this course the students shall be able to

1. Formulate the real life managerial problems in an appropriate mathematical model
2. Provide the optimum solution to the real life problems within the constraints.
3. Use network techniques in project management
4. To evaluate alternative courses of actions in actual decision making under conditions of uncertainty using Simulation techniques.

SECTION-I

Unit 1: No. of Lectures 05

OR Models, model formulation, Linear Programming models, Graphical solution, Simplextechniques, Two Phase method

Unit 2: No. of Lectures 05

Duality theory - Properties of Primal and Dual Optimal Solutions, Duality Simplex method, Shadow Price- Sensitivity analysis

Unit 3: No. of Lectures 05

Simulation Techniques - Need of Simulation techniques , Monto-Carlo Simulation, random number concept, applications of Simulation technique

Unit 4: No. of Lectures 03

Queuing Models - Introduction, Structure of queuing system, Terminology (Kendal‘s Notations) and Applications. Queuing Model M/M/1: /FIFO,

SECTION II

Unit 5: No. of Lectures 05

Inventory control - Inventory costs, Economic order quantity, deterministic models with or without shortages - probabilistic models - Price break model, Selective Inventory management techniques.

Unit 6: No. of Lectures 05

Replacement analysis - Replacement models - Replacement policy for items considering change in money value with time - Individual replacement policy - Group replacement policy

Unit 7: No. of Lectures 05

Network flow models - Minimal Spanning Tree problems -Shortest route probems - Dijiktra's algorithm - Maximal Flow problem

Unit 8 No. of Lectures 05

PERT and CPM Networks - floats and applications - Network crashing - Cost optimization - Resource allocation and scheduling

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4. **Internal Continuous Assessment (ICA):**
   ICA consist of minimum 6 tutorials based upon above curriculum

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5. **Reference Books**
   1. Operations Research by Hillier and Lieberman TMGH
   2. HamdyTaha, "Operations Research – An Introduction", 7th edition PHI (2003)
   3. S. D. Sharma, "Operation Research", Kedarnath and Rannalt Pub.
   4. Hira and Gupta, "Operation Research", S. Chand and Co.
   5. N. D. Vohra, "Quantitative Techniques in Management", TMGH
   6. Shrinath L.S.: PERT & CPM –Affiliate East West Press
   7. Anand Sharma " Quantitative Techniques for decision making" Himalaya publishinghouse
   8. Billy E. Gillet - " Introduction to Operations Research" TMGH
   9. R.Panneerselvan " Operations Research" PHI

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

Open Elective Course

21EEP3O31T - COST MANAGEMENT OF ENGINEERING PROJECTS

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

COURSE OUTCOMES: -

At the end of this course the students shall be able to -

1. Analyze various elements of the cost associated with the engineering project
2. Measure and assess the performance of engineering projects
3. Control the cost of project
4. carry out value analysis in an engineering project

SECTION-I

Unit 1: Cost No. of Lectures 08

Cost Elements - pricing , materials ,labor , engineering , equipment, parts and tools; economic costs, Cost-Analysis: direct cost, indirect cost, overhead, allowance, contingency

Unit 2: Cost Estimating No. of Lectures 07

Estimating models; parametric estimating- modular estimating, parametric model, analogous estimating- ratio estimating, the three-quarters rule, the square root rule, two-thirds rule, range estimating

Unit 3: Energy Storage No. of Lectures 07

Progress & cost control: progress measurement and earned values; earned value for variable budgets; tracking cost and schedule performance

SECTION-II

Unit 4: Solar Photovoltaic System No. of Lectures 08

Cost Management: causes of change, feed forward techniques, impact of schedule on cost, lifecycle costs, impact of project risk, integrated cost management programme

Unit 5: Value Management No. of Lectures 07

Concept of value, dimensions and measures of value, overview of value management, definition' scope, key principles of VM, key attributes of VM, value management terms , need for value management in projects , the value management approach ,cross-functional framework ' use of functions, structured decision process, the VM Process, benefits of value management, other VM requirements, relationship between project value and risk, value management as an aid to risk assessment

Unit 6: Value Analysis No. of Lectures 07

Earned value management for assessing project performance, earned value management, earned value management model, fundamentals of earned value, EVM terminology, relevancy of earned value management, conducting an earned value analysis, performing an earned value assessment, managing a portfolio of projects with earned value management, important issues in the effective use of earned value management, integrating cost and value in projects

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a. Internal Continuous Assessment

ISE shall be based upon minimum 5 assignments and at least one case study.

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b. Reference Book:

1. Project Estimating and Cost Management By Parivs F. Rad PhD,PMP
2. Project Cost Management guide from PMBOK 5thedition
3. Project Scheduling and Cost Control: Planning, Monitoring and Controlling theBaseline byJamesTaylor
4. Systems Life Cycle Costing: Economic Analysis, Estimation, and Management,John V. Farr, Draft Textbook, Version1.0.
5. COST AND VALUE MANAGEMENT IN PROJECTS Ray R. Venkataraman andJeffrey K. Pinto John Wiley & Sons, Inc Inc., Hoboken, NewJersey
6. American Association of Cost Engineers, “SKILLS AND KNOWLEDGE OFCOST ENGINEERING”,1996
7. Cost Management of Capital Projects (Cost Engineering) by Kurt Heinze –International Edition, August 28,1996

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

Open Elective Course

21EEP3O42T - NON-CONVENTIONAL ENERGY

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

COURSE OUTCOMES: -

At the end of this course the students shall be able to -

1. Analyze various elements of the cost associated with the engineering project
2. Measure and assess the performance of engineering projects
3. Control the cost of project
4. carry out value analysis in an engineering project

SECTION-I

Unit 1: Energy Resources No. of Lectures 05

Energy, economy and social development, Indian scenario, conventional energy sources- electric, nuclear, hydroelectric, environmental aspects, renewable energy sources, comparison between conventional and non conventional energy sources

Unit 2: Energy Conservation and Efficiency No. of Lectures 05 Energy efficiency, conservation, energy audit, cogeneration, schemes to promote conservation and efficiency, new technologies, energy conservation opportunities, distributed energy systems

Unit 3: Energy Storage No. of Lectures 03

Introduction, necessity, specifications of energy storage devices, methods of energy storage

Unit 4: Solar Thermal Energy No. of Lectures 05

Introduction to solar radiation and energy, solar thermal energy collectors, solar thermal systems- water heater, distillation, power plant, cookers, kilns, air conditioning, greenhouse, furnace, dryer, industrial heating

SECTION-II

Unit 5: Solar Photovoltaic System No. of Lectures 05

Solar cell fundamentals, characteristics, design consideration, classification, module and arrays, maximizing the output and load matching, balance of system, applications

Unit 6: Wind Energy No. of Lectures 05

Fundamentals, wind energy estimation, turbines: types, construction and characteristics, modes of power generation, wind energy conversion system, wind – diesel hybrid system, wind energy storage, environmental aspects, applications

Unit 7: Biomass Energy No. of Lectures 05

Fundamentals, resources, conversion technologies, urban waste to energy conversion, gasification, ethanol, biogas

Unit 8: Emerging Technologies No. of Lectures 04

Fuel cell, classification, comparisons, fuel for fuel cells, efficiency and VI characteristics, fuelcell power plant, hydrogen as energy carrier

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6. **Internal Continuous Assessment (ICA):**
   ICA consist of minimum 6 tutorials based upon above curriculum

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Reference Books

1. Non-Conventional Energy Resources, B H Khan, McGraw Hill Education, Third Edition
2. Renewable Energy Sauces and Emerging Technologies, D P Kothari, K C Singal, Rakesh Ranjan, PHILearning Pvt. Ltd., Second Edition

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Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

21EEP3SM3L - - Dissertation Phase – I : Synopsis Submission Seminar

Teaching Scheme	**Examination Scheme**
Practical –4Hours/week, 3 Credits	**ICA**- 100 Marks

Phase I Synopsis Submission Seminar (ISE):

A student shall be expected to carry out intensive literature survey for a period of about two months in the field of interest and to select a topic for his/her dissertation in consultation with the faculty adviser assigned. The student shall then submit a report and deliver a seminar on the problem chosen by him/her to the panel of three departmental PG recognized faculty members. It shall be expected that a student justifies the gravity and the relevance of the problem through his/her seminar. This shall be for the approval of synopsis.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

21EEP3SM4L - Dissertation Phase – II : ICA

Examination Scheme

Credits- 3

ICA- 100 Marks

Phase II Term Work (ICA) :

Phase II evaluation consists of term-work evaluation (ICA) based on the efforts put in by the student to carry out his/her work & the results obtained thereof.

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-III

21EEP3SM5L - Dissertation Phase – II : Progress Seminar

Examination Scheme
Credits- 3
ICA- 100 Marks

Phase II Progress Seminar Presentation (ESE):

The End Semester Evaluation (ESE) consisting of submission of progress report and presentation of progress seminar followed by demonstration before a panel three departmental PG recognizedfaculty members.

Guidelines for Assessment of Dissertation Phase I & II

1. Quality of literature survey and novelty in the problem
2. Clarity of problem definition and feasibility of problem solution
3. Clarity of objective and scope

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-IV

21EEP4SM1L - Dissertation Phase – III : Progress Seminar

Teaching Scheme	**Examination Scheme**
Practical: 4 Hrs/Week	**Credits: 3**
	ICA: 100 marks

Phase III Term Work and Progress Seminar Presentation and report (ISE):

The student who has cleared his/her Phase II evaluation shall submit a report and present the statusof work carried out on the dissertation, after 8-10 weeks of Phase II ESE, to three departmental PG recognized faculty members.

Guidelines for Assessment of Dissertation Phase III

1. Quality of work attempted
2. Presentation skills
3. Relevance to the specialization

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-IV

21EEP4SM2L - Dissertation Phase – IV

Teaching Scheme
Practical: 2 Hrs/Week

Examination Scheme
Credits: 6
ICA: 200 marks

After completing the dissertation work to the satisfaction, the student shall submit the dissertation report in the prescribed format to the university.

Guidelines for Assessment of Dissertation Phase IV Term work

1. Fulfillment of objectives
2. Validation of results
3. Quality of Written Presentation

- *Students shall publish at least one paper based on his/her work in reputed International Journal (desirably in Referred Journal)*

Walchand Institute of Technology

M. Tech. (Electronics Engineering) Semester-IV

21EEP4SM3L - Final Presentation and Viva-voce

Examination Scheme
Credits: 6
ESE: 200 marks

Final Presentation and Viva-voce (ESE):

Open defense of the student on his/her dissertation shall be arranged by the university. This defense shall be in front of the panel of examiners as appointed by university authority.