



**KASIREDDY NARAYANREDDY COLLEGE OF ENGINEERING & RESEARCH.**

(Approved by AICTE & Affiliated to JNTUH)

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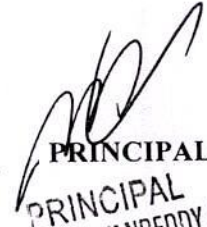
**Action Taken by the Affiliating University on the Feedback**

In the view of collected feedback on curriculum from various stakeholders (like Teachers, Students, Employers and Alumni) . University has taken necessary action to improve the curriculum from all the aspects to meet the Industrial Requirements.

JNTUH presented courses in the curriculum based on the inputs of the stakeholders for all the affiliated colleges so, it can help the students to built their career.

The University (JNTUH) would like to accept our kind notice to include the new subjects in curriculum of next academic Year based on the feasibility.

  
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R.R. District-501 505.

  
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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**B.Tech in CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)**  
**III & IV YEAR COURSE STRUCTURE & TENTATIVE SYLLABUS (R18)**

Applicable From 2020-21 Admitted Batch

**III YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1		Design and Analysis of Algorithms	3	0	0	3
2		Machine Learning	3	0	0	3
3		Computer Networks	3	0	0	3
4		Compiler Design	3	0	0	3
5		Professional Elective - I	3	0	0	3
6		Professional Elective - II	3	0	0	3
7		Machine Learning Lab	0	0	3	1.5
8		Computer Networks Lab	0	0	3	1.5
9		Advanced Communication Skills Lab	0	0	2	1
10		Intellectual Property Rights	3	0	0	0
		<b>Total Credits</b>	<b>21</b>	<b>0</b>	<b>8</b>	<b>22</b>

**III YEAR II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1		Artificial Intelligence	3	1	0	4
2		DevOps	3	1	0	4
3		Natural Language Processing	3	1	0	4
4		Professional Elective – III	3	0	0	3
5		Open Elective - I	3	0	0	3
6		Artificial Intelligence and Natural Language Processing Lab	0	0	3	1.5
7		DevOps Lab	0	0	3	1.5
8		Professional Elective - III Lab	0	0	2	1
9		Environmental Science	3	0	0	0
		<b>Total Credits</b>	<b>18</b>	<b>3</b>	<b>8</b>	<b>22</b>

**IV YEAR I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1		Neural Networks & Deep Learning	3	0	0	3
2		Reinforcement Learning	2	0	0	2
3		Professional Elective - IV	3	0	0	3
4		Professional Elective - V	3	0	0	3
5		Open Elective - II	3	0	0	3
6		Deep Learning Lab	0	0	2	1
7		Industrial Oriented Mini Project/ Summer Internship	0	0	0	2*
8		Seminar	0	0	2	1
9		Project Stage - I	0	0	6	3
		<b>Total Credits</b>	<b>14</b>	<b>0</b>	<b>10</b>	<b>21</b>

**IV YEAR II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1		Organizational Behaviour	3	0	0	3
2		Professional Elective - VI	3	0	0	3
3		Open Elective - III	3	0	0	3
4		Project Stage - II	0	0	14	7
		<b>Total Credits</b>	<b>9</b>	<b>0</b>	<b>14</b>	<b>16</b>

**\*Note:** Industrial Oriented Mini Project/ Summer Internship is to be carried out during the summer vacation between 6th and 7th semesters. Students should submit report of Industrial Oriented Mini Project/ Summer Internship for evaluation.

MC - Environmental Science – Should be Registered by Lateral Entry Students Only.

MC – Satisfactory/Unsatisfactory.

**Professional Elective-I**

	Graph Theory
	Introduction to Data Science
	Web Programming
	Image Processing
	Computer Graphics

**Professional Elective - II**

	Software Testing Methodologies
	Information Retrieval Systems
	Pattern Recognition
	Computer Vision and Robotics
	Data Warehousing and Business Intelligence

**Professional Elective - III**

	Internet of Things
	Data Mining
	Scripting Languages
	Mobile Application Development
	Cryptography and Network Security

# Courses in PE - III and PE - III Lab must be in 1-1 correspondence.

**Professional Elective -IV**

	Quantum Computing
	Expert Systems
	Cloud Computing
	Game Theory
	Mobile Computing

**Professional Elective - V**

	Social Network Analysis
	Federated Machine Learning
	Augmented Reality & Virtual Reality
	Web Security
	Ad-hoc & Sensor Networks

**Professional Elective – VI**

	Speech and Video Processing
	Robotics Process Automation
	Randomized Algorithms
	Cognitive Computing
	Semantic Web

## ARTIFICIAL INTELLIGENCE

**B.Tech. III Year II Sem.**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
3	1	0	4

**Prerequisites:**

1. A course on "Computer Programming and Data Structures"
2. A course on "Advanced Data Structures"
3. A course on "Design and Analysis of Algorithms"
4. A course on "Mathematical Foundations of Computer Science"
5. Some background in linear algebra, data structures and algorithms, and probability will all be helpful

**Course Objectives:**

- To learn the distinction between optimal reasoning Vs. human like reasoning
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**Course Outcomes:**

- Ability to formulate an efficient problem space for a problem expressed in natural language.
- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem.
- Possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

**UNIT - I**

**Problem Solving by Search-I:** Introduction to AI, Intelligent Agents

**Problem Solving by Search -II:** Problem-Solving Agents, Searching for Solutions, Uninformed Search Strategies: Breadth-first search, Uniform cost search, Depth-first search, Iterative deepening Depth-first search, Bidirectional search, Informed (Heuristic) Search Strategies: Greedy best-first search, A\* search, Heuristic Functions, Beyond Classical Search: Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces, Searching with Non-Deterministic Actions, Searching with Partial Observations, Online Search Agents and Unknown Environment .

**UNIT - II**

**Problem Solving by Search-II and Propositional Logic**

**Adversarial Search:** Games, Optimal Decisions in Games, Alpha-Beta Pruning, Imperfect Real-Time Decisions.

**Constraint Satisfaction Problems:** Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems.

**Propositional Logic:** Knowledge-Based Agents, The Wumpus World, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses, Forward and backward chaining, Effective Propositional Model Checking, Agents Based on Propositional Logic.

**UNIT - III**

**Logic and Knowledge Representation**

**First-Order Logic:** Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic.

**Inference in First-Order Logic:** Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution.

**Knowledge Representation:** Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, Reasoning with Default Information.

#### UNIT - IV

##### Planning

**Classical Planning:** Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches.

**Planning and Acting in the Real World:** Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

#### UNIT - V

##### Uncertain knowledge and Learning

**Uncertainty:** Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use,

**Probabilistic Reasoning:** Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning, Dempster-Shafer theory.

**Learning:** Forms of Learning, Supervised Learning, Learning Decision Trees. Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.

##### TEXT BOOK:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

##### REFERENCE BOOKS:

1. Artificial Intelligence, 3<sup>rd</sup> Edn, E. Rich and K.Knight (TMH)
2. Artificial Intelligence, 3<sup>rd</sup> Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

**INTERNET OF THINGS (Professional Elective – III)****B.Tech. III Year II Sem.**

L	T	P	C
3	0	0	3

**Course Objectives:**

- To introduce the terminology, technology and its applications.
- To introduce the concept of M2M (machine to machine) with necessary protocols.
- To introduce the Python Scripting Language which is used in many IoT devices.
- To introduce the Raspberry PI platform, that is widely used in IoT applications.
- To introduce the implementation of web-based services on IoT devices.

**Course Outcomes:**

- Interpret the impact and challenges posed by IoT networks leading to new architectural models.
- Compare and contrast the deployment of smart objects and the technologies to connect them to network.
- Appraise the role of IoT protocols for efficient network communication.
- Elaborate the need for Data Analytics and Security in IoT.
- Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.

**UNIT - I**

Introduction to Internet of Things –Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics, Communication protocols, Embedded Systems, IoT Levels and Templates Domain Specific IoTs – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health and Lifestyle

**UNIT - II**

IoT and M2M – Software defined networks, network function virtualization, difference between SDN and NFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER

**UNIT - III**

Introduction to Python - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib

**UNIT - IV**

IoT Physical Devices and Endpoints - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) Programming – Python program with Raspberry PI with focus of interfacing external gadgets, controlling output, reading input from pins.

**UNIT - V**

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

**TEXT BOOKS:**

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madiseti, Universities Press, 2015, ISBN: 9788173719547.
2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**R18 B.TECH. List of Open Electives**  
**Applicable From 2018-19 Admitted Batch**

Branch	III Yr II Sem Open Elective (OE – I)	IV Yr I Sem Open Elective (OE – II)	IV Yr II Sem Open Elective (OE – III)
Civil Engineering	Disaster Preparedness & Planning Management	Remote Sensing & GIS	Environmental Impact Assessment
Computer Science & Engineering / Information Technology	1. Entrepreneurship 2. Fundamentals of Management for Engineers 3. Cyber Law & Ethics	1. Data Structures 2. Artificial Intelligence 3. Python Programming 4. Java Programming	1. Machine Learning 2. Mobile Application Development 3. Scripting Languages 4. Database Management Systems
Electronics and Instrumentation Engineering	Basics of Sensors Technology	Fundamentals of Biomedical Applications	Basics of Virtual Instrumentation
Electronics and Communication Engineering	Fundamentals of Internet of Things	Electronic Sensors	Measuring Instruments
Electrical and Electronics Engineering	1. Reliability Engineering 2. Renewable Energy Sources	1. Utilization of Electrical Energy 2. Electric Drives and Control	1. Basics of Power Plant Engineering 2. Energy Sources and Applications
Mechanical Engineering	Quantitative Analysis for Business Decisions	Basic Mechanical Engineering	Non-Conventional Sources of energy
Aeronautical Engineering	Quantitative Analysis for Business Decisions	Basics of Aeronautical Engineering	Elements of Rocket Propulsion
Mechatronics	1. Industrial Management 2. Non-Conventional Energy Sources	1. Intellectual Property Rights 2. Principles of Entrepreneurship 3. Basic Mechanical Engineering	1. Fundamentals of Robotics 2. Linear and Non-Linear Optimization Techniques 3. Total Quality Management
Petroleum Engineering	General Geology	Natural Gas Engineering	Green Fuel Technologies
Metallurgical and Materials Engineering	1. Testing of Materials 2. Alloy Steels	1. Engineering Materials 2. Surface Engineering	1. High Temperature Materials 2. Light Metals and Alloys
Mining Engineering	1. Introduction to Mining Technology 2. Coal Gasification, CBM & Shale Gas	1. Health & Safety in Mines 2. Material Handling in Mines	1. Solid Fuel Technology 2. Remote Sensing and GIS in Mining

\*Note: Students should take Open Electives from the List of Open Electives Offered by Other Departments/Branches Only.

## CS801OE: MOBILE APPLICATION DEVELOPMENT (Open Elective - III)

B.Tech. CSE/IT IV Year II Sem

L	T	P	C
3	0	0	3

### Prerequisites:

1. Acquaintance with JAVA programming
2. A Course on DBMS

### Course Objectives:

- To demonstrate their understanding of the fundamentals of Android operating systems
- To improve their skills of using Android software development tools
- To demonstrate their ability to develop software with reasonable complexity on mobile platform
- To demonstrate their ability to deploy software to mobile devices
- To demonstrate their ability to debug programs running on mobile devices

### Course Outcomes:

- Student understands the working of Android OS Practically.
- Student will be able to develop Android user interfaces
- Student will be able to develop, deploy and maintain the Android Applications.

### UNIT - I

Introduction to Android Operating System: Android OS design and Features – Android development framework, SDK features, Installing and running applications on Android Studio, Creating AVDs, Types of Android applications, Best practices in Android programming, Android tools  
Android application components – Android Manifest file, Externalizing resources like values, themes, layouts, Menus etc, Resources for different devices and languages, Runtime Configuration Changes  
Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes

### UNIT - II

Android User Interface: Measurements – Device and pixel density independent measuring UNIT - s  
Layouts – Linear, Relative, Grid and Table Layouts  
User Interface (UI) Components – Editable and non editable TextViews, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers  
Event Handling – Handling clicks or changes of various UI components  
Fragments – Creating fragments, Lifecycle of fragments, Fragment states, Adding fragments to Activity, adding, removing and replacing fragments with fragment transactions, interfacing between fragments and Activities, Multi-screen Activities

### UNIT - III

Intents and Broadcasts: Intent – Using intents to launch Activities, Explicitly starting new Activity, Implicit Intents, Passing data to Intents, Getting results from Activities, Native Actions, using Intent to dial a number or to send SMS  
Broadcast Receivers – Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity  
Notifications – Creating and Displaying notifications, Displaying Toasts

### UNIT - IV

Persistent Storage: Files – Using application specific folders and files, creating files, reading data from files, listing contents of a directory Shared Preferences – Creating shared preferences, saving and retrieving data using Shared Preference

### UNIT - V

Database – Introduction to SQLite database, creating and opening a database, creating tables, inserting retrieving and etindelg data, Registering Content Providers, Using content Providers (insert, delete, retrieve and update)



**TEXT BOOKS:**

1. Professional Android 4 Application Development, Reto Meier, Wiley India, (Wrox) , 2012
2. Android Application Development for Java Programmers, James C Sheusi, Cengage Learning, 2013

**REFERENCE BOOK:**

1. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013