Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)

(Accredited 'A++' Grade by NAAC with a score of 3.6)

Hingna Road, Wanadongri, Nagpur - 441 110

Bachelor of Technology

SoE & Syllabus 2025

(Department of Electronics & Telecommunication Engineering)

B.Tech Honors in Computational Intelligence for Automation

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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B.Tech SCHEME OF EXAMINATION 2025-26

Department of Electronics & Telecommunication Engineering

SoE No.
25ET-CIA-101

B.Tech Honors in Computational Intelligence for Automation

SN	Sem	Type	Sub. Code	Subject	T/P	Contact Hours				Credits	% Weightage			ESE Duration Hours
						L	T	P	Hrs		MSEs*	TA**	ESE	
1	5	PC	25ETH501	Internet of Things	T	3	0	0	3	3	30	20	50	3 Hours
2	5	PC	25ETH502	Machine Learning	T	3	0	0	3	3	30	20	50	3 Hours
3	5	PC	25ETH503	Design Lab	P	0	0	2	2	1		60	40	
4	6	PC	25ETH601	Deep Learning for Computer Vision	T	3	0	0	3	3	30	20	50	3 Hours
5	6	PC	25ETH602	Industrial Automation and Robotics	T	3	0	0	3	3	30	20	50	3 Hours
6	6	PC	25ETH603	Simulation Lab	P	0	0	2	2	1		60	40	
7	7	PC	25ETH701	Database Management System	T	3	0	0	3	3	30	20	50	3 Hours
8	7	PC	25ETH702	Database Management System Lab	P	0	0	2	2	1		60	40	
					TOTAL	**15**	**0**	**6**	**21**	**18**				

MSEs* = Two MSEs of 15 Marks each will conducted and marks of of these 2 MSEs will be considered for Continuous Assessment

TA ** = for Theory : 12 marks on lecture quizzes, 12 marks on two TA2 activitied decided by course teacher, 2 marks on class attendance and 4 marks on TA4 activities

TA = for Practical : MSPA will be 15 marks each**

		July 2025	**1.00**	**Applicable for AY 2025-26 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

V Semester

25ETH501: Internet of Things

Course Outcomes
The students will be able to 1. Explore the physical and Logical design of IoT. 2. Explore the networking of IoT. 3. Explore python programming. 4. Apply basic skills of IoT to solve real life problems.

Unit I: Introduction & Concepts	**6 Hours**
Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels. **(Contemporary Issues related to Topic)**	
Unit II: Domain Specific IOTs	**6 Hours**
Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style. **(Contemporary Issues related to Topic)**	
Unit III: Networking of IoT Node	**7 Hours**
IoT nodes, challenges in networking of IoT Nodes, IoT node access method, Low power low data rate network: IEEE 802.15.4 Physical layer, IEEE 802.15.4 MAC layer, LPWAN, LoRA Technology, SigFox technology, IPv6 over Low power WPAN, Header compression and Fragmentation, Routing protocol for LLNS. . **(Contemporary Issues related to Topic)**	
Unit IV: Messaging Protocol	**6 Hours**
Introduction to CoAP, CoAP message format, CoAP communication in IoT infrastructure, Introduction to MQTT, MQTT message format & sessions. **(Contemporary Issues related to Topic)**	
Unit V: Developing Internet of Things & Logical Design using Python	**7 Hours**
: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Python Modules, Packages, File Handling, Classes, Python Packages, IoT Device-Raspberry Pi, Programming Raspberry pi with Python **(Contemporary Issues related to Topic)**	
Unit VI: IoT physical servers and cloud offerings	**(7 Hours)**

Amezon web service for IoT, Google cloud IoT, Microsoft Azure IoT, IBM Whatson IoT , IoT security **(Contemporary Issues related to Topic)**	
Total Lecture	**39 Hours**

Textbooks:	
1.	Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands- On Approach, 1st edition 2015, Orient Blackswan Private Limited-New Delhi.
Reference Books:	
1.	Adrian McEwen , Designing the Internet of Things, 1st edition, Wiley
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/106/105/106105166/
2.	https://www.coursera.org/learn/introduction-to-internet-of-things

V Semester

25ETH502: Machine learning

Course Outcomes
The students will be able to 1. Apply and analyze models using regression 2. Apply supervised and unsupervised learning for problem solving 3. Apply neural network algorithms for classification 4. Evaluate deep neural network with parameters computational complexity

UNIT I : Regression Supervised and Unsupervised learning, Regression, Model and Cost Function, Gradient Descent, Multivariate Linear Regression, Feature Scaling	06Hrs
UNIT II : Classification Logistic Regression, Hypothesis Representation, Decision Boundary, Cost Function and Gradient Descent, Multiclass Classification, Regularization, Model Evaluation	07Hrs
UNIT III : Supervised Learning KNN, SVM, Decision Tree, Naïve Bayes Classifier, Random Forest	06Hrs
UNIT IV : Unsupervised learning K-means Clustering, Hierarchical Clustering, DBSCAN Clustering, Recommendation System, Anomaly Detection	07Hrs
UNIT V: Artificial Neural Network Introduction to Neural Network, Activation Functions, Perceptron Rule, Backpropogation	06Hrs
UNIT VI: Deep Learning Introduction to Deep Learning, Building Blocks of CNN, Computational Complexity, CNN Architectures	07Hrs
Total Lecture	39 Hours

Text books:				
1	Understanding Machine Learning. https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/copy.html	2017	Shai Shalev-Shwartz and Shai Ben-David.	Cambridge University Press.
2	The Elements of Statistical Learning. https://web.stanford.edu/~hastie/ElemStatLearn/	2009	Trevor Hastie, Robert Tibshirani and Jerome Friedman.	Second Edition
3.	Pattern Recognition and Machine Learning. https://www.microsoft.com/en-us/research/people/cmbishop/downloads/	2006	Christopher Bishop.	Springer
Reference books:				
1	Foundations of Data Science.	January 2017	Avrim Blum, John Hopcroft and Ravindran Kannan.	
2	Deep Learning, Part II, http://www.deeplearningbook.org/	2016	Goodfellow, I., Bengio, Y., Courville, A.	MIT Press
3	Machine Learning: A Probabilistic Perspective	2012	Kevin P. Murphy	MIT Press
4.	MACHINE LEARNING An Algorithmic Perspective	Second Edition	Stephen Marsland	Chapman & Hall/CRC

V Semester
25ETH503: Design Lab

Course Outcomes
The students will be able to 1. Explore Python Programming 2. Explore the interfacing with the Raspberry pi 3. Implement and apply regression models 4. Apply neural network algorithms for classification

Expt. No.	Experiment based on
1	Experiment based on loops and functions in python.
2	To Interface LED with Raspberry pi.
3	To Interface DHT11 sensor with Raspberry pi.
4	Experiment based on File handling using Python.
5	To monitor temperature and humidity data remotely using things speak platform.
6	Data Analysis
7	Univariate Linear Regression
8	Multivariate Linear Regression
9	Logistic Regression
10	Supervised Learning such as KNN, SVM, RF, DT etc
11	Ensemble Learning
12	MNIST Dataset
13	**Mini-project**

VI Semester
25ETH601– Deep Learning for computer vision

Course Outcomes:
Upon successful completion of the course the students will be able to 1. Explain Image Fundamentals and Basic Processing Techniques. 2. Apply Neural Networks and Backpropagation for Vision Tasks. 3. Implement CNNs for Image Classification. 4. Explore Advanced CNN Architectures for Object Detection and Segmentation.

Unit:1	**Introduction to Computer Vision & Image Fundamentals**	**7Hours**
What is Computer Vision? Applications and History, Overview of the human visual system vs machine vision, Digital image formation, types of images (binary, grayscale, RGB), Image representation and storage (pixels, channels, resolution), Image I/O and display using OpenCV, Basic image operations (resize, crop, rotate, flip, blur, thresholding). **Contemporary Issues related to Topic**		
Unit:2	**Image Processing & Feature Extraction**	**6 Hours**
Filters and kernels, Convolution basics (non-neural), Edge detection: Sobel, Prewitt, Histograms and histogram equalization. **Contemporary Issues related to Topic**		
Unit:3	**Neural Networks and Backpropagation**	**7 Hours**
Multi-layer Perceptron, Backpropagation, Regularization, Stochastic Gradient Descent, Momentum, AdaGrad, Adam, Learning rate schedules, Softmax loss **Contemporary Issues related to Topic**		
Unit:4	**Convolutional Neural Networks for Image Classification**	**6 Hours**
Convolutional Neural Networks: An Introduction, Backpropagation in CNNs, Padding, Strides, CNN Architecture for Image Classification. LeNet. **Contemporary Issues related to Topic**		
Unit:5	**Beyond Basic CNNs: Architectures, Fine-tuning and Visualization**	**6 Hours**
Evolution of CNN Architectures: VGG, ResNets, MobileNet, EfficientNet, Finetuning CNNs, Transfer learning. **Contemporary Issues related to Topic**		
Unit :6	**CNNs for Object Detection & segmentation**	**7 Hours**
Object localisation using bounding box, RCNN, Faster RCNN, YOLO, Semantic segmentation, U-Net. **Contemporary Issues related to Topic**		
Total Lecture Hours		**39 Hours**
Textbooks		
1	Foundations of Computer Vision, Antonio Torralba, Phillip Isola, William T. Freeman, The MIT Press, 2024.	

2	Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville , MIT Press
2	Fundamentals of Deep Learning and Computer Vision, Nikhil Singh and Paras Ahuja, BPB Publications, 2020.
Reference Books	
1	Deep Learning for Computer Vision by Rajalingappaa Shanmugamani, Packt Publishing; 1st edition
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	
MOOCs Links and additional reading, learning, video material	
1	https://archive.nptel.ac.in/courses/106/106/106106224/

VI Semester
25ETH602: Industrial Automation and Robotics

Course Outcomes
Upon successful completion of the course the students will be able to 1. Understand the Concept of Industrial Automation. 2. Identify the components required for automation systems. 3. Write the program for PLC and Robotics. 4. Design control system as per the application

UNIT I: Introduction: Automation overview, Requirement of automation systems, Architecture of Industrial Automation system, Introduction of PLC and supervisory control and data acquisition (SCADA). Industrial bus systems: modbus & profibus	06Hrs
UNIT II: Automation components: Sensors: temperature, pressure, force, displacement. Introduction to Actuators, process control valves. Introduction of DC and AC servo drives for motion control.	07Hrs
UNIT III : Programmable logic controllers: Programmable controllers, Programmable logic controllers, Analog digital input and output modules, PLC programming, Ladder diagram, Sequential flow chart, PLC Communication and networking, PLC selection, PLC Installation, Advantage of using PLC for Industrial automation, Application of PLC to process control industries.	06Hrs
UNIT IV : Introduction to robotics Definition of a Robot - Basic Concepts - Robot configurations - Types of Robot drives - Basic robot motions - Point to point control - Continuous path control.	07Hrs
UNIT V: Components, Operations, Sensing and Machine Vision Basic control system concepts - control system analysis - robot actuation and fed back, Manipulators - director and inverse kinematics, Coordinate transformation - Brief Robot dynamics. Types of Robot and effectors - Grippers - Tools as end effectors - Robot/End - effort interface. Range sensing - Proximity sensing - Touch sensing - Force and Torque sensing.	06Hrs
UNIT VI: Robot Programming Methods - languages - Capabilities and limitation - Artificial intelligence - Knowledge representation - Search techniques - AI and Robotics.	07Hrs
Total Lecture Hours	**39 Hours**
Text books:	

1.	Industrial Instrumentation and Control	Third Edition 2009	S.K. Singh	The McGraw Hill Companies
2.	Robotics Control, sensing, Vision and Intelligence	1987	K.S. Fu., R.C.Gonalez, C.S.G.Lee	McGraw Hill International Edition
Reference books:				
1.	Process Control Instrumentation Technology	2014 Eighth edition	C.D. Johnson	Prentice Hall of India.
2.	Programmable logic controller	Fourth edition 2006	W. Bolton	ELSEVIER
2.	Industrial control handbook	Third Edition 1998	E A Parr	Butterworth-Heinemann
	Industrial robotics, technology, Programming and Applications	1986	Mikell P. Groover, mitchell Weiss	McGraw Hill International Edition
	Robotic engineering - An Integrated Approach	1989	Richard D. Klafter, Thomas A. Chmielewski and Michael Negin	Prentice Hall Inc, Englewoods Cliffs, NJ, USA,

VI Semester
23ETH503: Simulation Lab

Course Outcomes
The students will be able to 1. Apply and analyze image filtering and edge detection. 2. Apply neural network for image classification. 3. Apply neural network for object detection and image segmentation. 4. Write the program for PLC and Robotics. 5. Explore characteristics of automation components

Expt. No.	Experiment based on
1.	Image Filtering and Edge Detection Using Classical Convolution Techniques
2.	Building and Training a Multi-Layer Perceptron for Digit Classification
3.	Optimizing Neural Networks with SGD, Momentum, AdaGrad, and Adam
4.	Implementing a Basic CNN and Visualizing Feature Maps
5.	Image Classification with LeNet and Modern CNN Architectures (VGG, ResNet)
6.	Transfer Learning and Fine-tuning with Pretrained CNNs (MobileNet, EfficientNet)
7.	Object Detection using RCNN, Faster RCNN and YOLO
8.	Semantic Segmentation using U-Net
9.	Experiment based on Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.
10.	Experiment based on Robot programming.
11.	Measurement of Temperature using RTD.
12.	Measurement of Strain using Strain Gauge or load cell
13.	Study the characteristics of LVDT
14.	Performed logical operation using Ladder Diagram.
15.	Study of PLC Programmer

Semester VII
25ETH701 : Data Base Management Systems

Course Outcomes:

Upon successful completion of the course the students will be able to

1. Explain various concept of Data base management system.
2 . Design Entity Relationship Diagram for any scenario.
3. Solve queries based on relational algebra & SQL.
4. Identify functional dependencies & normalize the database and apply ACID properties.
5. Analyze transaction management, various concurrency control protocols and crash recovery methods.

Unit:1	Introduction to Database Management System:	8 Hours

General File System and Database system Concepts and Architecture, Data Models, Schemas and Instances, Abstraction & Different Levels of Data Abstraction, Data Independence: Logical & Physical Independence.

Contemporary Issues related to Topic

Unit:2	Entity-Relationship Model:	7 Hours

Entities and Entity Sets, Relationships and Relationship Sets, Attributes, Mapping Constraints, Keys, Entity Relationship Diagram, Reducing E-R Diagrams to Tables, Generalization, Aggregation, Design of an E-R Database Scheme

Contemporary Issues related to Topic

Unit:3	SQL and Advanced SQL	8 Hours

SQL: Data definition language (DDL), Data Manipulation Language (DML), Basic structure of SQL Queries, Set operations, Null Values, Nested subqueries, views, modification of database, transaction, Joins.
Advanced SQL: SQL data types & schemas, Integrity Constraints, Domain Constraints, Assertions, triggers, Advanced SQL Features.

Contemporary Issues related to Topic

Unit:4	Relational Data Model:	7 Hours

Structure of Relational Databases, Relational Database Design: Pitfalls in Relational Database Design, Functional Dependencies, Normalization using Functional Dependencies, Alternative Approaches to Database design.
Relational Algebra: Structure of relational databases, Fundamental Relational-Algebra Operations, Additional relational algebra operations, extended relational algebra operations, modification of the databases

Contemporary Issues related to Topic		
Unit:5	**Data Storage and Querying & Transaction Management**	**8 Hours**
Data Storage and Querying: Storage and File Structure, Indexing and Hashing, Query Processing, query-evaluation. **Transaction Management**: ACID Properties, Implementation of ACID Properties, Database processes to support ACID Properties, Schedules, and Testing of Serializability. **Contemporary Issues related to Topic**		
Unit :6	**Concurrency Control & Crash Recovery**	**7 Hours**
Concurrency Control: Lock-based Protocols, Timestamp Based Protocols, Validation Techniques, Multiple Granularity, Multi version Timestamp Protocol, Transaction isolation levels, Read consistency. **Crash Recovery**: Failure Classification, Log Based Recovery, Buffer Management, Checkpoints, Shadow Paging. **Contemporary Issues related to Topic**		
Total Lecture Hours		**45 Hours**

Textbooks	
1	Database System Concepts,Korth, Silberschatz, sudarshan ,McGraw-Hill publication
2	Fundamentals of Database Systems, Elmasri, Navathe & Gupta,Pearson Education.
Reference Books	
1	SQL & PL / SQL for Oracle 11g Black Book Kindle Edition,3rd Edition, Dr. P.S. Deshpande, Dreamtech Press
2	Database Systems, 3rd Edition,Connolly, Begg , Pearson Education
3	Database Systems, 6th Edition,S. K. Singh,Pearson Education
YCCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]	
1	http://link.springer.com/openurl?genre=book&isbn=978-1-4613-6193-0
2	https://onlinelibrary.wiley.com/doi/book/10.1002/9780470168042
MOOCs Links and additional reading, learning, video material	
1	https://onlinecourses.nptel.ac.in/noc21_cs04/preview
2	https://onlinecourses.nptel.ac.in/noc22_cs80/preview

Semester VII
25ETH702 Lab: Data Base Management Systems

Course Outcomes:
Upon successful completion of the course the students will be able to 1. Design Entity Relationship Diagram for any scenario. 2. Solve queries based on relational algebra & SQL.

SN	Experiments based on
1	Creating a schema -To implement different basic Data Definition Language (DDL) & Data Manipulation Language(DML) Commands in SQL.
2	To design an ER Diagram.
3	1. Answer each of the following questions. The questions are based on the following relational schema: Emp(*eid:* integer, *ename:* string, *age:* integer, *salary:* real) Works(*eid:* integer, *did:* integer, *pcttime:* integer) Dept(*did:* integer, *dname:* string, *budget:* real, *managerid:* integer) a. Give an example of a foreign key constraint that involves the Dept relation. What are the options for enforcing this constraint when a user attempts to delete a Dept tuple? b. Write the SQL statements required to create the preceding relations, including appropriate versions of all primary and foreign key integrity constraints. c. Define the Dept relation in SQL so that every department is guaranteed to have a manager. d. Write an SQL statement to add John Doe as an employee with *eid* = 101, *age* = 32 and *salary* = 15, 000. e. Write an SQL statement to give every employee a 10 percent raise. f. Write an SQL statement to delete the Toy department.
4	Given a schema , apply BETWEEN…AND, NOT BETWEEN, IN, NOT IN, IS NULL, IS NOT NULL clause on created database.
5	Given a schema , implement aggregate function & grouping commands.
6	Given a schema , implement basic set operations in SQL
7	Write the following queries in SQL for the following schema. Suppliers(sid: integer, sname: string, address:

	string) Parts(pid: integer, pname: string, color: string) Catalog(sid: integer, pid: integer, cost: real) 1. Find the pnames of parts for which there is some supplier. 2. Find the snames of suppliers who supply every part. 3. Find the snames of suppliers who supply every red part. 4. Find the pnames of parts supplied by Acme Widget Suppliers and by no one else. 5. Find the sids of suppliers who supply a red part and a green part. 6. Find the sids of suppliers who charge more for some part than the average cost of that part (averaged over all the suppliers who supply that part). 7. For each part, find the sname of the supplier who charges the most for that part. Find the sids of suppliers who supply only red parts.