Master of Engineering

in

Electronics & Communication Engineering
(Artificial Intelligence)

(2023-2025)

Electronics & Communication Engineering Department
National Institute of Technical
Teachers Training & Research
Chandigarh

SCHEME OF EXAMINATION FOR

MASTER OF ENGINEERING - ELECTRONICS AND COMMUNICATION ENGG. (ARTIFICIAL INTELLIGENCE)

Year: First   **Semester I**

S. No.	Course Code	Course Name	Scheme of Teaching			Scheme of Examination
			L-T-P	Contact hrs/week		

Year: First   **Semester II**

S. No.	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			Practical
			L-T-P	Contact hrs/week	Credits	Theory			
						Internal Assessment	University Assessment	Total	

Year: Second   **Semester III**

S. No.	Course Code	Course Name	Scheme of Teaching			Scheme of Examination			
			L-T-P	Contact hrs/week	Credits	Theory			Practical
						Internal Assessment	University Assessment	Total	
									-
									-

List of Example MOOCS Courses

MOOCS-I (Choose one from the list)

S. No.	Name of Course##	Faculty	Link

MOOCS-II (Choose one from the list)

S. No.	Name of Course##	Faculty	Link
1.	Managing Learning Resources	**Uday Chand Kumar** National Institute of Technical Research, Kolkatta	https://swayam.gov.in/courses/5224-managing-learning-resources
2.	Outcome Based Pedagogic Principles for Effective Teaching	**Shyamal Kr. Das** Mandal Institute of Technology-Kharagpur	https://swayam.gov.in/courses/4898-July-2018-outcome-based-pedagogic-principles-for-effective-teaching
3.	Pedagogical Innovations & Research Methodology	**Vandana Punia** Guru Jambheshwar University of Science and Technology	https://swayam.gov.in/courses/5269-pedagogical-innovations-reserach-methodology
4.	Managing Intellectual Property in Universities	**Feroze Ali** IIT Madras	https://swayam.gov.in/courses/5474-jan-2019-managing-intelluctual-property-at-universities
5.	Innovation, Business Models and Entrepreneurship	**Rajat Agarwal** IIT Roorkee	https://swayam.gov.in/courses/4816-july-2018-innovation-business-moels-and-entrepreneurship
6.	Environment Natural Resources and Sustainable Development	**Prabhakar Rao Jandhyala** University of Hyderabad	https://swayam.gov.in/courses/3911-environment-natural-resources-and-

| Title | DATA STRUCTURES AND PROGRAMMING | Credits | 04 |

SECTION B	
UNIT II: Python Programming Introduction, gitHub, Functions, Booleans and Modules, Sequences, Iteration and String Formatting, Dictionaries, Sets, and Files, Exceptions, Testing, Comprehensions, Advanced Argument Passing, Lambda -- functions as objects, Object Oriented Programming, More OO -- Properties, Special methods, Iterators, Iterables, and Generators, Decorators, Context Managers, Regular Expressions, and Wrap Up	16
SECTION C	
UNIT III: JavaScript Basics, Functional programming, Object oriented programming, Client-side applications, Server-side applications, Design patterns and Idioms, Popular frameworks	16

Suggested Books

Title	NATURAL LANGUAGE PROCESSING	Credits	04
Code	ECEAI 1102 Semester: Ist	L T P	

Title

SECTION-B	
Classification algorithms covering logistic regression, Multi-Layer perceptron, SVM, Decision trees and Random Forest Probabilistic algorithms covering Bayes classifier and Hidden Markov Models	8
Cross Validation, Performance measurement of models Feature engineering techniques to improve model performance	8
Unsupervised learning: k-means clustering, hierarchical clustering, Gaussian Mixture models and Density Based clustering Dimensionality Reduction techniques: PCA, FDA, QDA, Random Forests	6
Suggested Books	1. Machine Learning by Tom Mitchell 2. Introduction to Machine Learning by Ethem Alpaydin 3. Introduction to Statistical Learning, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer, 2013. 4. Pattern Classification, 2nd Ed., Richard Duda, Peter Hart, David Stork, John Wiley & Sons, 2001.

Title	FUNDAMENTALS OF IoT			Credits	03
Code	CSEI 8107	Semester: Ist		L T P	3 0 0
Max. Marks	External: 50	Internal: 50		Elective	N

Pre-

SDN for IoT Introduction to SDN, SDN for IoT, Data Aggregation, Handling and Analytics	4
Cloud Computing, Sensors, Fog Computing	4
Understanding of the various protocols being used in IoT like MQTT, AMQP, REST API	4
IoT Platforms and Applications Understanding of the IoT platforms like PTC Thingworx and IoT frameworks like MS Azure, Understanding of the usage of these platforms to build applications like Smart Cities and Smart Homes, Connected Vehicles, Smart Grid, Case Study: Agriculture, Healthcare, Activity Monitoring.	11

Suggested Books	1. e and Fast Way
	
	2. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis
	
	                                             Science
	Publishing Co. Inc, 2014.
	3.
	                                 st Edition, Auerbach
	Publications, 2017.
	4. oT
	                   st Edition, Springer International Publishing, 2018.

Title	**COMPUTER VISION**		Credits	04
Code	ECEAI 1201	**Semester:** 2nd	**L T P**	4 0 0
Max. Marks	**External:** 50	**Internal:** 50	**Elective**	N

Pre-requisites Digital Signal Processing

SECTION-B

Image Morphological Processing: Introduction to basic operation on binary and grayscale images: Dilation, Erosion, Opening & Closing, Morphological Algorithms: Boundary & Region Extraction, Convex Hull, Thinning, Thickening, Skeletons, Pruning.	6
Image Segmentation, Representation & Descriptions: Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Contour following, Boundary representations, Region Representations, shape properties, Boundary Descriptors, Regional Descriptors, Texture representations, Object Descriptions	6
Object Recognition: Patterns and Patterns classes, Recognition based on Decision Theoretic methods, Structural Methods	9

1. Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley 1992.
2. Forsyth and Ponce: Computer Vision A Modern Approach Pearson Education Latest Edition.
3. Pakhera Malay K: Digital Image Processing and Pattern Recognition, PHI.

Suggested Books

Title	DEEP LEARNING		Credits	04
Code	ECEAI 1202	Semester: 2nd	L T P	4 0 0
Max. Marks	External: 50	Internal: 50	Elective	N
Pre-requisites	Machine Learning, Python Programming		Contact Hours	45
Objectives	This course aims to present the mathematical, statistical and computational challenges of building stable representations for high-dimensional data, such as images, text and data. Course delves into selected topics of Deep Learning, discussing recent models from both supervised and unsupervised learning. Special emphasis will be on convolutional architectures, invariance learning, unsupervised learning and non-			

SECTION-B

Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout	6
Greedy Layerwise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalization	6
Learning Vectorial Representations of Words	3
Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks.	4
Suggested Books	1. Deep Learning by Ian Goodfellow, Yoshua Bengio, Aaron Courville and Francis Bach. 2. Neural Networks and Deep Learning By Michael Nielsen 3. Deep Learning with Python by Francois Chollet, 1st Edition 4. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems by Aurélien Géron,1st Edition 5. Colab (Google)

Title	INDUSTRIAL INTERNET OF THINGS		Credits	03
Code	CSEI 8206	Semester: 2nd	L T P	3 0 0
Max. Marks	External: 50	Internal: 50	Elective	N

Pre-requisites

SECTION-B	
Big Data Analytics and Software Defined Networks	2
IIoT Analytics: Introduction, Machine Learning and Data Science, and Julia Programming, Data Management with Hadoop	6
Data Center Networks, Security and Fog Computing, Cloud Computing in IIoT	3

Application Domains: Factories and Assembly Line, Food Industry, Healthcare, Power Plants, Inventory Management & Quality Control, Plant

Title	**BIG DATA ANALYTICS**		**Credits**	03
Code	CSEI 8207	**Semester:** 2nd	**L T P**	3 0 0
Max. Marks	**External:** 50	**Internal:** 50	**Elective**	N

BIG DATA ACQUISITION & STORAGE **Data Acquisition:** Apache Flume; Apache Sqoop; Publish - Subscribe Messaging Frameworks; Big Data Collection Systems, Messaging queues, Custom connectors, Implementation examples	4
Big Data Storage: HDFS, HBase, Kudu **NoSQL Databases:** Key-value databases, Document databases, Column Family databases, Graph databases	3

Standard ETL Tools: Standard �A 0 Qq63.624 634.3 438.79 25.8 reW* n EMC /F

Title	CLOUD COMPUTING AND VIRTUALIZATION		Credits	04
Code	ECEAI 1103	Semester: Ist	L T P	4 0 0
Max. Marks	External: 50	Internal: 50	Elective	Y

Pre-requisites Basic Knowledge of Distributed Computing

	SECTION-B	
Network Protocols: Issues in designing MAC protocol for WSNs, Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and Zig Bee, Dissemination protocol for large sensor network.		7
Routing protocols: Issues in designing routing protocols, Classification of routing protocols, Energy-efficient routing, Unicast, Broadcast and multicast, Geographic routing.		7
Data Storage and Manipulation: Data centric and content based routing, storage and retrieval in network, compression technologies for WSN, Data aggregation technique. Applications: Detecting unauthorized activity using a sensor network, WSN for Habitat Monitoring.		8
Suggested Books	1. Protocols and Architectures for Wireless Sensor Network by Holger Kerl & Andreas Willig, John Wiley and Sons, 2005 2. Wireless Sensor Network by Raghavendra, Cauligi S, Sivalingam, Krishna M., Zanti Taieb, Springer 1st Ed., 2004 3. Wireless Sensor Network by Feng Zhao, Leonidas Guibas, Elsevier, 1st Ed. 2004 4. Wireless Sensor Network: Technology, Protocols and Application by Kazem, Sohraby, Daniel Minoli, Taieb Zanti, John Wiley and Sons, 1st Ed., 2007 5. Networking Wireless Sensors by B. Krishnamachari, Cambridge University Press. 6. Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications by N. P. Mahalik, Springer Verlag.	

Title

Title   **RESEARCH METHODOLOGY**   **Credits**   04

Title

Other Optimization Methods

Artificial Immune Systems, Other Algorithms Harmony Search, Honey-Bee Optimization, Memetic Algorithms, Co-

Title	EMBEDDED SYSTEM DESIGN & ARCHITECTURE		Credits	04
Code	ECEAI 1205	Semester - 2nd	L T P	4 0 0
Max. Marks	External - 50	Internal - 50	Elective	Y

SECTION-B	
CORTEX EXCEPTION HANDLING AND INTERRUPTS Exceptions: Exception Types, Priority, Vector Tables, Interrupt Inputs and Pending Behavior, Fault Exceptions, Supervisor Call and Pending Service Call. NVIC: Nested Vectored Interrupt Controller Overview, Basic Interrupt Configuration, Software Interrupts and SYSTICK Timer. Interrupt Behavior: Interrupt/Exception Sequences, Exception Exits, Nested Interrupts, Tail, Chaining Interrupts, Late Arrivals and Interrupt Latency.	10
CORTEX, M3/M4 PROGRAMMING Cortex, M3/M4 Programming: Overview, Typical Development Flow Using C, CMSIS (Cortex Microcontroller Software Interface Standard), Using Assembly. Exception Programming: Using Interrupts, Exception/Interrupt Handlers, Software Interrupts, Vector Table Relocation. Memory Protection Unit and other Cortex, M3 features: MPU Registers, Setting Up the MPU, Power Management, Multiprocessor Communication. STM32L15xxx ARM Cortex M3/M4 Microcontroller: Memory and Bus Architecture, Power Control, Reset and Clock Control. STM32L15xxx Peripherals: GPIOs, System Configuration Controller, NVIC, ADC, Comparators, GP Timers, USART. Development & Debugging Tools: Software and Hardware tools like Cross Assembler, Compiler, Debugger, Simulator, In-circuit Emulator (ICE), Logic Analyzer etc.	15

[1]

nd Edition, Tata McGraw Hill, 2

Suggested Books

FUZZY LOGIC: APPLICATIONS AND IMPLEMENTATION Fuzzy pattern recognition systems, Neuro-fuzzy systems and evolutionary learning in fuzzy systems, Fuzzy logic implementation using Python scikit, fuzzy	10

Suggested Books	1. "Fuzzy Logic with Engineering Applications" Timothy J. Ross, ISBN: 0470860758, 650 pages, paperback, published by John Wiley & Sons, 2nd edition, 2004.
	2. Fuzzy Logic: Intelligence, Control, and Information, J. Yen, R. Langari, Prentice Hall, 1998.
	3. Fuzzy Logic: Implementation and Applications by Marek J. Patyra and Daniel J. Mlynek
	4.
	   Wesley Longman, Menlo Park, CA, 1998 (later published by Prentice Hall).
	5.
	   1994 Academic Press Professional.