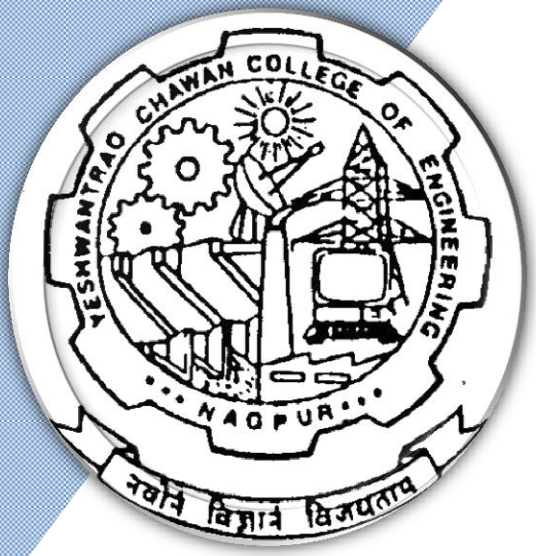
Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

(Accredited 'A' Grade by NAAC with a score of 3.25)

Hingna Road, Wanadongri, Nagpur - 441 110



Bachelor of Engineering

Honors in Automation and Computer Vision

Offered by Electronics & Telecommunication Engineering

SoE & Syllabus 2020

28 June 2020

Nagar Yuwak Shikshan Sanstha's

Yeshwantrao Chavan College of Engineering

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

B.E. SCHEME OF EXAMINATION 2020-21

Electronics & Telecommunication Engineering

Honors in Automation and Computer Vision

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	ET2501	Internet of Things	T	3	0	0	3	3	30	30	40	3
2	5	PC	ET2502	Industrial Automation and Robotics	T	3	0	0	3	3	30	30	40	3
3	5	PC	ET2503	Design Lab	P	0	0	2	2	1		60	40	3
4	6	PC	ET2511	Machine learning	T	3	0	0	3	3	30	30	40	3
5	6	PC	ET2512	Artificial Intelligence	T	3	0	0	3	3	30	30	40	3
6	6	PC	ET2513	Simulation Lab	P	0	0	2	2	1		60	40	3
7	7	PC	ET2521	Advanced Digital Communication	T	3	0	0	3	3	30	30	40	3
8	7	PC	ET2522	Advanced Digital Communication Lab	P	0	0	2	2	1		60	40	3
					TOTAL	**15**	**0**	**6**	**21**	**18**				

MSEs* = Three MSEs of 15 Marks each will conducted and marks of better 2 of these 3 MSEs will be considered for Continuous

TA ** = for Theory : 20 marks on lecture quizzes, 8 marks on assignments, 2 marks on class performance

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

		June 2020	**1.00**	**Applicable for AY 2020-21 Onwards**
Chairperson	**Dean (Acad. Matters)**	**Date of Release**	**Version**	

V Semester
ET2501: Internet of Things

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1. To understand the physical and Logical design of IoT. 2. To study the M2M and NETCONF. 3. To understand python programming. 4. To understand physical servers and cloud offerings.	1. Explore the physical and Logical design of IoT. 2. Explore the M2M and NETCONF. 3. Explore python programming. 4. Apply basic skills of IoT to solve real life problems.

UNIT-1:
Introduction & Concepts: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels. **5 Hrs.**

UNIT-2:
Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style. **6Hrs**

UNIT-3:
M2M & System Management with NETCONF-YANG: M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG. **7Hrs**

UNIT-4:
Developing Internet of Things & Logical Design using Python: Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions **6Hrs**

UNIT-5:
Python Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages, IoT Device-Raspberry Pi, Programming Raspberry pi with Python **6Hrs**

UNIT-6:
IoT physical servers and cloud offerings, Introduction to cloud storage models and communication APIs, Python web application frame work-Django, Amezon web service for IoT **7Hrs**

Text books:				
1	Internet of Things: A Hands-On Approach	1st edition 2015	by Arshdeep Bahga, Vijay Madisetti	Orient Blackswan Private Limited - New Delhi
Reference books:				
1	Designing the Internet of Things	1st edition	By Adrian McEwen	Wiley
2	Python for Everybody		Charles R. Severance	

V Semester
ET2502: Industrial Automation and Robotics

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1. Learn the basic Concept of Industrial Automation. 2. Understand functioning of automation components. 3. Learn the programming related to automation and robotics. 4. Understand the concept behind controlling systems.	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

(5 Hours)

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.

(6 Hours)

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.

(7 Hours)

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.

(6 Hours)

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.

(6 Hours)

UNIT VI: Robot Programming

Methods - languages - Capabilities and limitation - Artificial intelligence - Knowledge representation - Search techniques - A1 and Robotics.

(6 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,

V Semester
ET2503: Design Lab

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1. Learn Python Programming 2. Understand the interfacing with the Raspberry pi 3. Learn the program for PLC and Robotics. 4. Understand characteristics of automation components	1. Explore Python Programming 2. Explore the interfacing with the Raspberry pi 3. Write the program for PLC and Robotics. 4. Explore characteristics of automation components

Expt. No.	Name of Experiment
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	Experiment based on Integration of assorted sensors (IR, Potentiometer, strain gages etc.), micro controllers and ROS (Robot Operating System) in a robotic system.
7	Experiment based on Robot programming.
8	Measurement of Temperature using RTD.
9	Measurement of Strain using Strain Gauge or load cell
10	Study the characteristics of LVDT
11	Performed logical operation using Ladder Diagram.
12	Study of PLC Programmer
13	**Mini-project**

VI Semester
ET2511: Machine learning

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1. Understand the concepts of machine learning and regression models 2. Understanding clustering techniques and their utilization in machine learning 3. Learn neural network classification for machine learning 4. Understand the clustering techniques and dimensionality reduction	1. Explain and apply the concepts of machine learning and regression models 2. Identify and apply clustering techniques and their utilization 3. Apply neural network algorithms for classification 4. Explain and solve problems using clustering techniques and dimensionality reduction

Prerequisites: Basic probability and statistics, linear algebra and calculus and some background in programming

UNIT I :

Introduction to Machine learning, types of Machine learning, Classification of problem – Regression and Classification, Supervised and Unsupervised learning, basics of statistical learning theory **06Hrs**

UNIT II :

Linear Regression: Model representation for single variable, Single variable Cost Function, Gradient Decent for Linear Regression, Multivariable model representation, Multivariable cost function, Gradient Decent in practice, Normal Equation and non-invertibility **06Hrs**

UNIT III :

Logistic Regression: Classification, Hypothesis Representation, Decision Boundary, Cost function, Advanced Optimization, Multi-classification (One vs All), Problem of Overfitting, Regularization, KNN, SVM, Decision tree **06Hrs**

UNIT IV :

Introduction to neural network, perceptron rule/multi-layer perceptrons, backpropagation, brief introduction to deep learning models

06Hrs

UNIT V:

Clustering: k-means, spectral clustering: graph models**,** Gaussian mixture models **06Hrs**

UNIT VI:

Dimensionality reduction: PCA, ICA and LDA. **06Hrs**

		June 2019	1.00	Applicable for AY 2019-20 Onwards
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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

VI Semester
ET2512: Artificial Intelligence

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1. Learn the fundamentals of Artificial Intelligence, Autonomous Agents. 2. Learn the problem solving techniques. 3. Understand the Knowledge and Reasoning based methods 4. Study the machine learning and Natural Language Processing.	1. Apply basic of Artificial Intelligence programming techniques 2. Solve the problems using different search techniques. 3. Describe the Knowledge and Reasoning based methods 4. Describe the concept of Machine Learning and Natural Language Processing

UNIT 1: Introduction to AI and intelligent agents: reactive, deliberative, goal-driven, utility-driven, and learning agents, Artificial Intelligence programming techniques (5 Hours)
UNIT 2: Problem Solving: Solving Problems by Searching, heuristic search techniques, constraint satisfaction problems, stochastic search methods. Game Playing: minimax, alpha-beta pruning. (6 Hours)
UNIT 3: Knowledge and Reasoning: Building a Knowledge Base: Propositional logic, first order Logic, situation calculus. Theorem Proving in First Order Logic. Planning, partial order planning. (6 Hours)
UNIT 4: Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks. (7 Hours)
UNIT 5: Machine Learning: Overview of different forms of learning, Learning Decision Trees, Neural Networks (6 Hours)
UNIT 6: Introduction to Natural Language Processing, Deep Learning for Natural Language Processing, Computer Vision (6 Hours)

Text books:				
1	Artificial Intelligence: A Modern Approach		Stuart Russell and Peter Norvig	Prentice-Hall
2	Artificial Intelligence: A New Synthesis		Nils J. Nilsson	Morgan-Kaufmann
Reference books:				
1	Dr. Dheeraj Mehrotra		Basics of Artificial Intelligence & Machine Learnig ,	Kindle Edition

VI Semester
ET2513: Simulation Lab

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1. Understand the concepts of regression models 2. Learn neural network classification for machine learning 3. Understanding clustering techniques and their utilization in machine learning 4. Solve the problems using search techniques and NLP	1. Implement and apply regression models 2. Apply neural network algorithms for classification 3. Apply clustering techniques and their utilization 4. Apply search techniques and NLP in problem solving

Expt. No.	Name of Experiment
1.	Experiment based on linear regression
2.	Experiment based on Logistic regression
3.	Implementation of AND/OR/NOT Gate using Single Layer Perceptron: http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/exp1/index.php
4.	Experiment based on gradient Descent
5.	Implementation of XOR Gate Using Multi-Layer Perceptron/ Error Back Propagation http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/exp2/index.php
6.	Case study explaining function of Optical Character Recognition http://vlabs.iitb.ac.in/vlabs-dev/labs/machine_learning/labs/exp11/index.php
7.	Classify your uploaded image Python using TensorFlow 2 with Keras support https://www.kdnuggets.com/2020/05/interactive-machine-learning-experiments.html
8.	Experiment based on Clustering and dimension reduction
9.	Experiment based on Search Methods
10.	Experiment based on Deep Learning for Natural Language Processing
11.	Case study

VII Semester
ET2521: Advanced Digital Communication

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1) Learn Baseband representation, reception and probability of error 2) Understand the transmission errors in digital communication systems 3) Understand the concept of spread spectrum modulation, its types and applications. 4) Understand the practical applications of Multichannel and multicarrier communication systems	1) Distinguish various digital modulation techniques. 2) Analyze the probability of errors in digital communication systems. 3) Apply spread spectrum modulation for various applications of communication systems. 4) Distinguish Multichannel and multicarrier communication systems

UNIT-1: Representations of band pass signal and systems: signal space representation, representation of digitally modulated signals, spectral characteristics of digitally modulated signals. **06 Hrs**

UNIT-2: Review of fundamental concepts and parameters in Digital Communications: Minimum Shift Keying (MSK) Modulation, GMSK, Continuous Phase Modulation (CPM) Schemes Channel Characterization and Modelling, **06 Hrs**

UNIT-3:Baseband reception and probability of error: The ML and MAP detection strategies, ML detection with zero mean AWGN, the optimum filter, Schwarz's inequality, transfer function of optimum filter, equalization, the zero forcing equalizer, adaptive equalizer, scrambling, the eye pattern **06 Hrs**

UNIT-4: Error Control Coding: Introduction, error control strategies, modulo-2 arithmetic, error correcting codes, block codes, convolutional codes, turbo codes **06 Hrs**

UNIT-5: Spread spectrum signals for digital communications: CDMA signals, Code Acquisition and Tracking, multiple access technique, gold codes **06 Hrs**

UNIT-6: Multichannel and Multicarrier Systems: Digital Communications through Fading Multipath channels; Multi User Communications. **06 Hrs**

Text books:

1	Digital Communications	1995 4th Edition	J. G. Proakis	McGraw Hill
2	Digital Communications	2011	P.RamkrishnaRao	McGraw Hill

Reference books:

1	Principles of Digital Communications and Coding	1979	J. Viterbi and J. K. Omura	McGraw Hill
2	Digital Communications	1998	Simon Haykin	John Wiley & Sons

VII Semester
ET2522: Lab: Advanced Digital Communication

Course Learning Objective Students should be able to	Course Outcomes Students will be able to
1) Learn Baseband representation, reception and probability of error 2) Understand the transmission errors in digital communication systems 3) Understand the concept of spread spectrum modulation, its types and applications. 4) Understand the practical applications of Multichannel and multicarrier communication systems	1) Distinguish various digital modulation techniques. 2) Analyze the probability of errors in digital communication systems. 3) Apply spread spectrum modulation for various applications of communication systems. 4) Distinguish Multichannel and multicarrier communication systems

Expt. No.	Name of Experiment
1	To write MATLAB Program for generation and detection ASK signal
2	To write MATLAB Program for generation and detection BPSK signal
3	To write MATLAB Program for generation and detection QPSK signal
4	To write MATLAB Program for generation and detection MSK signal
5	To write MATLAB Program for Matched filter receiver
6	To write MATLAB Program for generation and detection 16-PSK signal
7	To generate eye diagram with channel noise and without a band limiting filter
8	To perform practical on the data scrambler and descrambler.
9	Perform a Monte Carlo simulation of an M=8 QAM communication system.
10	To Perform DSSS using Simulink.