DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW, UTTAR PRADESH

EVALUATION SCHEME & SYLLABUS

FOR

B. TECH. 4TH YEAR

- **Information Technology**

Based On

NEP2020

(Effective from the Session: 2025-26)

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, LUCKNOW, UTTAR PRADESH

B. TECH (CE&IT, CSIT, IT)
CURRICULUM STRUCTURE

		SEMESTER- VII											
S. No.	Code	Subject	LTP			Evaluation Scheme						Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	BCS701	Artificial Intelligence	3	-	-	20	10	30	-	70	-	100	3
2	BCS070	Internet of Things	3	-	-	20	10	30	-	70	-	100	3
3	BOE074	Renewable Energy Resources	3	0	0	20	10	30	-	70	-	100	3
4	BCS751	Artificial Intelligence LAB	0	0	2	-	-	-	50	-	50	100	1
5	BIT752	Mini Project or Internship Assessment*	0	0	4	-	-	-	100	-	-	100	2
6	BIT753	Project-I	0	0	10	-	-	-	150	-	-	150	5
7	BIT754	Startup and Entrepreneurial Activity Assessment#	0	0	4	-	-	-	100	-	-	100	2
		Total	**9**	**0**	**20**							**750**	**19**
		*The Mini Project or internship (5-6 weeks) conducted during summer break after VI semester and will be assessed during VII semester. #The Startup and Entrepreneurial Activity Assessment will be done in 7th semester under which a student will have to undergo a startup/entrepreneurship activity of at least 60 hours till 6th semester											

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B.TECH. (IT)

SEVENTH SEMESTER (DETAILED SYLLABUS)

Artificial Intelligence (BCS701)		
DETAILED SYLLABUS		**3-0-0**
Unit	**Topic**	
I	**Introduction to Artificial Intelligence & Intelligent Agents:** Definition and scope of AI, History and applications of AI, Characteristics of Intelligent Agents, Types of agents and environments, Agent architecture, Problem Solving Approach to Typical AI problems, Problem-solving agents. Example problems and approaches.	
II	**Problem Solving & Search Strategies:** Uninformed Search Strategies: BFS, DFS, Iterative Deepening, Informed Search Strategies: Greedy Best-First Search, A* Search, Heuristics and Optimization, Hill Climbing, Simulated Annealing, Constraint Satisfaction Problems, Game Playing: Min-max, Alpha-Beta Pruning, Stochastic & Partially Observable Games.	
III	**Knowledge Representation & Reasoning:** Propositional and First Order Logic, Syntax, Semantics, and Inference, Knowledge-based agents: Wumpus world, Logic Programming using Prolog, Forward and Backward Chaining, Resolution, Ontological Engineering and Reasoning.	
IV	**Uncertainty & Learning Techniques:** Introduction to uncertainty and probabilistic reasoning, Bayes' Rule, Bayesian Networks, Fuzzy logic and handling imprecision, Neural Networks (basics only): Perceptron, Backpropagation (intro level), Fundamentals of Machine Learning in AI context, Introduction to supervised and unsupervised learning.	
V	**Applications of AI & Multi-Agent Systems:** Natural Language Processing, Machine Translation, Information Retrieval and Extraction, Robotics: Perception, Planning, and Motion, Speech Recognition, Software Agents: Architecture, Communication, Trust, Multi-agent Negotiation and Reputation. **Explainable AI (XAI)** – Importance of interpretability, techniques for explaining black-box models, trust in AI, case studies in NLP and vision.	

RecommendedTextbooks:

1. Stuart Russell & Peter Norvig, *Artificial Intelligence: A Modern Approach*, 4th Edition, Pearson, 2022
2. Ivan Bratko, *Prolog: Programming for Artificial Intelligence*, 4th Edition, Addison-Wesley
3. Nils J. Nilsson, *The Quest for Artificial Intelligence*, Cambridge University Press
4. David Poole & Alan Mackworth, *Artificial Intelligence: Foundations of Computational Agents*, Cambridge Press

Internet of Things (BCS070)		
DETAILED SYLLABUS		**3-1-0**
Unit	**Topic**	**Proposed Lecture**
I	**Internet of Things (IoT):** Vision, Definition, Conceptual Framework, Architectural view, technology behind IoT, Sources of the IoT, M2M Communication, IoT Examples. Design Principles for Connected Devices: IoT/M2M systems layers and design standardization, communication technologies, data enrichment and consolidation, ease of designing and Affordability	
II	**Hardware for IoT:** Sensors, Digital sensors, actuators, radio frequency identification (RFID) technology, wireless sensor networks, participatory sensing technology. Embedded Platforms for IoT: Embedded computing basics, Overview of IOT supported Hardware platforms such as Arduino, NetArduino, Raspberry pi, Beagle Bone, Intel Galileo boards and ARM cortex.	
III	**Network & Communication aspects in IoT:** Wireless Medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination	
IV	**Programming the Ardunio:** Ardunio Platform Boards Anatomy, Ardunio IDE, coding, using emulator, using libraries, additions in ardunio, prcgramming the ardunio for IoT.	
V	**Challenges in IoT Design challenges:** Development Challenges, Security Challenges, Other challenges IoT Applications: Smart Metering, E-health, City Automation, Automotive Applications, home automation, smart cards, communicating data with H/W units, mobiles, tablets, Designing of smart street lights in smart city.	

Text books:

1. Olivier Hersent,David Boswarthick, Omar Elloumi "The Internet of Things key applications and protocols", wiley
2. Jeeva Jose, Internet of Things, Khanna Publishing House
3. Michael Miller "The Internet of Things" by Pearson
4. Raj Kamal "INTERNET OF THINGS", McGraw-Hill, 1ST Edition, 2016
5. ArshdeepBahga, Vijay Madisetti "Internet of Things (A hands on approach)" 1ST edition, VPI publications,2014
6. Adrian McEwen,Hakin Cassimally "Designing the Internet of Things" Wiley India

OPEN ELECTIVE-II LIST 2025-26

BOE074	RENEWABLE ENERGY RESOURCES	3 Credits
Unit	**Content**	**Hours**
I	Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.	8
II	Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.	8
III	Geothermal Energy: Resources of geothermal energy, thermodynamics of geo- thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Cells: Principle of working of various types of fuel cells and their working, performance and limitations.	8
IV	Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.	8
V	Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants .rr	8

Text Books:

1. Raja et. al, "Introduction to Non-Conventional Energy Resources" SciTech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, "Energy Resources: Conventional & Non- Conventional" BSP Publications,2006.
4. D. S. Chauhan, "Non-conventional Energy Resources" New Age International.
5. C. S. Solanki, "Renewable Energy Technologies: A Practical Guide for Beginners" PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
7. Godfrey Boyle, "Renewable Energy Power for A Sustainable Future", Oxford University Press.

BCS751 ARTIFICIAL INTELLIGENCE LAB

DETAILED SYLLABUS

1. **Implement Breadth First Search (BFS)** for a given graph or maze.
2. **Implement Depth First Search (DFS)** for a tree or graph structure.
3. **Solve the 8-Puzzle Problem** using A* Search Algorithm.
4. **Implement Hill Climbing Algorithm** for numerical optimization or pathfinding.
5. **Implement Simulated Annealing Algorithm** for constraint-based search problems.
6. **Solve Water Jug Problem** using state-space search (BFS or DFS).
7. **Write Prolog programs** to define family relationships using predicates.
8. **Implement 4-Queens Problem** in Prolog using backtracking.
9. **Implement Unification Algorithm** in Python or Prolog.
10. **Implement Forward and Backward Chaining** in a rule-based system (manual or code-based).
11. **Demonstrate Resolution in Propositional Logic** through a basic example (e.g., proving a theorem).
12. **Remove punctuation and stop words** from a paragraph using nltk.
13. **Perform stemming and lemmatization** on user-input text.
14. **Apply POS (Part of Speech) tagging** using NLTK on a given sentence.
15. **Build a simple text classifier** using NLTK (e.g., classify messages as spam/ham).
16. **Implement Tic-Tac-Toe game** with a basic AI opponent.
17. **Implement Min-Max (Minimax) Algorithm** for decision making in turn-based games.
18. **Enhance the game with Alpha-Beta Pruning** to optimize Min-Max.
19. **Simulate a Vacuum Cleaner Agent** that intelligently cleans a 2D environment.
20. **Build a simple chatbot** using rules or pre-trained logic (can use regex or basic intent matching).
21. **Design a Constraint Satisfaction Problem solver**, e.g., Sudoku, or Map Coloring.
22. **Perform simple Bayesian reasoning** for a probability-based decision problem (e.g., medical diagnosis).

Instructions to the Instructor:

1. The instructor may **add/delete/modify/tune** experiments depending on syllabus coverage and availability of tools.
2. All experiments should preferably be implemented using **Python (with NLTK and standard libraries)** and **SWI-Prolog** for logic programming tasks.