BBAI501 HUMAN VALUES AND PROFESSIONAL ETHICS

SUBJECT CODE	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
		THEORY			PRACTICAL		L	T	P	CREDITS
		END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BBAI501	Human Values and Professional Ethics	60	20	20	-	-	4	-	-	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based on following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Objectives

The objective of the course is to disseminate the theory and practice of moral code of conduct and familiarize the students with the concepts of "right" and "good" in individual, social and professional context

Course Outcomes

1. Help the learners to determine what action or life is best to do or live.
2. Right conduct and good life.
3. To equip students with understanding of the ethical philosophies, principles, models that directly and indirectly affect business.

COURSE CONTENT

Unit I: Human Value

1. Definition, Essence, Features and Sources
2. Sources and Classification
3. Hierarchy of Values
4. Values Across Culture

Unit II: Morality

1. Definition, Moral Behaviour and Systems
2. Characteristics of Moral Standards
3. Values Vs Ethics Vs Morality
4. Impression Formation and Management

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Unit III: Leadership in Indian Ethical Perspective.

1. Leadership, Characteristics
2. Leadership in Business (Styles), Types of Leadership (Scriptural, Political, Business and Charismatic)
3. Leadership Behaviour, Leadership Transformation in terms of Shastras (Upanihads, Smritis and Manu-smriti).

Unit IV: Human Behavior – Indian Thoughts

1. Business Ethics its meaning and definition
2. Types, Objectives, Sources, Relevance in Business organisations.
3. Theories of Ethics, Codes of Ethics

Unit V: Globalization and Ethics

1. Sources of Indian Ethos & its impact on human behavior
2. Corporate Citizenship and Social Responsibility – Concept (in Business),
3. Work Ethics and factors affecting work Ethics.

Suggested Readings

1. Beteille, Andre (1991). ***Society and Politics in India***. Athlone Press:New Jersey.
2. Chakraborty, S. K. (1999). ***Values and Ethics for Organizations***. oxford university press
3. Fernando, A.C. (2009). ***Business Ethics - An Indian Perspective*** .India: Pearson Education: India
4. Fleddermann, Charles D. (2012). ***Engineering Ethics***. New Jersey: Pearson Education / Prentice Hall.
5. Boatright, John R (2012). ***Ethics and the Conduct of Business.***Pearson. Education: New Delhi.
6. Crane, Andrew and Matten, Dirk (2015). ***Business Ethics***. Oxford University Press Inc:New York.
7. Murthy, C.S.V. (2016). Business ***Ethics – Text and Cases***. Himalaya Publishing House Pvt. Ltd:Mumbai
8. Naagrajan, R.R (2016). ***Professional Ethics and Human Values***. New Age International Publications:New Delhi.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Joint Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya
Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B. Tech. in Robotics and Automation w.e.f. 2024

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA701		**Image Analysis and Computer Vision**	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** – Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To study the fundamentals of image processing.
2. To study segmentation, feature extraction and recognition.

Course Outcomes:

Students will be able to

1.To implement fundamental image processing techniques required for computer vision.
2. Understand Image formation process and perform shape analysis.
3. Extract features form Images and analyze Images.
4. To develop applications using computer vision techniques.
5. Understand video processing, motion computation and 3D vision and geometry.

Syllabus:

UNIT I **8 Hrs.**

Introduction: Image Processing, Computer Vision and Computer Graphics, Types of Computer Vision: Low-level, Mid-level, High-level, Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Virtual Reality and Augmented Reality.

UNIT II **8 Hrs.**

Image Formation Models: Monocular imaging system, Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, Depth from Defocus, Construction of 3D model from images.

UNIT III **7 Hrs.**

Image Processing and Feature Extraction: Image preprocessing, Image representations (continuous and discrete), Edge detection.

Motion Estimation: Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.

Shape Representation and Segmentation: Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations.

Chairperson	Chairperson	Controller of Examinations	Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

UNIT IV **6 Hrs.**

Object recognition: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal component analysis, Shape priors for recognition pattern recognition methods, HMM, GMM and EM.

UNIT V **7 Hrs.**

Face detection: Face recognition, Eigen faces, Active appearance and 3D shape models of faces Application: Surveillance, foreground and background separation, particle filters, Chamfer matching, tracking, and occlusion. Application: In-vehicle vision system: locating roadway, road markings, identifying road signs, locating pedestrians.

Text Books:

1. D. Forsyth and J. Ponce, "Computer Vision - A modern approach", Pearson Education India; 2nd edition, 2015.
2. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
3. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.

References:

1. Richard Szeliski, "Computer Vision: Algorithms and Applications (CVAA)", Springer, 2010.
2. M. Sonka, V. Hlavac, and R. Boyle, "Image Processing, Analysis, and Machine Vision", 4th ed., Boston, MA, USA: Cengage Learning, 2014.
3. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012
4. R. C. Gonzalez, R. E. Woods, "Digital Image Processing" Addison Wesley Longman, Inc., 4th Edition, 2018.

List of Experiments:

1. Implement image pre-processing and Edge detection
2. Implement camera calibration methods
3. Implement Projection
4. Determine depth map from Stereo pair
5. Construct 3D model from Stereo pair
6. Implement Segmentation methods
7. Construct 3D model from defocus image
8. Construct 3D model from Images
9. Implement optical flow method
10. Implement object detection and tracking from video
11. Face detection and Recognition
12. Object detection from dynamic Background for Surveillance

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Robotics and Automation w.e.f. 2024

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTECIOT711	EC	Principles of Artificial Intelligence and Machine Learning	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C – Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
The student will have ability to:
1. Know how to build simple knowledge-based systems.
2. Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms).
3. Ability to apply knowledge representation, reasoning, and machine learning techniques to real world problems.

Course Outcomes (COs):
Upon completion of the subject, students will be able to:
1. Describe the key components of the artificial intelligence (AI) field.
2. Identify and describe artificial intelligence techniques, including search heuristics, knowledge representation, automated planning and agent systems, machine learning, and probabilistic reasoning.
3. Identify and apply AI techniques to a wide range of problems, including complex problem solving via search, knowledge-base systems, machine learning, probabilistic models, agent decision making.
4. Analyze and understand the machine learning and various algorithms

Syllabus:

UNIT I **7 Hrs.**

Introduction To AI

Introduction to AI, Problem formulation, Problem solving methods, Problem graphs, Matching, Indexing and Heuristic functions: Hill Climbing, Depth first and Breath first, Constraints satisfaction, Related algorithms, Measure of performance and analysis of search algorithms.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

UNIT II **6 Hrs.**

Representation of knowledge

Knowledge Representation Issues: Representations and Mappings, Approaches to Knowledge Representation. Knowledge representation using Predicate logic, Knowledge representation using other logic, Structured representation of knowledge.

UNIT III **7 Hrs.**

Knowledge inference

Knowledge Inference, Production based system, Frame based system. Inference, Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning, Certainty factors, Bayesian Theory.

UNIT IV **8 Hrs.**

Machine Learning (ML)

Types of ML, Supervised ML. Unsupervised ML, Semi Supervised ML. Reinforcement ML. Regression Algorithms: Simple Linear Regression, Multiple Regression, Polynomial Regression, Support Vector Regression SVR, Decision Tree Regression, Random Forest Regression.

UNIT V **7 Hrs.**

Classification of Algorithms

Supervised ML: K Nearest Neighbours, Support Vector Machine (SVM), Kernel SVM, Decision Trees Classification, Random Forest Classification, Semi-supervised learning with EM using labeled and unlabeled data, Unsupervised Learning: Dimension Reductionality, PCA and LDA, clustering and Association algorithm.

Text books:

1. Rich E and Knight K, "Artificial Intelligence", Third Edition, TMH, 2017.
2. Nelsson N.J., "Principles of Artificial Intelligence", First Edition, Springer Verlag, Berlin.
3. Oliver Theobald, "Machine Learning for Absolute Beginners: A Plain English Introduction", 2nd Edition, 2017.

Reference Books:

1. S. Rajasekaran and G. A. Vijayalakshmi Pai, Neural Networks, Fuzzy Systems and Evolutionary Algorithms: Synthesis and Applications, 2nd ed., PHI Learning, 2017.
2. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, 4th ed. Harlow, UK: Pearson, 2020.
3. E. Alpaydin, Introduction to Machine Learning, 4th ed. Cambridge, MA, USA: The MIT Press, 2020.

List of Experiments

1. Implement Depth First Search (DFS) and Breadth First Search (BFS) for a simple graph using Python.
2. Apply Hill Climbing Algorithm to find the maximum of a mathematical function.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

3. Represent Knowledge using Propositional and Predicate Logic with simple Python examples.
4. Develop a Rule-Based Expert System (e.g., suggesting fruits based on color/taste).
5. Implement Forward Chaining to derive new facts from a set of rules and facts.
6. Implement Backward Chaining for problem-solving in Python.
7. Apply Bayes' Theorem to solve a simple probabilistic inference problem (e.g., medical diagnosis).
8. Implement Linear Regression using scikit-learn on a small dataset.
9. Classify Data using K-Nearest Neighbors (KNN) (e.g., Iris dataset classification).
10. Build a Decision Tree Classifier for a simple dataset (e.g., predicting student pass/fail from marks).

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B. Tech. in EC/ ECIOT w.e.f. 2023

COURSE CODE	Category	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA722		IOT and Data Analytics	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** – Credit.
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

The objective of this course is to:

1. Explore the fundamental concepts of big data analytics.
2. Learn the different ways of data analysis.
3. Understand the various search methods and visualization techniques.

Course Outcomes (COs):

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes. The students will be able to:

1. Analyze the big data using intelligent techniques.
2. Perform analytics on data streams.
3. Learn NoSQL databases and management.
4. Understand ethical and privacy issues in data science conduct and apply ethical practices.

Syllabus

UNIT I

Introduction To Big Data Platform, Challenges Of Conventional Systems, Web Data, Evolution Of Analytic Scalability, Analytic Processes And Tools, Analysis Vs Reporting – Modern Data Analytic Tools, Statistical Concepts: Sampling Distributions, Resampling, Statistical Inference, Prediction Error.

UNIT II

Regression Modeling, Multivariate Analysis, Bayesian Modeling, Inference and Bayesian Networks, Support Vector and Kernel Methods, Analysis of Time Series: Linear Systems Analysis, Nonlinear Dynamics, Rule Induction.

UNIT III

Introduction To Streams Concepts, Stream Data Model And Architecture, Stream Computing, Sampling Data In A Stream, Filtering Streams, Counting Distinct Elements In A Stream, Estimating Moments, Counting Oneness In A Window, Decaying Window.

UNIT IV

Real time Analytics Platform (RTAP) Applications, Case Studies: Real Time Sentiment Analysis, Stock Market Predictions, Data Science and Ethical Issues, Discussions on privacy, security, ethics.

Chairperson	Chairperson	Controller of Examinations	Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

UNIT V

NoSQL Databases: Schema-less Models, Increasing Flexibility for Data Manipulation, Key Value Stores, Document Stores, Tabular Stores, Object Data Stores, Graph Databases Hive, Sharding, Hive and HBase for data storage and processing.

Text Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Anand Rajaraman And Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.
3. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/Elsevier Publishers, 2013.

References Books:

1. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities In Huge Data Streams With Advanced Analytics", John Wiley & Sons, 2012.
2. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O"Reilly, 2011.
3. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

List of Experiments:

1. To implement Map Reduce programs for processing big data
2. To realize storage of big data using H base.
3. To analyse big data using linear models
4. To analyse big data using machine learning techniques such as SVM / Decision tree classification and clustering.
5. Implement Linear and logistic Regression
6. To study and implement basic functions and commands in R Programming.
7. To implement clustering program using R programming.
8. To find Term Frequency and Inverse Document Frequency (tf-idf) Matrix for Recommendation Systems and Plot TF Using R used.
9. To finding similar documents with Cosine Similarity in R.
10. To run a basic Word Count MapReduce program to understand MapReduce Paradigm: To count words in a given file, to view the output file, and to calculate execution time.

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Mechatronics
(2021-2025)

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEI702	DSE	MEMS and NEMS	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
The main goal of this course is to make learners gain knowledge of designing and fabrication process which is essential for simulation of nanoelectronics devices.
1. To understand the limitations of silicon electronics and progress of nanoelectronics.
2. To study the significance of tunneling effect in nano electronic devices.
3. To understand the concepts of coulomb blockade and electron transport.
4. To emphasize the importance of electronic property of materials at a mesoscopic level

Course Outcomes (COs):
1. Students will understand the diver's electronic device fabrication.
2. Students will have in-depth technical knowledge in one or more areas of specialization.
3. Students will have practical understanding of the major engineering concepts and demonstrate application of their theoretical knowledge of the concepts and help to get the academic and industrial jobs.
4. Students will be able to interact scientifically with industry both within and outside of a classroom setting.
5. Students will develop an appreciation of continuing educational and professional development.

Syllabus

UNIT I **7 Hrs.**

UNIT I OVERVIEW AND INTRODUCTION

New trends in Engineering and Science: Micro and Nano scale systems Introduction to Design of MEMS and NEMS, Overview of Nano and Micro electromechanical Systems, Applications of Micro and Nano electromechanical systems, Micro electromechanical systems, devices and structures Definitions, Materials for MEMS: Silicon , silicon compounds, polymers, metals.

UNIT II MEMS FABRICATION TECHNOLOGIES **8 Hrs.**

Microsystem fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation. Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching techniques: Dry and wet etching, electrochemical etching,

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Mechatronics
(2021-2025)

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTEI702	DSE	MEMS and NEMS	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect-Ratio (LIGA and LIGA-like) Technology; Packaging: Microsystems packaging, Essential packaging technologies, Selection of packaging materials.

UNIT III MICRO SENSORS **7 Hrs.**

MEMS Sensors: Design of Acoustic wave sensors, resonant sensor, Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors- engineering mechanics behind these Microsensors. Case study: Piezo-resistive pressure sensor

UNIT IV MICRO ACTUATORS **7 Hrs.**

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps. Case study: Comb drive actuators.

UNIT V NANOSYSTEMS AND QUANTUM MECHANICS **7 Hrs.**

Atomic Structures and Quantum Mechanics, Molecular and Nanostructure Dynamics: Schrodinger Equation and Wavefunction Theory, Density Functional Theory, Nanostructures and Molecular Dynamics, Electromagnetic Fields and their quantization, Molecular Wires and Molecular Circuits.

Text Books:

1. Marc Madou, "Fundamentals of Micro fabrication", CRC press 1997.
2. Stephen D. Senturia," Micro system Design", Kluwer Academic Publishers,2001

References:

1. Tai Ran Hsu," MEMS and Microsystems Design and Manufacture" ,Tata Mcraw Hill, 2002.
2. Chang Liu, "Foundations of MEMS", Pearson education India limited, 2006
3. www.tutorials point.com.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Mechatronics
(2021-2025)

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assesssment*				
BTEI702	DSE	MEMS and NEMS	60	20	20	30	20	3	0	2	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

List of Experiments:

1. To diagram the output's properties, Comparison of n- and p-channel MOSFET transfer characteristics.
2. To create 2-input NAND, NOR XOR, and XNOR logic gates and then visualise their dynamic features using CMOS technology.
3. Create a positive and negative latch and then draw its features using multiplexers.
4. Using multiplexers, create a master/slave positive/negative edge triggered register and then visualise its properties.
5. To plan CMOS and NMOS inverter circuitry.
6. Common-source amplifier frequency response analysis.
7. Frequency response analysis of common drain amplifiers
8. Single-Stage Cascode Amplifier Design and Simulation.
9. The Cascode Current Mirror Amplifier, a Very Simple Current Mirror, and Their Design and Simulation.
10. Building and simulating a 5-transistor differential amplifier.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech. in Robotics and Automation w.e.f. 2024

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA713	EC	Field and Service Robotics	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C – Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

1. To study the various parts of robots and fields of robotics.
2. To study about the localization, planning and navigation.
3. To study the control of robots for some specific applications.
4. To study humanoid robots.

Course Outcomes:

Students will be able to

1. Understand the concepts of localization and path planning.
2. Design and create robots to perform tasks from simple movement to complex interactions with the world.

Syllabus:

UNIT I **8 Hrs.**

Introduction

History of service robotics, Present status and future trends, Need for service robots - applications- examples and Specifications of service and field Robots. Non-conventional Industrial robots.

UNIT II **7 Hrs.**

Localization

Introduction, Challenges of Localization, Map Representation, Probabilistic Map based Localization, Monte carlo localization, Landmark based navigation, globally unique localization, Positioning beacon systems- Route based localization

UNIT III **7 Hrs.**

Planning and Navigation

Introduction, Path planning overview, Road map path planning, Cell decomposition path planning, Potential field path planning, Obstacle avoidance, Case studies: tiered robot architectures.

Chairperson	Chairperson	Controller of Examinations	Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

UNIT IV **6 Hrs.**

Field Robots

Ariel robots: Collision avoidance, Robots for agriculture, mining, exploration, underwater, civilian and military applications, nuclear applications, Space applications.

UNIT V **8 Hrs.**

Humanoids

Wheeled and legged, Legged locomotion and balance, Arm movement, Gaze and auditory orientation control, Facial expression, Hands and manipulation, Sound and speech generation, Motion capture/Learning from demonstration, Human activity recognition using vision, touch, sound, Vision, Tactile Sensing, Models of emotion and motivation. Performance, Interaction, Safety and robustness, Applications, Case studies.

Text Books:

1. Roland Siegwart, Illah Reza Nourbakhsh, Davide Scaramuzza, "Introduction to Autonomous Mobile Robots", Bradford Company Scituate, USA, 2011.
2. Riadh Siaer, "The future of Humanoid Robots- Research and applications", Intech Publications, 2012.
3. Rajesh Subramanian, *Build Autonomous Mobile Robot from Scratch Using ROS: Simulation and Hardware*, Maker Innovations Series, Apress, 1st ed., 2023.

Reference Books:

1. Richard D Klafter, Thomas A Chmielewski, Michael Negin, "Robotics Engineering – An Integrated Approach", Eastern Economy Edition, Prentice Hall of India P Ltd., 2006.
2. Kelly, Alonzo; Iagnemma, Karl; Howard, Andrew, "Field and Service Robotics ", Springer, 2011.

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B. Tech. ECIOT/RA/EI w.e.f. 2022

SUBJECT CODE	Category	SUBJECT NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTECIOT703	EC	Wireless Sensor Networks	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; C - Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
This course discusses protocols and architectures for wireless sensor network design. It covers wireless sensor node and network architectures, and communication protocols in different layers. The course focuses on topics for wireless sensor networks such as time synchronization, localization, and topology management.

Course Outcomes (COs):
After the completion of this course, the student should be able to:
1. Elaborate various applications of wireless sensor networks,
2. Describe the concepts, protocols, and differences underlying the design, implementation, and use of wireless sensor networks, and
3. Propose, implement, and evaluate new ideas for solving wireless sensor network design issues.

Syllabus

UNIT I **6 Hrs.**
Introduction: Definition, challenges and constraints of Wireless Sensor Networks (WSN), Advantages of Sensor Networks, Applications of Sensor Networks, Enabling technologies for WSN, Operating systems and execution environments.

UNIT II **7 Hrs.**
Node architecture: Sensor Node Technology, sensing subsystem, processor subsystem-architectural overview, communication interfaces. Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components & design constraints.

UNIT III **7 Hrs.**
Deployment and Configuration: Localization and positioning, different types of localization, Coverage and connectivity, Single-hop and multihop localization, self-configuring localization systems, sensor management, ranging techniques.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

UNIT IV **7 Hrs.**

Routing protocols: Classification of routing protocols, Routing Challenges and Design issues in WSN, Routing Strategies in WSN, Data Dissemination and Gathering, Concepts of Flooding, Directed Diffusion, Negotiation and Clustering Hierarchy.

UNIT V **7 Hrs.**

Data Storage and Manipulation: Data centric and content-based routing, Energy-efficient routing, Geographical routing. Storage and retrieval in network, compression technologies for WSN, data aggregation techniques. Security attacks in wireless sensor networks.

Text Books:

1. Kazem, Sohraby, Daniel Minoli, Taieb Zanti, "Wireless Sensor Network: Technology, Protocols and Application", John Wiley and Sons 1st Ed., 2007.
2. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory & Practice", John Wiley and Sons, 2010.

References:

1. Holger Kerl, Andreas Willig, "Protocols and Architectures for Wireless Sensor Network", John Wiley and Sons, 2005.
2. Books on Demand, *Wireless Sensor Networks: Design, Deployment and Applications*, 2021.
3. Feng Zhao, Leonidas Guibas, "Wireless Sensor Network", Elsevier, 1st Ed. 2004.
4. B. Krishnamachari, "Networking Wireless Sensors", Cambridge University Press, 2005
5. Edla, Kongara, Lipare, and Kuppili, *Wireless Sensor Networks: Evolutionary Algorithms for Optimizing Performance*, CRC Press, 2021.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Department of Electrical and Electronics Engineering
Choice Based Credit System (CBCS) in the Light of NEP-2020
B. Tech. Robotics and Automation w.e.f. 2023

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA733		Design and Failure Analysis	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):
The goal of the Failure Analysis and Design course is to familiarize the students with various failure modes and examine the failed components.

Course Outcomes (COs):
The students will be able to
1. Recognize and describe common engineering failure mechanisms.
2. Detect and diagnose the machine faults from the vibration signals.
3. Predict the remaining useful life of the components using fatigue, fracture and creep.
4. Analyze the failed engineering components.

Syllabus

UNIT I
Introduction to Failures **5 Hrs.**
Introduction and causes of failures, classification, steps in failure analysis, tools, sample selection and treatment, materials analysis, Equipment's metallography, commonly used NDT methods. Failure mechanisms, overload failure, Wear failures, adhesive, abrasive, erosive, corrosive wear. Elevated temperature failures, creep, creep crack branching. Corrosion failures, types and their identification.

UNIT II
Introduction to Fracture **6 Hrs.**
Type of fracture, Theoretical cohesive strength of metals, Griffith theory of brittle fracture, fracture single crystals, Metallographic aspects of fracture, Dislocation theories of brittle fracture, Ductile fracture, Notch effects, Fracture under combined stresses.

UNIT III
Fatigue Analysis **7 Hrs.**
Fatigue mechanisms, classical fatigue prevention and prediction, fractography, damage tolerant fatigue approach. Fatigue, the Wöhler curve, Fatigue probability curves, Crack initiation and crack propagation in fatigue, Benchmarks and striations, the Paris-Erdogan equation, Environmental factors affecting fatigue, design against fatigue.

Chairperson	Chairperson	Controller of Examinations	Registrar
Board of Studies	Faculty of Studies	Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth
Shri Vaishnav Vidyapeeth	Shri Vaishnav Vidyapeeth	Vishwavidyalaya, Indore	Vishwavidyalaya, Indore
Vishwavidyalaya, Indore	Vishwavidyalaya, Indore		

Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Department of Electrical and Electronics Engineering
Choice Based Credit System (CBCS) in the Light of NEP-2020
B. Tech. Robotics and Automation w.e.f. 2023

COURSE CODE	CATE-GORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA733		Design and Failure Analysis	60	20	20	0	0	3	1	0	4

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit.
***Teacher Assessment** shall be based on the following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

UNIT IV **7 Hrs.**

Application and case studies on Failure analysis

Case Studies: Computer Finite element models for failure failures Finite Element modeling of Rigid and Flexible bodies, Finite Element method for crush and deformation, Case Studies: Fracture studies (Appliance Failure), Use of Reliability theory to improve safety. Failures of cast and welded components, failures of rotating components-shaft, bearing and gears.

UNIT V **5 Hrs.**

Design Application of the Knowledge of Failure

Design considering fatigue-Gebers parabola, Soderberg equation, lubricating optimally to combat bearing failures. Selection of materials to prevent seizure, galling, etc. Wear reduction techniques, Fracture toughness consideration in design.

Text Books:

1. Hock-Chye Qua, Ching-Seong et al., Applied Engineering Failure Analysis: Theory and Practice. Publisher Taylor & Francis, 2015.
2. Jones D. R. H., "Engineering Materials 3, Materials Failure Analysis: Case Studies and Design Implications", Pergamon Press, 1993.
3. ASM Handbook, Vol. 11, "Failure Analysis and Prevention" Edited by, ASM Publications, 2002.
4. ASM Handbook, Volume 11A: Analysis & Prevention of Component & Equipment Failures (2021) and Volume 11B: Characterization & Failure Analysis of Plastics.

References:

1. Jones D. R. H. "Failure Analysis and Case Studies", Elsevier Publications, 1998.
2. Robert Bond Randall, "Vibration-Based Condition Monitoring: Industrial, Aerospace and Automotive Applications", John Wiley & Sons, 2021.
3. W.D. Callister, Jr., D.G. Rethwisch, Materials Science and Engineering: An Introduction, John Wiley & Sons, 2009.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Shri VaishnavVidyapeethVishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech in Robotics and Automationw.e.f 2022

COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA702		**PLC Lab**	0	0	0	30	20	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Course Educational Objectives (CEOs):

To understand the concept of:

1. Advanced PLC architecture, programming languages, and industrial automation systems.
2. Design and development of complex control systems using PLC.
3. Integration of PLC with SCADA, HMI, and industrial communication networks.

Course Outcomes (COs):

After completing the course students will be able to:

1. Analyze and design complex industrial automation systems using PLC.
2. Develop programs using multiple PLC programming languages (Ladder Logic, Function Block Diagram, Structured Text).
3. Integrate PLC systems with HMI/SCADA and industrial communication protocols.
4. Implement advanced control strategies including analog control, PID control, and motion control.
5. Troubleshoot, optimize, and document industrial PLC-based automation systems.

List of Experiments:

1. Study of advanced PLC architecture, memory organization, and I/O addressing.
2. Programming exercises using Ladder Logic, Function Block Diagram (FBD), and Structured Text (ST).
3. Implementation of combinational logic circuits and Boolean expressions using PLC.
4. Advanced timer and counter applications.
5. Design and implementation of sequential control systems.
6. Process control applications.
7. Industrial automation projects.
8. SCADA/HMI integrate with PLC.
9. PLC communication and networking.
10. Mini project: Design, simulate, and implement a complete industrial automation system using PLC with comprehensive documentation.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth
Vishwavidyalaya, Indore

Shri VaishnavVidyapeethVishwavidyalaya, Indore
Shri Vaishnav Institute of Technology and Science
Choice Based Credit System (CBCS) in the Light of NEP-2020
B.Tech in Robotics and Automationw.e.f 2022

COURSE CODE	CATEGORY	COURSE NAME	TEACHING &EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTRA702		PLC Lab	0	0	0	30	20	0	0	2	1

Legends: **L** - Lecture; **T** - Tutorial/Teacher Guided Student Activity; **P** – Practical; **C** - Credit;
***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

Text Books:

1. Frank D. Petruzella, "Programmable Logic Controllers", 6th Edition, McGraw-Hill Education, 2022.
2. M. T. White, "Mastering PLC Programming: The Software Engineering Survival Guide to Automation Programming", Packt Publishing, 2023.

Reference Books:

1. M. T. White, "PLCs for Beginners: An Introductory Guide to Building Robust PLC Programs with Structured Text", Packt Publishing, 2024.
2. Ashraf Said AlMadhoun, "PLC SCADA for Beginners: Understanding and Implementing Industrial Automation Systems", Springer, 2023.
3. Gary A. Dunning, "Introduction to Programmable Logic Controllers", 3rd Edition, Delmar Cengage Learning, 2006.
4. Himanshu Kumar, "Advanced Industrial Automation: PLC Programming in Simplest Way with 110 Solved Examples", Notion Press, 2020.
5. R. G. Jamkar, "Industrial Automation Using PLC SCADA & DCS", Dreamtech Press, 2019.
6. Tom Mejer Antonsen, "PLC Programming Using RSLogix 500: A Practical Guide to Ladder Logic", Self-Published, 2024.

Chairperson
Board of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Chairperson
Faculty of Studies
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Controller of Examinations
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore

Registrar
Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore