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)



### Nagar Yuwak Shikshan Sanstha's

### Yeshwantrao Chavan College of Engineering

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

### **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**

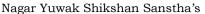
						Co	ntac	t Hou	ırs		% Weightage		ESE	
SN	Sem	Type	Sub. Code	Subject	T/P	L	Т	P	Hrs	Credits	MSEs*	TA**	ESE	Duration Hours
1	5	PC	25ETH501	Internet of Things	Т	3	0	0	3	3	30	20	50	3 Hours
2	5	PC	25ETH502	Machine Learning	Т	3	0	0	3	3	30	20	50	3 Hours
3	5	PC	25ETH503	Design Lab	Р	0	0	2	2	1		60	40	
4	6	PC	25ETH601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

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### B. Tech SoE and Syllabus 2025

(Scheme of Examination w.e.f. 2025-26 onward)

(Department of Electronics & Telecommunication Engineering)

**SoE No.** 25CIA-101

## **B.Tech Honors in Computational Intelligence for Automation**

# 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

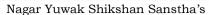
7 Hours

: 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)

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SoE No. 25CIA-101

(Department of Electronics & Telecommunication Engineering)

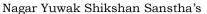
## **B.Tech Honors in Computational Intelligence for Automation**

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

Textb	Textbooks:						
1.	Arshdeep Bahga, Vijay Madisetti, Internet of Things: A Hands- On Approach, 1st edition 2015,						
	Orient Blackswan Private Limited-New Delhi.						
Refer	Reference Books:						
1.	Adrian McEwen, Designing the Internet of Things, 1st edition, Wiley						
YCCI	E e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]						
1							
MOO	Cs 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						

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### B. Tech SoE and Syllabus 2025

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## **B.Tech Honors in Computational Intelligence for Automation**

# V Semester 25ETH502: Machine learning

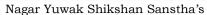
### **Course Outcomes**

### 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	06Hrs
Supervised and Unsupervised learning, Regression, Model and Cost Function, Gradient	
Descent, Multivariate Linear Regression, Feature Scaling	
UNIT II : Classification	07Hrs
Logistic Regression, Hypothesis Representation, Decision Boundary, Cost Function and	
Gradient Descent, Multiclass Classification, Regularization, Model Evaluation	
UNIT III: Supervised Learning	06Hrs
KNN, SVM, Decision Tree, Naïve Bayes Classifier, Random Forest	
UNIT IV : Unsupervised learning	07Hrs
K-means Clustering, Hierarchical Clustering, DBSCAN Clustering, Recommendation	
System, Anomaly Detection	
UNIT V: Artificial Neural Network	06Hrs
Introduction to Neural Network, Activation Functions, Perceptron Rule, Backpropagation	
UNIT VI: Deep Learning	07Hrs
Introduction to Deep Learning, Building Blocks of CNN, Computational Complexity, CNN	0/1113
Architectures	
Total Lecture	39
	Hours

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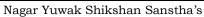
# Yeshwantrao Chavan College of Engineering (An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University) B. Tech SoE and Syllabus 2025 (Scheme of Examination w.e.f. 2025-26 onward)

SoE No. 25CIA-101

(Department of Electronics & Telecommunication Engineering)

Text bo	1	I = 0.1 =		
1	Understanding Machine Learning. <a href="https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/copy.html">https://www.cse.huji.ac.il/~shais/UnderstandingMachineLearning/copy.html</a>	2017	Shai Shalev-Shwartz and Shai Ben-David.	Cambridge University Press.
2	The Elements of Statistical Learning. <a href="https://web.stanford.edu/~hastie/ElemStatLearn/">https://web.stanford.edu/~hastie/ElemStatLearn/</a>	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
Referen	nce books:			
1	Foundations of Data Science.	Januar y 2017	Avrim Blum, John Hopcroft and Ravindran Kannan.	
Deep Learning, Part II, <a href="http://www.deeplearningbook.or">http://www.deeplearningbook.or</a> 2		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

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### B. Tech SoE and Syllabus 2025

(Scheme of Examination w.e.f. 2025-26 onward)

(Department of Electronics & Telecommunication Engineering)

SoE No. 25CIA-101

## **B.Tech Honors in Computational Intelligence for Automation**

# **V** Semester 25ETH503: Design Lab

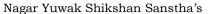
### **Course Outcomes**

### 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

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### B. Tech SoE and Syllabus 2025

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(Department of Electronics & Telecommunication Engineering)

**SoE No.** 25CIA-101

### **B.Tech Honors in Computational Intelligence for Automation**

## VI Semester 25ETH601– Deep Learning for computer vision

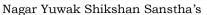
### **Course Outcomes:**

### 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						
	Computer Vision? Applications and History, Overview of the human visual system vs r							
	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).							
	porary Issues related to Topic	T						
Unit:2	Image Processing & Feature Extraction	6 Hours						
	nd kernels, Convolution basics (non-neural), Edge detection: Sobel, Prewitt, Histogram	s and						
	m equalization.							
	porary Issues related to Topic	<b>T</b>						
Unit:3	Neural Networks and Backpropagation	7 Hours						
Multi-la	yer Perceptron, Backpropagation, Regularization, Stochastic Gradient Descent, Momen	tum,						
AdaGrad	d, Adam, Learning rate schedules, Softmax loss							
Contem	porary Issues related to Topic							
Unit:4	Convolutional Neural Networks for Image Classification	6 Hours						
Convolu	tional Neural Networks: An Introduction, Backpropagation in CNNs, Padding, Strides,	CNN						
Architec	ture for Image Classification. LeNet.							
Contem	porary Issues related to Topic							
Unit:5	Beyond Basic CNNs: Architectures, Fine-tuning and Visualization	6 Hours						
Evolutio	n of CNN Architectures: VGG, ResNets, MobileNet, EfficientNet, Finetuning CNNs, T	ransfer						
learning								
Contem	porary 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 Lo	ecture Hours	39 Hours						
Textboo	ks	l						
1 Four	ndations of Computer Vision, Antonio Torralba, Phillip Isola, William T. Freeman, T.	he MIT Press,						
2024								
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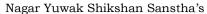
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2	Deep Learning by Ian Goodfellow, Yoshua Bengio, and Aaron Courville, MIT Press					
2	Fundamentals of Deep Learning and Computer Vision, Nikhil Singh and Paras Ahuja, BPB Publications,					
	2020.					
Re	eference Books					
1	Deep Learning for Computer Vision by Rajalingappaa Shanmugamani, Packt Publishing; 1st edition					
Y	CCE e- library book links [ACCESSIBLE FROM COLLEGE CAMPUS]					
1						
M	AOOCs Links and additional reading, learning, video material					
1	https://archive.nptel.ac.in/courses/106/106/106106224/					

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### B. Tech SoE and Syllabus 2025

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# **B.Tech Honors in Computational Intelligence for Automation**

### VI Semester 25ETH602: Industrial Automation and Robotics

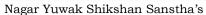
### **Course Outcomes**

### 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	06Hrs
Industrial Automation system, Introduction of PLC and supervisory control and data acquisition	
(SCADA). Industrial bus systems: modbus & profibus	
<b>UNIT II:</b> Automation components: Sensors: temperature, pressure, force, displacement.	07Hrs
Introduction to Actuators, process control valves. Introduction of DC and AC servo drives for motion	
control.	
UNIT III : Programmable logic controllers: Programmable controllers, Programmable logic	06Hrs
controllers, Analog digital input and output modules, PLC programming, Ladder diagram, Sequential	001113
flow chart, PLC Communication and networking, PLC selection, PLC Installation, Advantage of using	
PLC for Industrial automation, Application of PLC to process control industries.	
UNIT IV: Introduction to robotics	07Hrs
Definition of a Robot - Basic Concepts - Robot configurations - Types of Robot drives - Basic robot	071113
motions - Point to point control - Continuous path control.	
UNIT V: Components, Operations, Sensing and Machine Vision	06Hrs
Basic control system concepts - control system analysis - robot actuation and fed back, Manipulators -	OOTHS
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.	
UNIT VI: Robot Programming	07Hrs
Methods - languages - Capabilities and limitation - Artificial intelligence - Knowledge representation -	071113
Search techniques - AI and Robotics.	
Total Lecture Hours	39
	Hours
Text books:	<u> </u>

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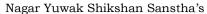
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SoE No. 25CIA-101

(Department of Electronics & Telecommunication Engineering) **B.Tech Honors in Computational Intelligence for Automation** 

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
Ref	erence 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,

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### B. Tech SoE and Syllabus 2025

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# **B.Tech Honors in Computational Intelligence for Automation**

### VI Semester 23ETH503: Simulation Lab

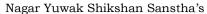
### **Course Outcomes**

### 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

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## **B.Tech Honors in Computational Intelligence for Automation**

### 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 | SOL and Advanced SOL

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

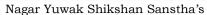
Structure of Relational Databases, Relational Database Design: Pitfalls in Relational Database Functional Dependencies, Normalization using Functional Dependencies, Alternative Approaches to Database design.

Relational Algebra: Structure of relational databases, Fundamental Relational-

Algebra Operations, Additional relational algebra operations, extended relational algebra operations,

modification of the databases

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**Contemporary Issues related to Topic** 

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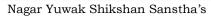
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Uı	nit:5 Data Storage and Querying & Transaction Management	8 Hours			
qu Tr su	ta Storage and Querying: Storage and File Structure, Indexing and Hashing, Query Proery-evaluation.  ansaction Management: ACID Properties, Implementation of ACID Properties, Data opport ACID Properties, Schedules, and Testing of Serializability.  ontemporary Issues related to Topic	C,			
Uı	nit :6   Concurrency Control & Crash Recovery	7 Hours			
Mi Ci Sh	oncurrency Control: Lock-based Protocols, Timestamp Based Protocols, Validation Technical Control of Control o	consistency.			
Total Lecture Hours 45 Hours					
Te	xtbooks				
1	Database System Concepts, Korth, Silberschatz, sudarshan , McGraw-Hill publication				
2	Fundamentals of Database Systems, Elmasri, Navathe & Gupta, Pearson Education.				
Re	ference Books				
1	SQL & PL / SQL for Oracle 11g Black Book Kindle Edition, 3rd Edition, Dr. P.S. Desh Dreamtech Press	pande,			
2	Database Systems, 3rd Edition, Connolly, Begg, Pearson Education				
3	Database Systems, 6th Edition,S. K. Singh,Pearson Education				
Y	CCE 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				
M	OOCs 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				

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## **B.Tech Honors in Computational Intelligence for Automation**

# **Semester VII** 25ETH702 Lab: Data Base Management Systems

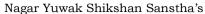
### **Course Outcomes:**

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.							
	<ul> <li>c. Define the Dept relation in SQL so that every department is guaranteed to have a manager.</li> <li>d. Write an SQL statement to add John Doe as an employee with eid = 101, age = 32 and salary = 15, 000.</li> <li>e. Write an SQL statement to give every employee a 10 percent raise.</li> </ul>							
4	f. Write an SQL statement to delete the Toy department.  Given a schema, apply BETWEENAND, NOT BETWEEN, IN, NOT IN, IS							
	NULL, IS NOT NULL clause on created database.							
5	Given a schema, implement aggregate function & grouping commands.							
6 7	Given a schema, implement basic set operations in SQL  Write the following queries in SQL for the following schema. Suppliers(sid: integer, sname: string, address:							

Therefore .	Mest	Shami		1.00	Applicable for AY 2025-26 Onwards
Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	





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

### B. Tech SoE and Syllabus 2025

(Scheme of Examination w.e.f. 2025-26 onward)

(Department of Electronics & Telecommunication Engineering)

**SoE No.** 25CIA-101

### **B.Tech Honors in Computational Intelligence for Automation**

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.

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Chairperson	Dean (Acad. Matters)	Dean OBE	Date of Release	Version	AY 2025-26 Onwards