SCHOOL OF ENGINEERING

SYLLABUS

ARTIFICIAL INTELLIGENCE

Class		**M.Tech.- AI**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**3**	**-**	**-**	**3**
Subject Name		**Knowledge Representations and Reasoning**				
Subject Code		**MCSAI20S301**				
Paper	**English**					
	Hindi					
Max. Marks		**100**				

Course Objective:

1. The course introduces the principles of logic-based knowledge representation and reasoning, as well as other important symbolic approaches to representing and reasoning about knowledge such as production systems, frames, taxonomies and Kripke models.
2. How to represent different sorts of knowledge, such as uncertain or incomplete knowledge, knowledge about action and change, and knowledge about default situations, is discussed.
3. Various types of reasoning are discussed, such as logical entailment, explanation and planning.

Course Outcomes:

CO1. Analyze and design knowledge based systems intended for computer implementation.
CO2. Acquire theoretical knowledge about principles for logic-based representation and reasoning.
CO3. Ability to understand knowledge-engineering process.
CO4. Ability to implement production systems, frames, inheritance systems.
CO5. Ability to approaches to handle uncertain or incomplete knowledge.

Unit	Syllabus	Periods
UNIT – I	The Key Concepts: Knowledge, Representation, Reasoning, Why knowledge representation and reasoning, Role of logic. Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity.	**10**
UNIT - II	Ontology: Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time.	**10**
UNIT - III	Knowledge Representations: Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation.	**10**
UNIT - IV	Processes: Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change. Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in contexts.	**10**
UNIT – V	Knowledge Soup: Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Non monotonic Logic, Theories, Models and the world, Semiotics. Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition.	**10**

TEXT BOOKS:

1. Knowledge Representation logical, Philosophical, and Computational Foundations by John F. Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J. Brachman, Hector J. Levesque, Elsevier.

REFERENCE BOOKS:

1. Concepts, Ontologies, and Knowledge Representation (Springer Briefs in Computer Science) 2013 Edition by Grega Jakus (Author), Veljko Milutinović (Author), Sanida Omerović (Author), Sašo Tomažič (Author).
2. Systematic Introduction to Expert Systems: Knowledge Representations and Problem-Solving Methods Softcover reprint of the original 1st ed. 1993 Edition by Frank Puppe (Author).

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Class		**M.Tech.- AI**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**3**	**-**	**-**	**3**
Subject Name		**Robotics & Automation**				
Subject Code		**MCSAI20S302**				
Paper	**English**					
	Hindi					
Max. Marks		**100**				

Course Objective:

1. To introduce the concepts of Robotic system, its components and instrumentation and control related to robotics.

Course Outcomes:

CO1. Acquire basic Knowledge on Robots.
CO2. Ability to process end effectors and robotic controls.
CO3. Analyze Robot Transformations and Sensors.
CO4. Able to understand Robot cell design and applications.
CO5. Explain sensors and instrumentation in robotics.

Unit	Syllabus	Periods
UNIT – I	**Introduction** Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems.	**10**

UNIT – II	**End Effectors and Robot Controls** Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers-Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot- Control system for robot joint-Control actions-Feedback devices-Encoder, Resolver, LVDT- Motion Interpolations-Adaptive control.	**10**
UNIT - III	**Robot Transformations and Sensors** Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneous coordinates, multiple transformation-Simple problems. Sensors in robot – Touch sensors-Tactile. Sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors.	**10**
UNIT - IV	**Robot Cell Design and Applications** Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions-Robot applications Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot.	**10**
UNIT - V	**Micro/Nano Robotics System** Micro/ Nano robotics system overview-Scaling effect-Top down and bottom up approach- Actuators of Micro/Nano robotics system-Nanorobot communication techniques-Fabrication of micro/nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot-Nanorobot in targeted drug delivery system.	**10**

TEXT BOOKS:

1. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education, 2009.
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012.

REFERENCE BOOKS:

1. Carl D. Crane and Joseph Duffy, Kinematic Analysis of Robot manipulators, Cambridge University press, 2008.
2. Fu. K. S., Gonzalez. R. C. & Lee C.S.G., “Robotics control, sensing, vision and intelligence”, McGraw Hill Book co, 1987.
3. Craig. J. J. “Introduction to Robotics mechanics and control”, Addison- Wesley, 1999.
4. Ray Asfahl. C., “Robots and Manufacturing Automation”, John Wiley & Sons Inc, 1985.

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Class		**M.Tech.- AI**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**3**	**-**	**-**	**3**
Subject Name		**Geographical Information Systems & Spatial Decision Support Systems**				
Subject Code		**MCSAI20S303**				
Paper	**English**					
	Hindi					
Max. Marks		**100**				

Course Objective:

1. The course deals with the methods and instruments supporting decision processes in the geographical space.
2. The focus is on multi-criteria decision analysis, with the special requirements carried by space-related scenarios and solutions, and by the participatory processes among numerous stakeholders.

Course Outcomes:

CO1. Analyse the Fundamental mechanism of GIS.
CO2. Process spatial and attribute data to prepare the matic maps.
CO3. Identify decision support models, methods, and technologies.
CO4. Analyse and prepare the DSS for the remote sensing and GIS applications.
CO5. Apply most important multi-criteria decision analysis processes.

Unit	Syllabus	Periods
UNIT - I	Map – mapping concepts, analysis with paper based maps, limitations, Computer Automated Cartography – History and Developments, GIS- Definition, advantages of digital maps.	**10**

UNIT - II	Fundamentals of GIS – Information Systems, Modeling Real World Features Data , Data Formats – Spatial and Non-spatial, Components, Data Collection and Input, Data Conversion, Database Management – Database Structures, Files; Standard Data Formats, Compression Techniques, Hardware – Computing, printing and scanning systems; Software – Standard Packages like Arcview, ArcGIS, Autocad Map, Map Infoetc.	**10**
UNIT - III	Spatial Analysis and Modeling – Proximity Analysis, Overlay Analysis, Buffer Analysis, Network Analysis, Spatial Auto Correlation, Gravity Modeling, DTM/DEM, Integration with Remote Sensing data.	**10**
UNIT - IV	Introduction: Concepts of decision making, systems and modelling, Need for DSS, Expert Systems. Decision Analysis and Decision Making: Decision environments, Decision making under certainty, risk and uncertainty, Concepts of multi criteria decision making, Value and utility concepts in decision making, overview of methods of multi criteria decision making.	**10**
UNIT - V	Overview of DSS: Characteristics and capabilities of DSS, Components of DSS, Data management, model management and user interface subsystems, Classification of DSS, Development of DSS, Approaches to DSS construction, DSS development tools.	**10**

TEXT BOOKS:

1. Thanappan Subash., Geographical Information System, Lambert Academic Publishing, 2011.
2. Paul Longley., Geographic Information systems and Science, John Wiley & Sons, 2005.
3. Efraim Turban and Jay E. Aronson, Decision Support Systems and Intelligent Systems, Prentice Hall College Div; 5edition, 1997.

REFERENCE BOOKS:

1. Marble, D.F & Calkins, H.W., Basic Readings in Geographic Information System, Spad System Ltd, 1990. ArcGIS 10.1 Manuals, 2013.
2. Kang Tsung Chang., Introduction to Geographic Information Systems, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2008.
3. Burrough, P.A., Principles of GIS for Land Resource Assessment, Oxford Publications, 2005.

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Class		M.Tech.- AI	L	T	P	C
Semester/Year		III/II	3	-	-	3
Subject Name		Business Analytics				
Subject Code		MCSAI20S304				
Paper	English					
	Hindi					
Max. Marks		100				

Course objective:

1. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.
2. To become familiar with the processes needed to develop, report, and analyze business data.
3. To learn how to use and apply Excel and Excel add-ins to solve business problems.

Course Outcomes:

After completion of course, students would be:

CO1. Able to have knowledge of various business analysis techniques.
CO2. Understand and critically apply the concepts and methods of business analytics.
CO3. Identify, model and solve decision problems in different settings.
CO4. Interpret results/solutions and identify appropriate courses of action for a given managerial situation whether a problem or an opportunity.
CO5. Create viable solutions to decision making problems.

Unit	Syllabus	Periods
UNIT – I	Business Analysis: Overview of Business Analysis, Overview of Requirements, Role of the Business Analyst. Stakeholders: the project team, management, and the front line, Handling Stakeholder Conflicts.	10
UNIT - II	Life Cycles: Systems Development Life Cycles, Project Life Cycles, Product Life Cycles, Requirement Life Cycles.	10

UNIT - III	Forming Requirements: Overview of Requirements Attributes of Good Requirements, Types of Requirements, Requirement Sources, Gathering Requirements from Stakeholders, Common Requirements Documents.	**10**
UNIT - IV	Transforming Requirements: Stakeholder Needs Analysis, Decomposition Analysis, Additive/Subtractive Analysis, Gap Analysis, Notations (UML & BPMN), Flowcharts, Swim Lane Flowcharts, Entity-Relationship Diagrams, State-Transition Diagrams, Data Flow Diagrams, Use Case Modeling, Business Process Modeling.	**10**
UNIT - V	Finalizing Requirements: Presenting Requirements, Socializing Requirements and Gaining Acceptance, Prioritizing Requirements. Managing Requirements Assets: Change Control, Requirements Tools. Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data Journalism.	**10**

TEXT BOOKS:

1. Fundamentals of Business Analytics Paperback – 1 January 2011 by R.N. Prasad (Author), Seema Acharya (Author).
2. Essentials of Business Analytics Paperback – 1 April 2015 by Jeffrey D Camm (Author).

REFERENCE BOOKS:

1. Business Analysis by James Cadleetal. Project Management: The Managerial Process by Erik Larson and, Clifford Gray.

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Class		**M.Tech.- AI**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**3**	**-**	**-**	**3**
Subject Name		**Industrial Safety**				
Subject Code		**MCSAI20S305**				
Paper	**English**					
	Hindi					
Max. Marks		**100**				

Course Objectives:
The objective of this course is to impart knowledge on different facets and aspects of engineering systems safety, focusing on tools, techniques and methodologies needed for prevention of occurrences of unsafe operations and accidents under different industrial settings.

Course Outcomes:
Upon completion of the course The students will be able to.

CO1. Equipped with concepts of engineering systems safety, dimensions of engineering systems safety, safety design.
CO2. Analysis mathematics.
CO3. Design for engineering systems safety.
CO4. Control for safety.
CO5. Integrating safety with other operational goals such as quality and reliability.

Unit	Syllabus	Periods
UNIT – I	Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and fire fighting, equipment and methods.	**10**

UNIT – II	Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.	**10**
UNIT – III	Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.	**10**
UNIT – IV	Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.	**10**
UNIT - V	Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.	**12**

TEXT BOOKS:

1. Industrial Safety Management System (English, Paperback, Raj Kishore Ojha).
2. Handbook of Occupational Safety and Health 3rd Edition by S. Z. Mansdrof.

REFERENCE BOOKS:

1. Maintenance Engineering Handbook, Higgins & Morrow, Da Information Services.
2. Maintenance Engineering, H. P. Garg, S. Chand and Company.
3. Pump-hydraulic Compressors, Audels, Mcgrew Hill Publication.
4. Foundation Engineering Handbook, Winter korn, Hans, Chapman &Hall London.

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Class		**M.Tech.- AI**	**L**	**T**	**P**	**C**
Semester/Year		**III/II**	**3**	**-**	**-**	**3**
Subject Name		**Operations Research**				
Subject Code		**MCSAI20S306**				
Paper	**English**					
	Hindi					
Max. Marks		**100**				

Course Objectives:

1. To impart knowledge in concepts and tools of Operations Research.
2. To understand mathematical models used in Operations Research.
3. To apply these techniques constructively to make effective business decisions.

Course Outcomes:

At the end of the course, the student should be able to:

CO1. Students should able to apply the dynamic programming to solve problems of discreet and Continuous variables.

CO2. Students should able to apply the concept of non-linear programming.

CO3. Students should able to carry out sensitivity analysis.

CO4. Student should able to model the real world problem and simulate it.

CO5. Solve Linear Programming Problems.

Unit	Syllabus	Periods
UNIT - I	Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models.	**10**
UNIT - II	Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.	**10**

UNIT - III	Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT.	**10**
UNIT - IV	Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.	**10**
UNIT - V	Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation.	**10**

TEXT BOOKS:

1. Operations Research—Introduction to Management Science Paperback – 1 January 2019 by A Panel of Authors (Author).
2. OPERATIONS RESEARCH Paperback – 1 January 2015 by D S HIRA, P K GUPTA, (Author).

REFERENCE BOOKS:

1. H.A. Taha, Operations Research, an Introduction, PHI, 2008.
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C.Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008.
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009.
5. Panner selvam, Operations Research: Prentice Hall of India 2010.
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010.

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Class		M.Tech.- AI	L	T	P	C
Semester/Year		III/II	-	-	20	10
Subject Name		Dissertation-I				
Subject Code		MCSAI20S307				
Paper	English					
	Hindi					
Max. Marks		250				

Course Objective:

1. To undertake a substantial in-depth study of a specific topic in Computer Science, Software Engineering, Artificial Intelligence.

Course Outcomes:

At the end of the course, the student will be able to:

CO1. Identify Computer Science engineering problems reviewing available literature.
CO2. Identify appropriate techniques to analyze complex Computer Science systems.
CO3. Apply engineering and management principles through efficient handling of project.

Syllabus

- Dissertation-I will have mid semester presentation and end semester presentation. Mid semester presentation will include identification of the problem based on the literature review on the topic referring to latest literature available.

- End semester presentation should be done along with the report on identification of topic for the work and the methodology adopted involving scientific research, collection and analysis of data, determining solutions and must bring out individuals contribution.
- Continuous assessment of Dissertation – I and Dissertation – II at Mid Sem and End Sem will be monitored by the departmental committee.

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ARTIFICIAL INTELLIGENCE

Class		M.Tech.- AI	L	T	P	C
Semester/Year		IV/II	-	-	32	16
Subject Name		Dissertation II				
Subject Code		MCSAI20S401				
Paper	English	English				
	Hindi					
Max. Marks		500				

Course Objective

1. Extension of the work on the topic identified in Dissertation – I.

Course Outcomes:

At the end of the course, the student will be able to:

CO1. Solve complex Computer Science problems by applying appropriate techniques and tools.
CO2. Exhibit good communication skill to the engineering community and society.
CO3. Demonstrate professional ethics and work culture.

Syllabus

Dissertation – II will be extension of the work on the topic identified in Dissertation – I.

Continuous assessment should be done of the work done by adopting the methodology decided involving numerical analysis/ conduct experiments, collection and analysis of data, etc.
There will be pre submission seminar at the end of academic term. After the approval the student has to submit the detail report and external examiner is called for the viva-voce to assess along with guide.