DEPARTMENT OF COMPUTER APPLICATIONS

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE PLAN – PART I			
Name of the programme and specialization	**M.Tech. Industrial Automation**		
Course Title	**Artificial Intelligence in Industrial Automation**		
Course Code	**IC 611**	**No. of Credits**	**3**
Course Code of Pre-requisite subject(s)	**-**		
Session	**August 2020**	**Section (if, applicable)**	**-**
Name of Faculty	**Dr Selvakumar K**	**Department**	**Instrumentation and Control Engineering**
Email	**kselvakumar@nitt.edu**	**Telephone No.**	**-**
Name of PAC Chairman	**Dr. D. Ezhilarasi**		
E-mail	**ezhil@nitt.edu**	**Telephone No.**	
Course Type	**Elective course**		

Syllabus (approved in BoS)
Introduction to Industrial Automation - Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations.

Production Economics - Methods of Evaluating Investment Alternatives, Costs in Manufacturing, Break Even Analysis, Unit cost of production, Cost of Manufacturing Lead time and Work-in-process.

Introduction to Artificial Intelligence -Introduction-Foundations of AI- History of AI Intelligent agents: Agents and Environment- Reactive agent- deliberative- goal-driven, utility driven, and learning agents -Artificial Intelligence programming techniques. Introduction to ML and DL Concepts

Knowledge Representation and Reasoning -Ontologies-foundations of knowledge representation and reasoning-representing and reasoning about objects-relations-events actions- time- and space- predicate logic-situation calculus-description logics-reasoning with defaults,-reasoning about knowledge-sample applications- Representing Knowledge and reasoning in an Uncertain Domain- Bayes rule-Bayesian networks-probabilistic inference sample applications- Planning: planning as search- partial order planning- construction and use of planning graphs.

Expert systems -Expert systems Architecture of expert systems, Roles of expert systems,

Knowledge Acquisition Meta knowledge, Heuristics. Typical expert systems MYCIN, DART, XOON.

Industrial AI applications and Case studies - Applications of Industrial AI in Monitoring, optimization and control.AI applications in Industry Automation using -natural language processing-computer vision-speech recognition-computer vision.

Text Books

1. Rich and Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2014.

2. M.P.Groover, " Automation, Production Systems and Computer Integrated Manufacturing", 5th Edition, Pearson Education, 2009

Reference Books

1. Anuradha Srinivasaraghavan, Vincy Joseph, "Machine Learning", Wiley, 2019

2. Stuart Russell and Peter Norvig, "Artificial Intelligence: A modern Approach", 2nd Edition, Prentice Hall, 2003.

3. Rajiv Chopra, "Deep Learning", 1st Edition, Khanna Publishing House, 2018

COURSE OBJECTIVE(S)

To identify potential areas for automation and justify need for automation

Study the concepts of Artificial Intelligence.

Learn the methods of solving problems using Artificial Intelligence.

Apply the concepts of AI to attain industrial automation

COURSE OUTCOMES (CO)

Course Outcomes	Aligned Programme Outcomes (PO)
Students will be able to:	
Understand basic AI algorithms.	1, 3
Identify appropriate AI methods to solve a given problem.	1, 2, 3, 4
Acquire knowledge about AI/ ML/DL techniques in Industrial automation.	1, 2, 3, 4, 5
Understand the levels of automation	1, 3

COURSE PLAN – PART II
COURSE OVERVIEW

This course introduces the concept of artificial intelligence in industrial automation and deals with the basics of the production system as well as production economics. Also, it deals with problem-solving methods. It discusses the way to represent knowledge and how to reason logically with that knowledge as well as planning. It describes machine learning and computational intelligence techniques for solving real-world problems. It depicts the expert systems. Finally, the course discusses various industrial applications of artificial intelligence.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/ Contact Hours	Topic	Mode of Delivery
1	Week 1 (3 Classes)	Introduction to Industrial Automation - Automation in Production System, Principles and Strategies of Automation	Chalk and Talk, PowerPoint Presentation
2	Week 2 (3 Classes)	Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations	Chalk and Talk, PowerPoint Presentation
3	Week 3 (3 Classes)	Production Economics - Methods of Evaluating Investment Alternatives, Costs in Manufacturing, Break Even Analysis, Unit cost of production, Cost of Manufacturing Lead time and Work-in-process.	Chalk and Talk, PowerPoint Presentation
4	Week 4 (3 Classes)	Introduction to Artificial Intelligence - Introduction-Foundations of AI- History of AI Intelligent agents: Agents and Environment- Reactive agent- deliberative- goal-driven, utility driven, and learning agents	Chalk and Talk, PowerPoint Presentation
5	Week 5 (3 Classes)	Artificial Intelligence programming techniques. Introduction to ML and DL Concepts	Chalk and Talk, PowerPoint Presentation
6	Week 6 (3 Classes)	Knowledge Representation and Reasoning - Ontologies-foundations of knowledge representation and reasoning-representing and reasoning about objects-relations- events actions- time- and space	Chalk and Talk, PowerPoint Presentation
7	Week 7 (3 Classes)	Predicate logic-situation calculus-description logics-reasoning with defaults,-reasoning about knowledge-sample applications-	Chalk and Talk, PowerPoint Presentation
8	Week 8 (3 Classes)	Representing Knowledge and reasoning in an Uncertain Domain- Bayes rule-Bayesian networks-probabilistic inference sample applications	Chalk and Talk, PowerPoint Presentation
9	Week 9 (3 Classes)	Planning: planning as search- partial order planning- construction and use of planning graphs	Chalk and Talk, PowerPoint Presentation
10	Week 10 (3 Classes)	Expert systems -Expert systems Architecture of expert systems, Roles of expert systems, Knowledge Acquisition Meta knowledge	Chalk and Talk, PowerPoint Presentation

11	Week 11 (3 Classes)	Heuristics. Typical expert systems MYCIN, DART, XOON	Chalk and Talk, PowerPoint Presentation
12	Week 12 (3 Classes)	Industrial AI applications and Case studies - Applications of Industrial AI in Monitoring	Chalk and Talk, PowerPoint Presentation
13	Week 13 (3 Classes)	Optimization and control.AI applications in Industry Automation using -natural language processing	Chalk and Talk, PowerPoint Presentation
14	Week 14 (3 Classes)	Computer vision-speech recognition-computer vision	Chalk and Talk, PowerPoint Presentation

COURSE ASSESSMENT METHODS

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Cycle Test 1	As per Academic Schedule	1 hr	25
2	Cycle Test 2		1 hr	25
3	Assignment	4th Week, 7th Week and 9th week	-	20
4	Compensation Assessment	As per Academic Schedule	1 hr	25
5	Final Assessment		2 hrs	30

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

➢ **At least 75% attendance in each course is mandatory.**

➢ **A maximum of 10% shall be allowed under the On Duty (OD) category.**

➢ Students with **less than 65% of attendance** shall be prevented from writing the

final assessment and **shall be awarded 'V' grade.**

COMPENSATION ASSESSMENT

➢ One compensation assessment for absentees in assessments (other than

final assessment) is mandatory. Only genuine cases of absence shall be considered.

ACADEMIC DISHONESTY & PLAGIARISM

➢ Possessing a mobile phone, carrying bits of paper, talking to other students, copying

from others during an assessment will be treated as punishable dishonesty.

➢ Zero marks to be awarded for the offenders. For copying from another student,

both students get the same penalty of zero marks.

➢ The departmental disciplinary committee including the course faculty member,

PAC chairperson and the HoD, as members shall verify the facts of the malpractice

and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

The above policy against academic dishonesty shall be applicable for all the programmes.

ADDITIONAL INFORMATION

NIL

FOR APPROVAL

Course Faculty _____   **CC-Chairperson** _____   **HOD** _____