JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

Course Structure for Electronics & Instrumentation Engineering
B. Tech Course (2013-14)

IV B. Tech – II Sem

S.No.	Course Code	Subject	Theory	Tu	Lab	Credits
1	13A04704 13A10801	Theory-I MOOC-I* 1. Digital Image Processing 2. Mems and Its Applications	3	1	-	3
2	13A05707 13A05403	Theory-I MOOC-II* 1. Artificial Intelligence 2. Java Programming	3	1	-	3
3	13A10802 13A02605	Theory-I MOOC-III* 1. Robotics 2. Neural Networks and Fuzzy Logic	3	1	-	3
4	13A10804	Technical Seminar	-	-	4	2
5	13A10805	Project Work	-	-	24	12
		Total	**09**	**03**	**28**	**23**

3 Theory + 1 Technical Seminar + 1 Project work

*Either by MOOCS manner or Self study or Conventional manner

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-II Sem (E.I.E)	**T**	**Tu**	**C**
	3	**1**	**3**

(13A04704) DIGITAL IMAGE PROCESSING
(MOOCS-I)

Course Outcomes:

- Able to apply the Image processing concept for various fields of engineering and real life toprocess as per needs &specifications.
- Get the skills to heuristically develop new techniques to process images of any context.
- Can experiment, analyze & interpret imagedata /processing data.

UNIT–I

Introduction to Digital Image processing – Example fields of its usage- Image sensing andAcquisition – image Modeling - Sampling, Quantization and Digital Image representation – Basicrelationships between pixels, - Mathematical tools/ operations applied on images - imaging geometry.

UNIT–II

2D Orthogonal and Unitary Transforms and their properties - Fast Algorithms - Discrete FourierTransform - Discrete Cosine Transforms- Walsh- Hadamard Transforms- Hoteling Transforms ,Comparison of properties of the above.

UNIT–III

Background enhancement by point processing Histogram processing, Spatial filtering, Enhancement infrequency Domain, Image smoothing, Image sharpening, Colour image Enhancement

UNIT–IV

Degradation model, Algebraic approach to restoration – Inverse filtering – Least Mean Square filters,Constrained Least square restoration. Blind DeconvolutionImage segmentation: Edge detection -,Edgelinking, Threshold based segmentation methods – Regionbased Approaches - Template matching –use of motion in segmentation

UNIT–V

Redundancies in Images - Compression models, Information theoretic perspective-Fundamentalcoding theorem. Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Transformcoding, Image Formats and compression standards.

Text Books:

1. R.C .Gonzalez & R.E. Woods, “Digital Image Processing”, Addison Wesley/Pearson education,3rd Edition, 2010.
2. A .K. Jain, “Fundamentals of Digital Image processing”, PHI.

References:

1. Rafael C. Gonzalez, Richard E woods and Steven L.Eddins, "Digital Image processing usingMATLAB", Tata McGraw Hill, 2010.
2. S jayaraman, S Esakkirajan, T Veerakumar, "Digital Image processing", Tata McGraw Hill.
3. William K. Pratt, "Digital Image Processing", John Wilely, 3rd Edition, 2004.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-II Sem (E.I.E)	**T**	**Tu**	**C**
	3	**1**	**3**

(13A10801) MEMS AND ITS APPLICATIONS
(MOOCS I)

Course Objectives:

- To study about fabrication processes involved in different types of sensors.
- To Study about characteristics of different MEMS materials.
- To get complete knowledge regarding working of MEMS Switches, relays, Inductors, Capacitors and Packing techniques associated with MEMS.

Learning Outcomes:

After completion of this course the students will be able to

- Understand different steps involved in fabrication processes of different types of sensors.
- Understand characteristics of different MEMS materials.
- Get complete knowledge regarding working of MEMS Switches, relays, Inductors, Capacitors and Packing techniques associated with MEMS.

Unit-I:
MEMS Fabrication processes & Sensors*:*
Introduction, MEMS Overview, Micro-fabrication of MEMS: Surface Micromachining, Bulk Micromachining, LIGA, micromachining of polymeric MEMS devices, Three-dimensional micro-fabrications. Electromechanical transducers: Piezoelectric transducers, Electro-strictive transducers, Magneto-strictive transducers, Electrostatic actuators, Electromagnetic transducers, Electro-dynamic transducers, Electro-thermal actuators, comparison of electro-thermal actuation process, Micro-sensing for MEMS: Piezo-resistive sensing, Capacitive sensing, Piezoelectric sensing, Resonant sensing, Surface Acoustic Wave sensors.

Unit-II:
MEMS Materials and Fabrication techniques: Metals, semiconductors, thin films for MEMS and their deposition techniques, materials for polymer MEMS, Bulk micromachining for silicon based MEMS, Silicon surface micromachining, Micro-stereo-lithography for polymer MEMS.

Unit-III:
MEMS Switches and Micro relays: Switch parameters, basics of switching, Switches for RF and microwave applications, actuation mechanisms for MEMS devices, bistable micro relays and micro-actuators, dynamics of switch operation, MEMS switch design considerations, modeling and evaluation.

Unit- IV:

MEMS Inductors and Capacitors: MEMS Micro-machined passive elements: pros and cons, MEMS Inductors: self and mutual inductance, micro-machined inductors, reduction of stray capacitance, improvement of quality factor, folded inductors, modeling and design issues of planar inductors, variable inductor and polymer based inductor. MEMS Capacitors: MEMS gap tuning capacitor, MEMS area tuning capacitor, Dielectric Tunable capacitors.

Unit-V:

MEMS packaging & MEMS RF Applications: MEMS packaging: Role of MEMS packaging, Types of MEMS packaging, flip-chip and multichip Unit packaging, RF MEMS packaging issues. MEMS RF applications: Micro-machined transmission line and components, micro-machined RF Filters, Micro-machined Phase shifters, and Micro-machined antenna, Gyros and Bio-MEMS.

References:

1. Gabriel M. Rebeiz, "RF MEMS: Theory, Design, and Technology," John Wiley & Sons, 2003.
2. Vijay K. Varadan, K. J. Vinoy and K. A. Jose, "RF MEMS & Their Applications," John Wiley & Sons, 2003.
3. Tai-Ran Hsu, "MEMS and Microsystems: Design and Manufacture," McGraw- Hill.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-II Sem (E.I.E)

T	Tu	C
3	1	3

(13A05707) ARTIFICIAL INTELLIGENCE
(MOOCS II)

Course Objective:

- *To learn the difference between optimal reasoning Vs human like reasoning*
- *To understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities*
- *To learn different knowledge representation techniques*
- *To understand the applications of AI namely, Game Playing, Theorem Proving, Expert Systems, Machine Learning and Natural Language Processing*

Learning Outcome:

- *Possess the ability to formulate an efficient problem space for a problem expressed in English*
- *Possess the ability to select a search algorithm for a problem and characterize its time and space complexities.*
- *Possess the skill for representing knowledge using the appropriate technique*
- *Possess the ability to apply AI techniques to solve problems of Game Playing, Expert Systems, Machine Learning and Natural Language Processing*

UNIT I

Introduction: History, Intelligent Systems, Foundations of AI, sub areas of AI, applications. Problem solving – State – Space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, Heuristic search techniques, iterative-deepening A*, Constraint Satisfaction and Planning. Game Playing, Bounded Look-ahead strategy and use of Evaluation functions, Alpha-Beta Pruning

UNIT II

Logic concepts and Logic programming: - Introduction, Propositional Calculus, Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Tableau System in propositional Logic, Resolution Refutation in Propositional Logic, Predicate Logic, Logic Programming. Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames, advanced knowledge representation Techniques.

UNIT III

Expert System and Applications: Introduction, Phases in Building Expert systems, expert system architecture, expert systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of shells and tools. Uncertainty Measure – Probability Theory: - Introduction, Probability Theory, Bayesian Belief Networks, Certainty factor theory, Dempster-Shafer Theory

UNIT IV

Machine-Learning Paradigms: - Introduction, Machine Learning systems. Supervised and unsupervised learning. Inductive learning, learning decision Tree (Text Book 2), Deductive Learning. Clustering, Support Vector Machines. Artificial Neural Networks: - Introduction, artificial neural Networks, Single-Layer Feed-Forward Networks, Multi-Layer Feed-Forward Network, Radial-Basis Function Networks, Design Issues of Artificial Neural Networks, Recurrent Networks

UNIT V

Fuzzy Logic : - Fuzzy sets, Fuzzy sets, Evolutionary Programming, Genetic Programming Concepts, swarm Intelligence Ant colony Paradigm, Natural Language Processing

Text Books :

1. *Artificial Intelligence, Saroj Kaushik, Cengage Learning 2011*
2. *Artificial intelligence, A Modern Approach, Russell, Norvig, Pearson Education, Second Edition. 2004*

Reference Books :

1. *Artificial intelligence, Rich, Knight, Nair, Tata McGraw Hill, Third Edition 2009*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-II Sem (E.I.E)

T	Tu	C
3	1	3

(13A05403) JAVA PROGRAMMING

Course Objective:

- *Study the syntax, semantics and features of Java Programming Language*
- *Learn the method of creating Multi-threaded programs and handle exceptions*
- *Learn Java features to create GUI applications & perform event handling*

Learning Outcome:

- *Ability to solve problems using object oriented approach and implement them using Java*
- *Ability to write Efficient programs with multitasking ability and handle exceptions*
- *Create user friendly interface*

UNIT I

Introduction to Java: The key attributes of object oriented programming, Simple program, The Java keywords, Identifiers, Data types and operators, Program control statements, Arrays, Strings, String Handling

UNIT II

Classes: Classes, Objects, Methods, Parameters, Constructors, Garbage Collection, Access modifiers, Pass Objects and arguments, Method and Constructor Overloading, Understanding static, Nested and inner classes.

Inheritance – Basics, Member Access, Usage of Super, Multi level hierarchy, Method overriding, Abstract class, Final keyword.

Interfaces – Creating, Implementing, Using, Extending, and Nesting of interfaces.
Packages – Defining, Finding, Member Access, Importing.

UNIT III

Exception handling: Hierarchy, Fundamentals, Multiple catch clauses, Subclass exceptions, Nesting try blocks, Throwing an exception, Using Finally and Throws, Built-in exceptions, User-defined exceptions.

I/O: Byte streams and Classes, Character streams and Classes, Predefined streams, Using byte streams, Reading and Writing files using byte streams, Reading and writing binary data, Random-access files, File I/O using character streams, Wrappers.

UNIT IV

Multithreading: Fundamentals, Thread class, Runnable interface, Creating multiple threads, Life cycle of thread, Thread priorities, Synchronization, Thread communication, Suspending, Resuming and Stopping threads. **Applets**: Basics, skeleton, Initialization and termination, Repainting, Status window, Passing parameters.

Networking: Basics, Networking classes and interfaces, InetAddress, Inet4Address and Inet6Address, TCP/IP Client Sockets, URL, URLConnection, HttpURLConnection, The URI class, Cookies, TCP/IP Server sockets, Datagrams.

UNIT V

Swings: The origin and design philosophy of swing, Components and containers, Layout managers, Event handling, Using a push button, jtextfield, jlabel and image icon, The swing buttons, Trees, An overview of jmenubar, jmenu and jmenuitem, Creating a main menu, Add mnemonics and accelerators to Menu items, showmessagedialog, showconfirmdialog, showinputdialog, showoptiondialog, jdialog, Create a modeless dialog.

Text Books:

1. *"Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.*
2. *"Java The Complete Reference" Herbert Schildt, 8th Edition, 2011, Oracle press, TataMcGraw-Hill*

Reference Books:

1. *"Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition.*
2. *"Java – How to Program", Paul Deitel, Harvey Deitel, PHI.*
3. *"Core Java", Nageswar Rao, Wiley Publishers.*
3. *"Thinking in Java", Bruce Eckel, Pearson Education.*
4. *"A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.*
5. *"Head First Java", Kathy Sierra, Bert Bates, O"Reilly*
6. *"SCJP – Sun Certified Programmer for Java Study guide" – Kathy Sierra, Bert Bates, McGrawHill*
7. *"Java in Nutshell", David Flanagan, O"Reilly*
8. *"Core Java : Volume I – Fundamentals, Cay S. Horstmann, Gary Cornell, The Sun Micro Systems Press*

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-II Sem (E.I.E)	**T**	**Tu**	**C**
	3	**1**	**3**

(13A10802) ROBOTICS
(MOOCS III)

Course Objective:

- *Introduction to the design of multi degree-of-freedom robots and mobile platforms.*
- *Review of the latest technology available to design robotic systems.*
- *Use of professional engineering tools to design robots.*
- *Programming of microcontrollers to control a robotic system.*
- *Hands-on experience to design a robotic system*.

Learning Outcome:

- *Students will be able to design a robot starting with the conceptual design, develop the concept*

into a model, analyze the model on computer using engineering software packages, complete the
structural design, and be able to build a prototype, present results in terms of a Power Point resentation, develop an engineering report and demonstrate the robot's Performance.

UNIT I

INTRODUCTION: Robotics – Basic components – Classification – Performance characteristics –
Actuators- Electric actuator- DC motor horse power calculation, magnetostrictive hydraulic and
pneumatic actuators. Sensors and vision systems: Different types of robot transducers and sensors –
Tactile sensors – Proximity and range sensors –ultrasonic sensor-touch sensors-slip sensors-sensor
calibration- vision systems – Image processing and analysis – image data reduction – segmentation
feature extraction – Object recognition.

UNIT II

ROBOT CONTROL: Control of robot manipulators- state equations-constatnt solutions-linear feedback systems-single axis PID control- PD gravity control- computed torque control- variable structure control-Impedance control.

UNIT III

END EFFECTORS: End effectors and tools– types – Mechanical grippers – Vacuum cups – Magnetic
grippers – Robot end effectors interface, work space analysis work envelope workspace fixtures-pick and place operation- continuous path motion-interpolated motion-straight line motion.

UNIT IV

ROBOT MOTION ANALYSIS: Robot motion analysis and control: Manipulator kinematics –forward

and inverse kinematics- arm equation-link coordinates-Homogeneous transformations and rotations and
Robot dynamics.

UNIT V
ROBOT APPLICATIONS: Industrial and Non industrial robots, Robots for welding, painting and
assembly – Remote Controlled robots – Robots for nuclear, thermal and chemical plants – Industrial
automation – Typical examples of automated industries.

Text Books:
1. Mikel P. Grover , et. Al. ―Industrial Robots – Technology Programming and Applications,
McGraw Hill, 1980.
2. Robert J.Schilling, Fundamentals of Robotics-Analysis and Control, PHI,2007. (Unit-II and Unit-III)

Reference Books:
1. K.S.Fu,R.C.Gonzalez, CSG. Lee, Robotics,control sensing vision and Intelligence, Tata Mcgraw-Hill,
2008

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B.Tech IV-II Sem (E.I.E)	**T**	**Tu**	**C**
	3	**1**	**3**

(13A02605) NEURAL NETWORKS & FUZZY LOGIC
(MOOC III)

Objective:

- Importance of AI techniques in engineering applications
- Artificial Neural network and Biological Neural Network concepts
- ANN approach for various Engineering problems
- Fuzzy Logic and Its use in various Engineering Applications

UNIT-I: INTRODUCTION TO ARTIFICIAL INTILLEGENCE

Introduction and motivation – Approaches to AI – Architectures of AI – Symbolic Reasoning System – Rule based Systems – Knowledge Representation – Expert Systems.

UNIT-II: ARTIFICIAL NEURAL NETWORKS

Basics of ANN – Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules – ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories.

UNIT-III: ANN APPLICATIONS

ANN approach to : Load Forecasting Problem – System Identification – Control Systems – Pattern Recognition.

UNIT-IV: FUZZY LOGIC

Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic Systems – Fuzzification – Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

UNIT-V: FUZZY LOGIC APPLICATIONS

Fuzzy Logic Implementation in Automotive Application, Industrial and Control applications, Image Processing, Data mining, Power Plants and Biomedicine.

TEXT BOOKS:

1. S.N. Sivanandam, S. Sumathi and S.N. Deepa, “Introduction to Neural Networks using MATLAB”, McGraw Hill Edition, 2006.

2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications:, Third Edition, WILEY India Edition, 2012.

REFERENCE BOOKS:

1. S.N. Sivanandam, S. Sumathi and S.N. Deepa, “Introdution to Fuzzy Logic using MATLAB”, Springer International Edition, 2013.
2. Yung C. Shin and Chengying Xu, “Intelligent System – Modeling, Optimization & Control, CRC Press, 2009.

Outcomes: The students acquire knowledge about:

- Artificial Intelligence techniques
- ANN Techniques and their concepts
- Role of ANN in various Applications
- Fuzzy Logic concepts and its role in various applications