KANNUR UNIVERSITY

SYLLABUS FOR M.Sc ELECTRONICS

(Semester III & IV)

UNDER CHOICE BASED CREDIT SEMESTER SYSTEM (CBCSS) FOR AFFILIATED COLLEGES

(OBE – Outcome Based Education)

2023 Admission onwards

SEMESTER - III

ADVANCED DIGITAL IMAGE PROCESSING

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3	MSELE03C09	4	0	0	4	3

Course Outcomes:

After Completing this course students should be able to:
CO1. Analyze general terminology of digital image processing.

CO2. Examine various types of images, intensity transformations and spatial filtering.

CO3. Develop Fourier transform for image processing in frequency domain.

CO4. Evaluate the methodologies for image segmentation, restoration etc.

CO5. Implement image process and analysis algorithms.

CO6. Apply image processing algorithms in practical applications.

Module I: Digital image fundamentals
Fundamental steps in DIP, Components of digital image processing system, elements of visual perception, Structure of the human eye, Image formation in the eye, Brightness adaptation and discrimination, light, Image sensing and acquisition, Image formation model, definition and some properties of two dimensional system, Sampling and quantization of images, Two dimensional sampling theory, representation of digital image, Spatial and gray level resolution, Zooming and shrinking, some basic relationships between pixels.

Module II: Image Enhancement in spatial domain
Gray level transformations, Piecewise linear transformation, Histogram processing, enhancement using Arithmetic/ logic operations, Basics of spatial filtering, Smoothing and sharpening spatial filters, Use of first order and second order derivative in enhancement.
Image Enhancement in frequency domain
Two dimensional Fourier transform, properties of frequency domain, correspondence between filtering in spatial and frequency domain, Smoothing and Sharpening frequency domain filters, Homomorphic filtering

Module III: Image Restoration
Model of image degradation/ Restoration process, Noise models, Noise reduction in spatial domain and frequency domain, Inverse filtering, Wiener filtering. Image Segmentation, Detection of discontinuities (point, line edge), Edge linking and boundary detection, Thresholding, Basic global thresholding, Adaptive thresholding, Region based segmentation, region growing, splitting and merging.

Module IV: Image compression
Fundamentals of Image compression, Types of redundancy. Image compression model, concepts of information theory, Fundamental coding theorems, Estimation of entropy, Variable length coding, Huffman coding, Near optimal variable length coding, Arithmetic coding, LWZ coding, Bit plane coding, constant area coding, run length coding, Lossless predictive coding, image compression standards (JPEG, JPEG2000)

Text Books
1. R.C.Gonzalas and R.E.Woods: Digital Image Processing, Prentice Hall, 3rd Ed

Reference Books

1. A.K.Jain, Fundamentals of Digital Image Processing, Prentice Hall.
2. S.Sridhar, Digital Image Processing, Oxford University Press.

Continious Evaluation Mark Distribution	
Written Test	Assignment
6	6

Mark distribution

Unit	Mark
I	10
II	19
III	19
IV	28
Total Mark	76

Pattern of Question

Part	Total No. of Questions	Marks per Question	Questions to be answered	Total Mark
A	6	1	6	6
B	5	5	3	15
C	5	9	3	27
			Total	48

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3	MSELE03C10	4	0	0	4	3

Course Outcomes:

After the completion of the course, students should be able to
CO1: Understand the basic concepts of Bayesian theory and normal densities
CO2: Implement different classification algorithms used in machine learning
CO3: Implement clustering and component analysis techniques
CO4: Design and implement deep learning architectures for solving real life problems
CO5: Combine the evidence from two or more models/methods for designing a system

Module I: **Bayesian Decision Theory and Normal Distribution:**
Machine perception - feature extraction - classification, clustering, linear and logistic regression – Types of learning - Bayesian decision theory - classifiers, discriminant functions, and decision surfaces -univariate and multivariate normal densities - Bayesian belief networks.

Module II: **Classification Algorithms:**
Perceptron and backpropagation neural network - k-nearest neighbor rule. Support vector machine: multicategory generalizations – Regression Decision trees: classification and regression tree – random forest.

Module III: **Component Analysis and Clustering Algorithms:**
Principal component analysis - Linear discriminant analysis - Independent component analysis. K-means clustering - fuzzy k-means clustering – Expectation-maximization algorithm-Gaussian mixture models –auto associative neural network.

Supervised and Unsupervised:
Convolution neural network (CNN) -Layers in CNN - CNN architectures. Recurrent Neural Network -Applications: Speech-to-text conversion-image classification time series prediction.

Module IV: **Combining Multiple Learners:**
Generating diverse learners - model combination schemes - voting - error-correcting output codes -bagging - boosting - mixture of experts revisited - stacked generalization - fine-tuning an ensemble – cascading

Text Books

1. R. O. Duda, E. Hart, and D.G. Stork, “Pattern Classification”, Second Edition, John Wiley & Sons, Singapore, 2012.
2. Francois Chollet, “Deep Learning with Python”, Manning Publications, Shelter Island, New York, 2018.

Reference Books

1. Ethem Alpaydin, “Introduction to Machine Learning”, 3rd Edition, MIT Press, 2014.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2006.
3. Kevin P. Murphy, “Machine Learning: A Probabilistic Perspective”, MIT Press, 2012.
4. Navin Kumar Manaswi, “Deep Learning with Applications using Python”, A press, New York, 2018.

Continious Evaluation Mark Distribution	
Written Test	Assignment
6	6

Mark distribution

Unit	Mark
I	19
II	19
III	10
IV	28
Total Mark	76

Pattern of Question

Part	Total No. of Questions	Marks per Question	Questions to be answered	Total Mark
A	6	1	6	6
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INDUSTRIAL ELECTRONICS

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3	MSELE03E09	4	0	0	4	3

Course Outcomes:

CO1: Understand the operation of components used in electronics industry
CO2: Explain the operation of industrial power supply systems
CO3: Understand the Motor control techniques
CO4: Explain the operation of various electrical and electronic systems in industry

Module I: Opto- electronics-Photo electric theory- Energy of photo electrons –Photo devices photo emissive cells – Photo conductive cells – photo Voltaic cells – photo multipliers – photo activated SCR –Photo FETs –photo resistive devices – LEDs- liquid crystal displays-optically coupled resonators Other Devices : static circuit breakers –Over voltage protection – automatic battery charges –AC and Dc switches, flashers[10Hr]

Module II: Regulated Power supplies: DC voltage regulators – Different types of series Voltage regulators-polyphase rectifiers – Voltage and current regulations-Transformer utility factors – Rectifier performance. [10Hr]

Module III: Control of Motors and Generators: DC motor characteristics-Automatic regulation of speed and over load contol by SCR and Miscellaneous methods – Electronic contol for reversing motors-Instability of AC motors – Variable speed induction motors – Torque – speed characteristics – Inverters for driving the motor- Speed control of AC motors –Synchronous motor control. [14Hr]

Module IV: Resistance Welding and Induction Heating: Resistance welding process –Circuit for AC welding – Types of resistance welding -Control processes Linear contractor –Thyratron – Heat control - Sequence timer Synchronous weld control-Energy storage welding - polyphase welding –Induction heating :Principle and theory of induction heating –merits and applications –High frequency power source for induction heating
Measurement of Non Electrical Quantities: Pressure measurements- Mechanical pressure transducer – Measurements of displacement –level , flow, vacuum ,PH and thermal conductivity –Chromatography-Leak detection -Measurement of thickness and humidity. [14Hr]

Text Books:
1 Industrial and Power Electronics, Haigh C Rai ,Umesh Publications, New Delhi, IV Edn. 1992

2 Industrial Electronics,G.K.MithalL,Khanna Publishers, New Delhi, 14 edition 1992
3 Industrial Electronics ,Noel Morries TMH 2nd Edition 1991
4 Modern Industrial Electronics ,Schuler & MC Name MACMILLAN International edition 1993

Continious Evaluation Mark Distribution	
Written Test	Assignment
6	6

Mark distribution

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MODERN COMMUNICATION SYSTEMS

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3	MSELE03E10	4	0	0	4	3

Course Outcomes:

CO1: Understand various modern communication systems
CO2: Understand the concept of cell design
CO3: Explain system capacity in mobile network
CO4: Explain intelligent cell concept

Module I:Evolution of mobile radio communications, examples of wireless comm. systems, paging systems, Cordless telephone systems, comparison of various wireless systems. Modern Wireless Communication Systems: Second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks, Blue tooth and Personal Area networks[14Hr]

Module II: Spectrum Allocation, basic Cellular Systems, performance Criteria, Operation of cellular systems, analog cellular systems, digital Cellular Systems. Cellular System Design Fundamentals: Frequency Reuse, channel assignment strategies, handoff Strategies, Interference and system capacity, tracking and grade off service, improving coverage and capacity [14Hr]

Module III: Introduction to Multiple Access, FDMA, TDMA, Spread Spectrum multiple Access, space division multiple access, packet ratio, capacity of a cellular systems. [10Hr]

Module IV: Intelligent cell concept, applications of intelligent micro-cell Systems, in-Building Communication, CDMA cellular Radio Networks.[10Hr]

Text Books:
1. Wireless Communications: Theodore S. Rappaport; Pearsons.
2. Mobile Cellular Telecommunication: W.C.Y.Lee; McGraw Hill
3. Mobile Communications: Jochen Schiller; Pearson

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MICROWAVE INTEGRATED CIRCUITS AND ANTENNAS

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3	MSELE03E11	4	0	0	4	3

Course Outcomes:

CO1: Understand working principles of planar transmission lines
CO2: Design a microstrip line for a particular characteristic impedance
CO3: Understand MMIC technology
CO4: Understand Wire and printed antenna technologies

Module I: Planar Transmission lines: , Strip line, Microstrip line, coplanar line, quasi – static models of microstrip line, effective permittivity, characteristic impedance, dielectric and conductor losses, substrates for MIC, slot line and coplanar waveguide.[10Hr]

Module II: Microstrip Passive Components: Discontinuities in Microstrip lines and coplanar lines, step, bent, T-junction, Hybrid line coupler, parallel coupled line and directional couplers, Even and odd mode analysis, Branch line couplers, impedance transformers.[14Hr]

Module III: MMIC Technology – Thick film and Thin film technology. Hybrid MIC's. Monolithic MIC technology, fabrication process, testing methods, encapsulation and mounting of devices. [10Hr]

Module IV. Antenna structures: Wire antennas and Aperture antennas, dipoles, loops, helical antenna, horns, lens and reflector antennas, log periodic antenna.
Printed antennas: Rectangular and circular patch antenna design, Feeding techniques for microstrip antennas, Printed antenna arrays, Band width enhancement techniques. [14Hr]

Text Books:

1. Gupta K. C., and Amarjit Singh, Microwave Integrated circuits, Wiley Eastern,1974.
2. Bharathi Bhat and S. K. Koul, "Stripline-like transmission lines for microwave integrated circuits, New age international, 2007. Constantine Balanis A., Antenna Theory-Analysis and Design ,John wiley, 2005
3. T. C. Edwards ,"Foundation for Microstrip Circuit Design ," Jone Willy & sons. 2000
4. E. H. Fooks & R. A. Zakarevicuis," Microwave Engineering using Microstrip Circuits." Prentice Hall. Sakti 2000
5. Hoffman R. K., "Handbook of Microwave Integrated Circuits", Artech House, Boston, 1987.
6. Bahl I. J., and Bhartia, Microstrip Antennas, Artech House, 1982

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Software Development frameworks for Mobile Application

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3	MSELE03O01	4	0	0	4	3

Course Outcomes:

CO1: Compare and contrast architectures of Android, iOS, and Windows mobile platforms.
CO2: Understand the origin and evolution of the web, including TCP/IP and HTTP protocols.
CO3: Understand the architecture of Flutter applications, including widgets, gestures, and state management.
CO4: Apply Flutter to develop mobile Apps

Module I: Introduction to Mobile architectures
Mobile OS Architectures-Kernel structure-Comparing and Contrasting architectures of Android, iOS and Windows, Darwin vs. Linux vs. Windows, Runtime (Objective-C vs. Dalvik vs. WinRT), Approaches to power management and Security . Mobile Application Architectures: Client-Server-Connection Types-Synchronization- Architectural Patterns-Architectural Design Tenets. Mobile Infrastructure: Mobile Device Types-Mobile Device Components-Connection Methods. Mobile Client Applications: Thin Client-Fat Client-Web Page Hosting-Best Practices, Issues- Existing Web Architectures and Back-End Systems Security Issues.

Module II: Introduction to Web
Introduction to Web: In Perspective, Origin. Before the web: TCP/IP. Birth of WWW: HTTP. Web Servers, Web Browsers. HTML & its Roots, XML & Applications, Dynamic Web Applications, Approaches to web application development. Internet Programming: IP: Packet Format, Addressing, Addressing Class, Routing, Protocols -- Network: ARP, ICMP, DHCP, Transport: TCP, UDP. IPv6, Wireless IP, FTP, SNMP, SMTP. Domain: DNS, DDNS, NIS, LDAP. File: FTP, SFTP, TFTP. Mail: SMTP, MIME, POP, IMAP. WAP, VoIP, IPTV. JSON: Introduction, Datatypes, Objects, Schema, Encode and Decode. JSON with Python.

Module III: Introduction to Flutter
Features of Flutter- Advantages of Flutter- Disadvantages of Flutter. Flutter Installation-Installation in Windows- Installation in Mac OS- Creating Simple Application in Android Studio - Architecture of Flutter Applications . Widgets- Gestures- Concept of State-Layers- Introduction to Dart Programming-Variables and Data types- Decision Making and Loops. Functions- Object Oriented Programming. Introduction to Widgets- Widget Build Visualization

Module IV: Flutter Layouts
Type of Layout Widgets- Single Child Widgets- Multiple Child Widgets- Advanced Layout Application-Introduction to Gestures- Statement Management in Flutter. Ephemeral State Management-Application State - scoped model- Navigation and Routing.

Text Books
1. Valentino Lee, Heather Schneider, Robbie Schell, Mobile Applications: Architecture, Design, and Development, Prentice Hall, April 2004, ISBN-13: 978-0131172630.
2. Sajal Kumar Das, Mobile Handset Design, John Wiley & Sons, ISBN- 13:9781118684573
3. Bill Evjenet and Kent Sharkey, Professional XML, Wrox, I Edn, 2007, ISBN19 13:9780471777779
4. Leonard Richardson and Sam Ruby, RESTful Web Services: Web services for the real world, O'Reilly Media, I Edn, May 2007, ISBN-13: 978-0596529260
5. B V Kumar and S.V Subrahmanya; Web Services: An Introduction, McGraw Hill Education (India) Private Limited, 2 edn (2012), ISBN-13: 978-1259002762

6. Michael Rosen, Boris Lublinsky, Kevin T. Smith, and Marc J. Balcer, Applied SOA: Service-Oriented Architecture and Design Strategies, Wiley (Kindle Edn), (2010), ISBN- 13: 978-1118079799
7. Sam Key, XML Programming Success in a Day: Beginner's Guide to Fast, Easy, and Efficient Learning of XML Programming, CreateSpace Independent Publishing Platform, July 2015, ISBN-13: 978-1515212119
8. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)
9.Mirco Marchetti and Alessandro Bogliolo, Mobile Architecture and Operating Systems: A Survey of Mobile Platforms
10. Reto Meier, Professional Android 4 Application Development
11. Sayed Y. Hashimi and Satya Komatineni, Mobile Application Development: Architecture, Design, and Implementation
12. Ivo Balbaert, Learning Dart: Build Enterprise Applications with Google's Dart
13. Albert Nogueras, Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter and Dart
14.Eric Windmill, Flutter in Action

Continuous Evaluation Mark Distribution	
Written Test	Assignment
6	6

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Foundations of Data Science

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3	MSELE03O02	4	0	0	4	3

Course Outcomes:

CO1: Understand the fundamentals of data science and big data.
CO2: Understand Basic Machine Learning Algorithms
CO3: Apply data visualization using Python.
CO4: Apply data analysis using Python.

Module I: Introduction to Data Science
Big Data and Data Science – Datafication – Current landscape of perspectives – Skill sets needed; Matrices – Matrices to represent relations between data, and necessary linear algebraic operations on matrices - Approximately representing matrices by decompositions (SVD and PCA); Statistics: Descriptive Statistics: distributions and probability – Statistical Inference: Populations and samples – Statistical modeling – probability distributions – fitting a model – Hypothesis Testing – Intro to R and Python.

Module II: Data processing
Data cleaning – data integration – Data Reduction Data Transformation and Data Discretization.Evaluation of classification methods – Confusion matrix, Students T-tests and ROC curves-Exploratory Data Analysis – Basic tools (plots, graphs and summary statistics) of EDA, Clustering: Choosing distance metrics – Different clustering approaches – hierarchical agglomerative clustering, k-means (Lloyd's algorithm), DBSCAN .

Module III: Basic Machine Learning Algorithms
Association Rule mining – Linear Regression- Logistic Regression – Classifiers – k-Nearest Neighbors (k-NN), k-means -Decision tree – Naive Bayes- Ensemble Methods – Random Forest. Feature Generation and Feature Selection – Feature Selection algorithms – Filters; Wrappers; Decision Trees; Random Forests.

Module IV: Data Visualization and analysis using Python
Data Visualization : Bar charts, grouped bar charts, stacked bar charts, histogram, line charts , Pie charts, box plots, scatter plots, density plots, strip charts, QQ plots
Probability distributions - binomial, Poisson, normal, exponential, chi-squared, student's t, F distribution and Uniform distribution, Z-Test, one sample Z-Test, two sample Z-Test, F-Test, Student's t-Test
Tests of Hypothesis - population mean with known variance, population with unknown variance, population proportion, goodness of fit, chi-square test

Text Books
Cathy O'Neil and Rachel Schutt, " Doing Data Science, Straight Talk From The Frontline", O'Reilly, 2014.
Jiawei Han, Micheline Kamber and Jian Pei, " Data Mining: Concepts and Techniques", Third Edition. ISBN 0123814790, 2011.
Mohammed J. Zaki and Wagner Miera Jr, "Data Mining and Analysis: Fundamental Concepts and Algorithms", Cambridge University Press, 2014.
References
Matt Harrison, "Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization , O'Reilly, 2016.
Joel Grus, "Data Science from Scratch: First Principles with Python", O'Reilly Media, 2015.
Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, 2012.

Continuous Evaluation Mark Distribution	
Written Test	Assignment
6	6

Mark distribution

Unit	Mark
I	10
II	19
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IV	28
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Micro Electro Mechanical System (MEMS)

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3	MSELE03O03	4	0	0	4	3

Course Outcomes:

CO1: Understand the working principles of micro sensors and actuators
CO2: Understand the application of scaling laws in the design of micro systems
CO3: Understand the typical materials used for fabrication of micro systems
CO4: Understand the principles of standard micro fabrication techniques

Module I: MEMS and Microsystems: Applications – Multidisciplinary nature of MEMS – principles and examples of Micro sensors and micro actuators – micro accelerometer –comb drives - Micro grippers – micro motors, micro valves, micro pumps, Shape Memory Alloys.
Review of Mechanical concepts: Stress, Strain, Modulus of Elasticity, yield strength, ultimate strength – General stress strain relations – compliance matrix. Overview of commonly used mechanical structures in MEMS - Beams, Cantilevers, Plates, Diaphragms – Typical applications[14Hr]

Module II: Flexural beams: Types of Beams, longitudinal strain under pure bending – Deflection of beams – Spring constant of cantilever – Intrinsic stresses.
Actuation and Sensing techniques : Thermal sensors and actuators, Electrostatic sensors and actuators , Piezoelectric sensors and actuators, magnetic actuators[14Hr]

Module III: Scaling laws in miniaturization - scaling in geometry, scaling in rigid body dynamics, Trimmer force scaling vector, scaling in electrostatic and electromagnetic forces, scaling in electricity and fluidic dynamics, scaling in heat conducting and heat convection.
Materials for MEMS – Silicon – Silicon compounds – Silicon Nitride, Silicon Dioxide, Silicon carbide, Poly Silicon, GaAs , Silicon Piezo resistors [10Hr]

Module IV. Overview of Micro manufacturing – Bulk micro manufacturing, Surface micro machining , LIGA process –Microstereo lithography
Micro system Packaging: general considerations in packaging design – Levels of Micro system packaging
Bonding techniques for MEMS : Surface bonding , Anodic bonding , Silicon - on - Insulator , wire bonding , Sealing – Assembly of micro systems [10Hr]

Text Books:
1. Chang Liu, Foundations of MEMS, Pearson 2012
2. Tai-Ran Hsu, MEMS and Microsystems Design and Manufacture, TMH, 2002
3. Chang C Y and Sze S. M., VLSI Technology, McGraw-Hill, New York, 2000
4. Julian W Gardner, Microsensors: Principles and Applications, John Wiley & Sons, 1994
5. Mark Madou, Fundamentals of Micro fabrication, CRC Press, New York, 1997
6. Stephen D. Senturia, Microsystem design, Springer (India), 2006.
7. Thomas B. Jones, Electromechanics and MEMS, Cambridge University Press, 2001

Continious Evaluation Mark Distribution	
Written Test	Assignment
6	6

Mark distribution

Unit	Mark

I	10
II	19
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IV	28
Total Mark	76

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Part	Total No. of Questions	Marks per Question	Questions to be answered	Total Mark
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			Total	48

IMAGE PROCESSING & MACHINE LEARNING LAB

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3 & 4	MSELEO3Cl1	0	0	8	4	5

ADVANCED DIGITAL IMAGE PROCESSING LAB EXPERIMENTS

After the completion of the course, students should be able to
CO1: Analyze the problem and convert the image into the desired domain for analysis.
CO2: Analyze the need of image enhancement in spatial and Fourier domain.
CO3: Frame the design according to the type of image domain.
CO4: Integrate various algorithms to find a best fit solution as per the problem among various image processing techniques.
CO5: Develop image processing applications for solving real world problems

1. Simulation and Display of an Image, Negative of an Image (Binary & Gray Scale)

2. Implementation of Relationships between Pixels

3. Implementation of Transformations of an Image

4. Contrast stretching of a low contrast image, Histogram, and Histogram Equalization

5. Display of bit planes of an Image

6. Display of FFT(1-D & 2-D) of an image

7. Computation of Mean, Standard Deviation, Correlation coefficient of the given Image

8. Implementation of Image Smoothening Filters(Mean and Median filtering of an Image)

9. Implementation of image sharpening filters and Edge Detection using Gradient Filters

10. Image Compression by DCT,DPCM, HUFFMAN coding

11. Implementation of image restoring techniques

12. Implementation of Image Intensity slicing technique for image enhancement

13. Canny edge detection Algorithm

MACHINE LEARNING LAB EXPERIMENTS

Course Outcomes

After the completion of the course, students should be able to

CO1: Understand the mathematical and statistical prospective of machine learning algorithms through python programming
CO2: Apply structured thinking to unstructured problems
CO3: Design and evaluate the unsupervised models through python in built functions.
CO4: Design and apply various reinforcement algorithms to solve real time complex problems.
CO5: Develop an appreciation for what is involved in learning from data

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample

4. Build an Artificial Neural Network by implementing the Back-propagation algorithm and test the same using appropriate data sets

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API

8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program

9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points.

End Semester Evaluation:

There will be two questions for the lab examination (1 question from Image Processing and 1 question from Machine Learning)

Continious Evaluation Mark Distribution	
Lab involvement	Observation book with signature from the teacher
5	15

PROJECT

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
3	MSELEO3C12	1	0	0	10	3
4		1	0	14		

Guidelines:

1. The project is an individual activity and should have a project guide for each student.
2. Evaluation committee comprises of project guide and Four other members from the Department.
3. Continious Evaluation comprises of following components:
    a) Interim presentations (2 nos)
    c) Internal viva
4. The project can be done at industry. In that case an internal guide and external guide have to guide the student. Attendance data of the student must be maintained by the internal guide

Presentation 1: Literature reveiw & Block level presentation
Presentation 2: Working model

Deliverables:
1. Project Report
2. Working prototype/programme/Simulation Result
3. Presentation of the project using ICT

Continious Evaluation Mark Distribution		
Viva	Presentation (interim presetnation 1 &2)	Total
10	10	20

End Semester Exam Mark Distribution					
Viva	Methodology and Implementation	Presentation	Working prototype/programme/simulation result	Preparation of manuscript in IEEE format suitable for international/national conference publication	Total
40	10	10	10	10	80

SEMESTER - IV

INTERNET OF THINGS

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
4	MSELE04C13	4	1	0	5	3

Course Outcomes:

CO1: Explain the function blocks, three-layer model and five-layer model of IoT
CO2: Develop an understanding of various communication network: HAN, NAN, FAN, WAN and WSNs
CO3: Describe privacy, security and design related challenges of IoT
CO4: Describe IoT applications in the field of Electrical Engineering

Module I: Introduction to Internet of Things: IoT: Definition and importance, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Three-layer and Five-layer model of IoT. IoT Communication network: Architecture of IoT, Communication network: Home Area Network (HAN), Neighborhood Area Network (NAN), Field Area Network (FAN), Wide Area Network (WAN), Wireless Sensor Networks (WSNs)[14Hr]

Module II: IoT Protocols:IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRa WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT. [14Hr]

Module III: IoT Sensors/Actuators and IoT Challenges: IoT: Sensor Technology, Mobile Phone Based Sensors, Medical Sensors, Neural Sensors, Environmental and Chemical Sensors, Radio Frequency Identification, Actuators, IoT Challenges: Design challenges, Development challenges, Privacy and Security challenges, Data Management and Other challenges. [10Hr]

Module IV. Application of IoT: Smart Homes: Smart Appliances, Security and Safety. Smart Energy: Smart Meters, Automatic Meter Reading (AMR), Advanced Metering Infrastructure (AMI), Real Time Pricing, Smart grid, Smart Cities: Smart Vehicles, Smart Lighting and Smart Parking [10Hr]

Text Books:

1. Internet of Things By Rajkamal, Tata McGraw Hill publication
2. Internet of things(A-Hand-on-Approach) By Vijay Madisetti and ArshdeepBahga1st Edition, Universal Press
3. The Internet of Things: Connecting Objects By Hakima Chaouchi Wiley publication
4. The Internet of Things – Key applications and Protocols By Olivier Hersent, David Boswarthick, Omar Elloumi,, Wiley, 2012

Continious Evaluation Mark Distribution	
Written Test	Assignment
6	6

Mark distribution

Unit	Mark
I	10
II	19
III	19
IV	28
Total Mark	76

Pattern of Question

Part	Total No. of Questions	Marks per Question	Questions to be answered	Total Mark
A	6	1	6	6
B	5	5	3	15
C	5	9	3	27
			Total	48

ADVANCED MICROCONTROLLERS

Semester	Course Code	Hours per Week			Credit	Exam Hrs
		L	T	P		
4	MSELE04C14	4	1	0	5	3

Course Outcomes:

CO1: Describe the architecture and features of Atmega16 microcontroller.
CO2: Describe the architecture and features of ARM Cortex-M4
CO3: Describe the architecture and features of MCU TM4C123GH6PM
CO4: Develop Programs for Atmega16 and TM4C123GH6PM

Module I: Introduction to AVR and ARM
Introduction to AVR architecture, Comparison of AVR with other CISC & RISC based systems and Microprocessors, AVR family Categories and importance (AT tiny/ ATmega/ Xmega)
Background of ARM Architecture, Architecture Versions, Processor Naming,Instruction Set Development, Thumb-2 and Instruction Set Architecture.
Introduction to ARM CORTEX series, improvement over classical series and advantages for embedded system design. CORTEX A, CORTEX M, CORTEX R processors series, versions, features and applications.

Module II: AVR Atmega 16
Atmega 16 pin details and specifications , Instruction set / Bus architecture, RAM, FLASH, UART and other peripherals, Interrupts, timer, Counters. PWM , SPI Bus - Introduction to SPI , SPI master and SPI slave concept , SPI as data exchange protocol, SPI Registers - SPCR, SPDR, SPSR , ADC Registers - ADCSRA , ADMUX , ACSR , I2C Registers - TWCR , TWBR, TWSR , TWDR , EEPROM - Read/write Access , EEPROM address register. Atmega328 and Arduino

Module III : ARM Cortex-M4
ARM Cortex-M4 Processor Core overview - Programmers Model - Memory Model - Exception and Fault Handling - Power Management - Instruction Set Summary - CMSIS Functions - Hardware-Software Synchronization - Interrupt Synchronization - Multithreading - Register Map - System Timer - Nested Vectored Interrupt Controller - Floating Point Unit (FPU)-Optional Memory Protection Unit. Cortex-M4 Peripherals - Parallel I/O Ports - Timer Interfacing - Pulse Width Modulation - DAC - ADC -Serial Communication

Module IV : ARM CORTEX M4 based Microcontroller
ARM Cortex-M4F based Microcontroller TM4C123GH6PM: Block diagram, address space, onchip peripherals (analog and digital) Register sets, Addressing modes and instruction set basics. Programming system registers using TivaWare, GPIO control, Watchdog Timer, System Clocks and control, Hibernation Module in TM4C microcontrollers, Interrupts, Interrupt vector table, interrupt programming, Timers and Real Time Clock (RTC), Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

Text Books:
1. Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers,2014, Jonathan W Valvano CreateSpace publications ISBN: 978-1463590154.
2. Embedded Systems: Introduction to ARM Cortex - M Microcontrollers, 5th edition Jonathan W Valvano, CreateSpace publications ISBN-13: 978- 1477508992
3. AVR Microcontroller and Embedded Systems: Using Assembly and C" by Muhammad Ali Mazidi, Sarmad Naimi, and Sepehr Naimi.
4. The Definitive Guide to ARM® Cortex®-M3 and Cortex®-M4 Processors by Joseph Yiu.
5. Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C by Yifeng Zhu.

6. Make: AVR Programming by Elliot Williams.
7. "Tiva™ TM4C123GH6PM Microcontroller Data Sheet" (Manufacturer Documentation).

Continuous Evaluation Mark Distribution	
Written Test	Assignment
6	6

Mark distribution

Unit	Mark
I	10
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IV	28
Total Mark	76

Pattern of Question

Part	Total No. of Questions	Marks per Question	Questions to be answered	Total Mark
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B	5	5	3	15
C	5	9	3	27
			Total	48

Sample Question Paper

MSELE03E10 MODERN COMMUNICATION SYSTEMS

Time : 3 Hours Maximum Marks:48

Section-A (Answer All, Each carries 1 mark)

1) What is bloothtooth technology?
2) List the advantages of 4G mobile commnication
3) In cellular systems why cell shape is considered as Hexagonal
4) What is hand off
5) Define FDMA
6) What is CDMA?

Section -B (Answer any 3, Each carries 5 marks)

7) Explain the working of a pager
8) What is Adaptive antenna array?
9) Explain CDMA technique
10) Explain hand off strategy in detail
11) What is meant by in building communication?

Section -C (Answer any 3, Each carries 9 marks)

12) Explain evolution of Mobile communication in detail
13) Explain
    a) Cell design
    b) Frequency reuse
    c) Channel Assignment Strategies
14) How interference and system capacity are related?
15) Explain spread spectrum technique
16) Explain intelligent cell concept in detail