



K.S.R.M. COLLEGE OF ENGINEERING

(AUTONOMOUS)

Pulivendula Road, Kadapa - 516 005

Andhra Pradesh, India

Approved by AICTE, New Delhi & Affiliated to JNTUA, Ananthapuramu.

An ISO 14001:2004 & 9001: 2015 Certified Institution



Artificial Intelligence & Machine Learning

Curriculum

B.Tech. VII Sem (R20UG)									
S.No.	Course Code	Course Name	Category	Hours per Week			IM	EM	Credits
				L	T	P	40	60	
1	2039701 2039702 2039703	Professional Elective Course – III: 1. Artificial Intelligence Analyst (IBM) 2. Virtual and Augmented Reality 3. Natural Language Processing	PEC	3	0	0	40	60	03
2	2039704 2039705 2039706	Professional Elective Course – IV: 1. Robotics and Automation 2. Reinforcement Learning 3. Blockchain Technology	PEC	3	0	0	40	60	03
3	2039707 2039708 2039709	Professional Elective Course – V: 1. Internet of Things 2. Cognitive Science 3. Digital Forensic	PEC	3	0	0	40	60	03
4	20OE504 20OE508	Open Elective Course – III: 1. Cyber Security 2. Java Programming	OEC	3	0	0	40	60	03
5	20OE503 20OE505	Open Elective Course – IV: 1. Data Analytics with Python 2. Web Designing using PHP	OEC	3	0	0	40	60	03
6	2006701 2006702 2006703	Humanities & Social Sciences Elective: 1. Human Resource Management 2. Digital Marketing 3. Project Management	HSS	3	0	0	40	60	03
7	2039711	Internship	PROJ	0	0	0	100	---	03
8	2039712	Skill Course – V: Multimedia and Application Lab	SC	1	0	2	40	60	02
Total							380	420	23

B.TECH. VII SEM (R20UG) SYLLABUS

Course Title	ARTIFICIAL INTELLIGENCE ANALYST (Professional Elective Course – III)				B.Tech. VII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039701	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> • Explain what artificial intelligence (AI) is. • Describe the field of AI and its subfields: Machine learning, natural language processing (NLP), and computer vision. • List applications of AI in the industry and government. • Describe machine learning. • Describe different type of machine learning algorithms. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Prepare students to apply AI concepts to build real-life solutions.							
CO 2	Introduce students to basic concepts of AI, machine learning algorithms, natural language processing, chatbots and computervision.							
CO 3	Apply the concepts they learn to practical examples by using IBM Watson services and tools on IBM Cloud.							

AI Analyst (Class Room)

Career path description: The Artificial Intelligence Analyst career path prepares students to apply AI concepts to build real-life solutions. This career path introduces students to basic concepts of AI, machine learning algorithms, natural language processing, chatbots, and computer vision. Students apply the concepts they learn to practical examples by using IBM Watson services and tools on IBM Cloud.

ibm.com/training

General Information:	
Delivery Method	25% self-placed training 75% Instructor led training
Version	2020
Products	IBM Watson Discovery, IBM Watson Assistant, IBM Watson Visual Recognition, IBM Watson Tone Analyzer, IBM Watson Natural Language Understanding, IBM Watson Studio, IBM Watson Knowledge Studio, IBM Cloud.
Audience	Undergraduate senior students from IT related academic programs such as computer science, software engineering, information systems and similar others
Learning Objectives:	
After completing this course, you should be able to:	
<ul style="list-style-type: none"> • Explain what artificial intelligence (AI) is. • Describe the field of AI and its subfields: Machine learning, natural language processing (NLP), and computer vision. • List applications of AI in the industry and government. • Describe machine learning. • Describe different type of machine learning algorithms. • Apply machine learning algorithms to specific problems. 	

- Explain deep learning.
- Explain convolutional neural networks and neural networks.
- Describe examples of unsupervised and supervised learning.
- Describe IBM Watson.
- Explain how IBM Watson technology is applied to solve real world problems.
- Explain the capabilities of each IBM Watson service.
- Describe IBM Watson Studio, its components, and key applications.
- Describe the CRISP-DM process model and explain where machine learning fits in the CRISP-DM process.
- Create machine learning models for different machine learning algorithms by using IBM Watson Studio.
- Explain domain adaptation.
- Describe the purpose of training the various IBM Watson services.
- Describe IBM Watson Knowledge Studio capabilities and use.
- Explain what NLP is.
- List tools and services for NLP.
- Identify NLP use cases.
- Explain main NLP concepts.
- Explain how to evaluate the quality of an NLP algorithm.
- Identify the IBM Watson services based on NLP technology.
- Use IBM Watson Discovery to build a cognitive query application.
- Describe chatbot applications and chatbots design guidelines.
- Explain core concepts and artifacts needed to build a chatbot application.
- Build chatbot applications with IBM Watson Assistant and Node-RED.
- Explain what computer vision is.
- Identify computer vision use cases.
- Explain how computer vision analyzes and processes images and describe commonly used computer vision techniques.
- Use the IBM Watson Visual Recognition service to classify an image, detect faces, and recognize text in an image.
- Create custom models with IBM Watson Visual Recognition.
- Train the IBM Watson Visual Recognition service with IBM Watson Studio.
- Integrate multiple IBM Watson services to build a comprehensive intelligent solution.

Prerequisites Skills:

- Computer science fundamentals
- Basic knowledge of applied math, algorithms, and data modeling
- Basic knowledge of probability and statistics
- Basic knowledge of Node.js and cloud computing
- Access to IBM Cloud
- Exposure to the IBM Skills Academy Portal learning environment

Duration	36 Hours
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Skill Level	Basic – Intermediate
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Hardware Requirements (Classroom ILT setup Requirements)

Processor	2 GHz or Higher
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GB RAM	8 GB
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GB free disk Space	80 GB
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Network Requirements	Yes
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Other Requirements	IBM ID
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Notes: The following unit and exercise durations are estimates, and might not reflect every class experience. If the course is customized or abbreviated, the duration of unchanged units will probably increase

Course Agenda

MODULE I – AI OVERVIEW

Course I – AI Overview (Duration: 30 Minutes)

Course Overview (Duration: 05 Minutes)

Unit 1: Introduction to Artificial Intelligence (Duration: 03 Hours)

Overview	This unit explains what artificial intelligence (AI) is, its history and evolution, AI types, integral components of AI systems, factors that influenced the evolution of AI, and applications of AI in the industry, government, and science
Learning Objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Explain what AI is.• Describe the types of AI.• List the factors that influenced the advancement of AI in recent years.• List the applications of AI in the industry, science, and government.• List the subfields that are the focus of AI research.

Unit 2: Business Analytics (Duration: 30 Minutes)

Overview	This unit introduces business analytics and describes different approaches and types of business analytics
Learning Objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Explain what business analytics is.• Describe different approaches and types of business analytics.• Describe analytical solutions.• Explain the challenges of analytical solutions.

MODULE II –

Course I – IBM Watson Overview (Duration: 06 Hours 30 Minutes)

Unit 1. Introduction to IBM Watson (Duration: 01 Hour)

Overview	This unit introduces IBM Watson and its history.
Learning Objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Explain what IBM Watson is and how it works.• Explain how Watson technology is made available to developers and organizations.

Unit 2. IBM Watson applied to industry, business and science (Duration: 01 Hours 30 Minutes)

Overview	This unit provides several examples that demonstrate how IBM Watson is transforming industry, business and science.
Learning Objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Provide examples of Watson AI technologies applied to several industries.

Unit 3. IBM Watson use cases (Duration: 30 Minutes)

Overview	This unit presents two use cases showing organizations that successfully implemented AI solutions, based on IBM Watson technology
Learning Objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Describe how IBM Watson technology is being applied to solve real world problems.

Unit 4. Evolution from Deep QA to IBM Watson services (Duration: 01 Hour)

Overview	This unit describes the evolution of Watson technology from the original Deep QA architecture to the present
Learning Objectives	After completing this unit, you should be able to: <ul style="list-style-type: none">• Explain what the Deep QA architecture was.• Explain why IBM decided to commercialize Watson.• Describe the evolution of Watson services from the original Deep QA

		<p>architecture to the present.</p> <ul style="list-style-type: none"> Recognize the Watson services available today on the IBM Cloud.
Unit 5. IBM Watson services overview (Duration: 02 Hours)		
	Overview	This unit provides an overview of the Watson services available in IBM Cloud.
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> List the Watson services. Explain the capabilities of each Watson service.
Exercise 1. Setting up your hands-on environment (Duration: 30 Minutes)		
	Overview	This exercise guides you through the setup of your workstation before you perform the exercises in this course
	Learning Objectives	<p>After completing this exercise, you should have:</p> <ul style="list-style-type: none"> An IBM Cloud Lite account. C URL installed on your workstation. Node.js installed on your workstation. Git installed on your workstation. A code/text editor installed on your workstation
MODULE III – AI Analyst (Duration: 26 Hours)		
Course introduction (30 Minutes)		
Unit 1. Introduction to machine learning (01 Hour 30 Minutes)		
	Overview	<p>This unit recaps the main topics in Module I, AI overview and provides a deeper view into complex subjects such as:</p> <ul style="list-style-type: none"> Machine learning Machine learning algorithms Neural networks Deep learning
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> Explain what machine learning is. Describe machine learning types and approaches. List different machine learning algorithms. Explain what neural networks and deep learning are, and why they are important in today's AI field. Explain how to evaluate your machine learning model.
Exercise 1. Applying machine learning algorithms (Duration: 01 Hour 30 Minutes)		
	Overview	In this exercise, you apply machine learning algorithms to solve real problems
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> Determine the centroids of a data set with the K-means clustering algorithm. Predict the class of an object with the Naïve Bayes classifier. Apply the linear regression algorithm to solve supervised learning problems. Construct a decision tree to predict outcomes
Unit 2. Introduction to IBM Watson (01 Hour)		
	Overview	This unit provides an overview of key IBM Watson services, their purpose, how they work, and helps you get started with Watson services on IBM Cloud
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> Explain what IBM Watson is. List IBM Watson services offerings. List IBM Cloud Watson services. Explain the capabilities of each Watson service. List the Watson services that can be trained. List the Watson services that cannot be trained.

		<ul style="list-style-type: none"> • Create a Watson service instance on IBM Cloud
	Exercise 2. Exploring IBM Watson services (Duration: 01 Hour 15 Minutes)	
	Overview	This exercise introduces you to Watson REST APIs. You will use URL commands to submit requests to and receive responses from several Watson services
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> • Create Watson service instances. • Copy credentials from a service instance. • Submit API calls with the appropriate parameters. • Analyze the response returned from the Watson service. • Use Watson API Reference documentation.
	Unit 3. Introduction to IBM Watson Studio (Duration: 30 Minutes)	
	Overview	This unit provides a high level overview of Watson Studio, its components, key applications and the value added by the IBM offering
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Describe Watson Studio. • Identify industry use cases. • List Watson Studio offerings. • Create Watson Studio projects. • Describe Watson Studio and Spark. • Describe Watson Studio and Object Storage. • Explain Watson Studio high availability considerations. • Prepare and analyze data. • Use Jupyter notebooks.
	Exercise 3. Getting started with IBM Watson Studio (Duration: 01 Hour 30 Minutes)	
	Overview	This exercise introduces you to the basic tasks that you have to perform when using Watson Studio
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> • Create a Watson Studio project. • Manage the project. • Assign collaborators. • Load a data set into the project's object store. • Manage Object Storage. • Analyze data by using Watson Studio. • Use PixieDust for data visualization.
	Unit 4. Introduction to IBM Watson Machine Learning (Duration: 30 Minutes)	
	Overview	This unit describes the Cross Industry Standard Process for Data Mining known as CRISP-DM and explains the process of preparing data for a machine learning algorithm. This unit provides an overview of the IBM Watson Machine Learning service available on IBM Cloud
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Describe the CRISP-DM process model. • Explain where machine learning fits in the CRISP-DM process. • Describe data preparation before feeding into machine learning algorithms. • Describe Watson Machine Learning features and capabilities
	Exercise 4. Getting started with IBM Watson Machine Learning (Duration: 01 Hour 30 Minutes)	
	Overview	This exercise introduces you to the basic tasks that you have to perform while building machine learning models for different algorithms using Watson Machine Learning and Watson Studio

	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> • Create a machine learning model by using Watson Studio and Watson MachineLearning. • Use data sets to train the model. • Use different estimators to train the machine learning model representing different machine learning algorithms. • Deploy machine learning models. • Evaluate the deployed models. • Call the deployed models from your applications. • Test the model with your data.
Exercise 5. Exploring Deep Learning and Neural Network Modeler with IBM Watson Studio (Duration: 01 Hour)		
	Overview	This exercise guides you through designing, building, and training a deep learning model to recognize handwritten digits. The optional exercise guides you through using the MNIST computer vision data set to train a TensorFlow model to recognize handwritten digits.
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> • Build a neural network to recognize handwritten digits. • Create a neural network design flow by using the neural network modeler. • Train models with experiment builder. • Work with Watson Machine Learning experiments to train deep learning models (TensorFlow).
Unit 5. Introduction to natural language processing (NLP) (Duration: 30 Minutes)		
	Overview	This unit introduces NLP. It covers key applications of NLP, basics concepts and terminology, tools and services and NLP challenges
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Explain what NLP is. • Identify NLP use cases. • Explain basic NLP concepts and terminology. • List the tools and services for NLP.
Unit 6. NLP concepts and components (Duration: 30 Minutes)		
	Overview	This unit covers NLP components, the NLP pipeline, natural language understanding, natural language generation, information retrieval, and information extraction
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Define the NLP categories. • Describe the NLP pipeline. • Explain the challenges in natural language understanding. • Explain the concepts of information retrieval and extraction. • Describe sentiment analysis.
Unit 7. NLP evaluation metrics (Duration: 30 Minutes)		
	Overview	This unit explains how to evaluate the quality of your NLP algorithm.
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Define various metrics to measure the quality of your NLP algorithm. • Understand the difference between these metrics
Unit 8. NLP and IBM Watson (Duration: 30 Minutes)		
	Overview	This unit lists the Watson services and software that are based on NLP and explains the main capabilities of Watson Natural Language Classifier, Watson Natural Language Understanding, Watson Discovery

	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • List the NLP Watson services • List the Watson services that perform information extraction. • Describe the capabilities of IBM Watson Natural Language Classifier. • Describe the capabilities of the IBM Watson Natural Language Understanding. • Describe the capabilities of IBM Watson Discovery
Exercise 6. Ingest, Convert, Enrich and Query with IBM Watson Discovery Service (Duration: 01 Hour 30 Minutes)		
	Overview	This exercise takes you through the process of preparing a collection of documents and running queries to extract insights from the documents. In the optional exercisewill work with the Discovery API.
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> • Create a Watson Discovery service instance. • Create a collection. • Add content to a collection. • Create a custom configuration. • Build queries. • Use the Discovery API.
Unit 9. Introduction to IBM Watson Knowledge Studio (Duration: 45 Minutes)		
	Overview	This unit introduces Watson Knowledge Studio, its capabilities, and features. This unitexplains the end-to-end domain adaptation process
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Describe IBM Watson Knowledge Studio. • List the Watson services that are trained by Knowledge Studio. • List the Knowledge Studio workspace resources. • Explain the process to build Knowledge Studio models that can be deployed andused with other Watson services.
Exercise 7. Creating a machine learning model with Watson Knowledge Studio (Duration: 01 Hour 15 Minutes)		
	Overview	This exercise takes you through the process of building a machine learning model with Knowledge Studio that you can deploy and use with Watson services. In the optional exercise, you will create a rule-based model that you can use to find text patterns in documents
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> • Create a workspace for Watson Knowledge Studio. • Configure the workspace resources. • Create document sets. • Pre-annotate documents. • Create tasks for human annotators. • Analyze inter-annotator agreement and adjudicate conflicts in annotated documents. • Create machine learning models.
Unit 10. Introduction to chatbots (Duration: 30 Minutes)		
	Overview	This unit provides a high level introduction to chatbots, chatbot applications andguidelines to consider when designing a chatbot.
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Explain what a chatbot is. • Describe common applications of chatbots.

		<ul style="list-style-type: none"> • Identify factors that drive the growing popularity of chatbots. • Recognize the guidelines to consider when designing a chatbot. • List examples of tools and services that you can use to create chatbots.
Unit 11. Introduction to IBM Watson Assistant (Duration: 01 Hour)		
	Overview	This unit covers the core concepts that you need to understand to build a chatbot with Watson Assistant.
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Explain assistants and skills. • Explain intents. • Explain entities. • Explain context variables. • Describe how the nodes in a dialog are triggered. • Describe how the dialog flow is processed. • Describe the features that can be used to enrich the chatbot.
Exercise 8. Getting started with IBM Watson Assistant (Duration: 45 Minutes)		
	Overview	This exercise introduces IBM Watson Assistant and walks you through the process of creating a very simple chatbot with Watson Assistant
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> • Create a Watson Assistant service instance. • Create a Watson Assistant skill. • Add intents. • Build a dialog.
Exercise 9. Help Desk chatbot (Duration: 01 Hour 30 Minutes)		
	Overview	In this exercise you will create a chatbot application with Node-RED without coding and integrate it with the Watson Assistant service
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> • Create a Watson Assistant skill. • Add intents and entities. • Build a dialog. • Create a Node-RED application that integrates with the Watson Assistant service. • Set up Slack as a front-end chat service for the Help Desk chatbot
Unit 12. Introduction to computer vision (Duration: 30 Minutes)		
	Overview	This unit provides a high level introduction to computer vision
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Define computer vision. • Explain the history of computer vision and its advancement with AI. • Identify computer vision use cases. • List tools and services for computer vision
Unit 13. Computer vision fundamentals (Duration 30 Minutes)		
	Overview	This unit explains the basic steps of a typical computer vision pipeline, how CV analyzes and processes images, and explores commonly used techniques in CV.
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> • Describe image representation for computers. • Describe the computer vision pipeline. • Describe different preprocessing techniques. • Explain image segmentation. • Explain feature extraction and selection.

		<ul style="list-style-type: none"> Describe when object recognition takes place.
	Unit 14. Introduction to IBM Watson Visual Recognition (Duration: 45 Minutes)	
	Overview	This unit introduces the Watson Visual Recognition service, describes its capabilities and how to train the service
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> Describe the IBM Watson Visual Recognition service. List the features available with Watson Visual Recognition. Describe the output provided by the Watson Visual Recognition service. Explain the capabilities of the default classifier. Explain the difference between a default and a custom classifier. Describe how to train a custom classifier.
	Exercise 10. IBM Watson Visual Recognition model builder in IBM Watson Studio (Duration: 01 Hour)	
	Overview	In this exercise, you learn how to create, train, and test a custom model. With a custom model, you can train the Watson Visual Recognition service to classify images to suit your business needs
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> Create a Watson Visual Recognition service. Create and train a custom Watson Visual Recognition model by using Watson Studio. Edit and retrain the trained model. Describe the effect of adding a negative class when training a Watson Visual Recognition model
	Unit 15. Designing and building an intelligent solution (Duration: 45 Minutes)	
	Overview	This unit explains the benefits of integrating multiple Watson services to build a comprehensive intelligent solution. This unit presents two intelligent solutions use cases: Cognitive banking FAQ chatbot and Intelligent procurement system
	Learning Objectives	<p>After completing this unit, you should be able to:</p> <ul style="list-style-type: none"> Explain the need to integrate multiple IBM Watson services to build an intelligent solution. Describe the general outline for the integration of IBM Watson Assistant with other services and applications. Explain the key concepts that enable Watson Assistant integration. Describe the integration flow between Watson Assistant, Watson Discovery, Watson Natural Language Understanding, and Watson Tone Analyzer to build the cognitive banking chatbot. Describe the integration flow between Watson Knowledge Studio and Watson Discovery.
	Exercise 11. Creating a cognitive banking FAQ chatbot (01 Hour 30 Minutes)	
	Overview	This exercise introduces you to IBM Watson Node.js SDK to include conversation interactions, anger detection, natural language understanding, and answer discovery in your FAQ chatbot application
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> Create a chatbot using Watson Assistant and Node.js. Use Watson Discovery with passage retrieval to find answers in FAQ documents. Use Watson Tone Analyzer to detect emotion in a conversation. Identify entities in the user's input with Watson Natural Language

		Understanding
		Exercise 12. Integrating Watson Knowledge Studio with Discovery for the procurement domain (optional) (Duration: 01 Hour)
	Overview	In this exercise, you will create a Discovery collection with procurement documents initially enriched by the Discovery Default Configuration. Then, you will create a Knowledge Studio machine learning model trained for the procurement domain and deploy the model to Discovery. Finally, you will evaluate the results.
	Learning Objectives	<p>After completing this exercise, you should be able to:</p> <ul style="list-style-type: none"> • Create a machine learning model in Watson Knowledge Studio and deploy it to Watson Discovery. • Create a Watson Discovery custom configuration and leverage a Watson Knowledge Studio model to enrich entities and relations. • Integrate a custom model from Watson Knowledge Studio with the Discovery service to provide custom entity and relations enrichments customized for a specific procurement domain

Course Title	VIRTUAL AND AUGMENTED REALITY (Professional Elective Course – III)				B.Tech. VII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039702	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3			
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> To Understand Virtual reality, augmented reality and using them to build bio medical engineering applications. To know the intricacies of these platform to develop PDA applications with better optimality. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Explore the history of spatial computing and design interactions							
CO 2	Understand the foundational principles describing how hardware, computer vision algorithm's function.							
CO 3	Learn Virtual reality animation and 3D Art optimization.							
CO 4	Demonstrate Virtual reality.							
CO 5	Introduce to the design of visualization tools							

UNIT – I

Designing and Art Across Digital Realities: Introduction, Modalities, Types of common HCI modalities, New Modalities, The current state of modalities for spatial computing Devices, current controllers for immersive computing systems, Voice, Hands and Hardware inputs over the next generation.

Designing for our senses, not our devices: Envisioning a future, sensory technology, The Role of women in AI, Sensory Design, Five sensory Principles, Adobes' AR.

UNIT – II

Virtual Reality of Art: A more natural way of making 3D art, VR for animation.

3D Art Optimization: Introduction, Draw Calls, Using VR Tools for creating 3D Art, Acquiring 3D Models Versus Making them from scratch.

UNIT – III

Computer vision that makes augmented reality Possible works: History of AR, How and why to select an AR Platform, Mapping, platforms, other Development considerations, The AR Cloud.

Virtual Reality and Augmented Reality – cross- platform theory: Why cross platform, The role of game engines, understanding 3D Graphics, Portability lessons from video game design, simplifying the controller input.

UNIT – IV

Virtual Reality Toolkit: What is VRTK, History, Steam VR Unity Toolkit, VRTK v4, future of VRTK, success of VRTK

Three Virtual Reality and Augmented Reality Development Best Practices: Handling Locomotion, Locomotion in VR, Locomotion in AR, Effective use of Audio, Audio in VR, Audio in AR, Common interaction paradigms, Inventory of VR, Augmented Reality Raycasts

UNIT – V

Data and Machine learning visualization Design and Development in spatial computing: Introduction, understanding data visualization, principles for data and machine learning visualization design and development in spatial computing, why data and machine learning visualization works in spatial computing, 2D data visualization vs 3D data visualization in spatial computing, interactivity in data visualizations and in spatial computing, animation, failures in data visualization, good data visualization design optimize 3D spaces, data representations, info graphics, and interactions, defining distinctions in data visualization and big data for machine, how to create data visualization: data visualization creation pipeline, webXR, data visualization challenges in XR, data visualization industry use case examples of data visualization, 3D reconstruction and direct manipulation of real world data, data visualization is for everyone, hands on tutorials, how to create data visualization, resources.

Text Books:

1. Erin Pangilinan, Steve lukas, and Vasanth Mohan, “Creating Augmented & Virtual Realities”, 1st edition, O’REILLY, 2019.

Reference Books:

1. Steve Aukstakalnis, “Practical Augmented Reality”, Pearson Education, 2017.

Course Title	NATURAL LANGUAGE PROCESSING (Professional Elective Course – III)				B.Tech. VII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039703	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> To learn the fundamentals of natural language processing. To understand the use of CFG and PCFG in NLP To understand the role of semantics of sentences and pragmatics To apply the NLP techniques to IR applications 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	To tag a given text with basic Language features							
CO 2	To design an innovative application using NLP components							
CO 3	To implement a rule-based system to tackle morphology/syntax of a language							
CO 4	To design a tag set to be used for statistical processing for real-time applications							
CO 5	To compare and contrast the use of different statistical approaches for different types of NLP applications.							

UNIT – I

Introduction: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT – II

Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT – III

Syntactic Analysis: Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT – IV

Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT – V

Discourse Analysis And Lexical Resources: Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

1. Daniel Jurafsky, James H. Martin—Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, —Natural Language Processing with Python, First Edition, O_Reilly Media, 2009.

Reference Books:

1. Breck Baldwin, —Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, —Natural Language Processing with Java, O_Reilly Media, 2015.
3. Nitin Indurkha and Fred J. Damerau, —Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, —Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

Course Title	ROBOTICS AND AUTOMATION (Professional Elective Course – IV)					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039704	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> To study the fundamental concepts of robotics and automation To impart knowledge on various drive system, sensors & machine vision system. To learn the various manipulators, grippers as well as the various dynamic process. To acquire the concept of kinematics and inverse kinematics. To understand the programming and specific industrial applications. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Summarize knowledge of basic concepts of robotic system							
CO 2	Analyze the function of sensors and machine vision system in the robot.							
CO 3	Categorize the drives, manipulators and grippers.							
CO 4	Develop the qualitative knowledge of robot dynamics and kinematics.							
CO 5	Evaluate the recent trends and application of robotics in various fields.							
CO 6	Propose the theoretical concepts through specific experimental tasks							

UNIT – I

Basic Concepts: Origin & various generation of Robots - Robot definition - Robotics system components - Robot classification Coordinate frames - Asimov's laws of robotics - degree of freedom - dynamic stabilization of robots. work volume. Need for Automation - types of automation - fixed, programmable and flexible automation.

UNIT – II

Drives, Sensors and Machine Vision: Hydraulic, Pneumatic and Electric drives - Machine vision - Sensing - Range, Proximity, Position, Velocity, Acceleration, Tactile, Acoustic, Force, Torque, Optical & laser sensors. Machine vision - Introduction, Image acquisition, Illumination Techniques, Image conversion, Cameras, Image processing and analysis – Image data reduction – Segmentation feature extraction – Object recognition.

UNIT – III

Anipulators, Grippers and Robot Dynamics: Construction of manipulators - Manipulator dynamics and force control - Electronic and Pneumatic manipulator control circuits - End effectors - Various types of grippers - Design considerations. Introduction to Robot Dynamics - Lagrange formulation - Newton Euler formulation - Properties of robot dynamic equations.

UNIT – IV

Kinematics and Path Planning: Forward Kinematics - Denavit Hartenberg Representation. Multiple solution jacobian work envelop, Inverse Kinematics - Geometric approach. Hill climbing techniques.

UNIT – V

Programming Languages and Applications: Robot programming - Fixed instruction, sequence control, General programming language, Specific programming languages. Implementation of Robots in industries-Robots for welding, painting and assembly - Remote Controlled robots - robots in manufacturing and non-manufacturing applications - Robots for nuclear and chemical plants.

Text Books:

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., “Industrial Robotics”, McGraw-Hill Singapore, 1996.
2. Ghosh, “Control in Robotics and Automation: Sensor Based Integration”, Allied Publishers, Chennai, 1998.
3. Asfahl C.R., “Robots and Manufacturing Automation”, John Wiley, USA 1992.

Reference Books:

1. Klafter R.D., Chimielewski T.A., Negin M., “Robotic Engineering - An integrated approach”, Prentice Hall of India, New Delhi, 1994.
2. M.P.Groover, “Industrial Robotics – Technology, Programming and Applications”, TATA McGraw-Hill Publishing Company, New Delhi, 2008.
3. Mc Kerrow P.J. “Introduction to Robotics”, Addison Wesley, USA, 1991.
4. Fu K.S. Gonzalez R.C. and Lee C.S.G., "Robotics Control Sensing, Vision and Intelligence" McGraw Hill International Editions, 1987.
5. Janakiraman.P.A., —Robotics and Image Processing", Tata McGraw-Hill, 1995.
6. Deb S.R.,” Robotics Technology and Flexible Automation”, Tata McGraw Hill, New Delhi, 1994

Course Title	REINFORCEMENT LEARNING (Professional Elective Course – IV)				B.Tech. VII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039705	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> • This course aims to provide the cutting-edge concepts in deep reinforcement learning. • It also helps the students to train an agent which can perform a variety of complex tasks. • It will also help students to learn about the core challenges and approaches, including generalization and exploration and also make the students well versed in the key ideas and techniques for deep reinforcement learning 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	To understand the basics of deep reinforcement learning							
CO 2	To implement in code deep reinforcement learning algorithms.							
CO 3	To explore the core challenges and opportunities in the field of deep reinforcement learning							
CO 4	Implement and apply Monte Carlo reinforcement learning algorithms							
CO 5	Implement and apply temporal-difference reinforcement learning algorithms							
CO 6	Construct and apply on-policy reinforcement learning algorithms with function approximation							

UNIT – I

Introduction: Introduction to Deep Reinforcement Learning – Approximate Solution Methods: On-policy Prediction with Approximation – On-policy Control with Approximation – Off-policy Methods with Approximation

UNIT – II

Recurrent And Recursive Neural Networks: Tree Recursive Neural Networks and Constituency Parsing - Recurrent neural networks for language modeling Dynamic Neural Networks for Question Answering,

UNIT – III

Convolutional Neural Networks: Convolutional Neural Networks -Recurrent and Recursive Neural Networks - Backpropagation Algorithms - Regularization and Optimization Techniques for Training such Networks

UNIT – IV

Dynamic Programming: Dynamic Programming - Monte Carlo and Temporal Difference and Function Approximation - Reinforcement Learning Algorithms and Applications of Deep and Reinforcement Learning.

UNIT – V

Deep Reinforcement Learning: Value function methods - Deep RL with Q-learning – Multi agent RL - Eligibility Traces – Policy Gradient Methods – Applications and Case studies.

Text Books:

1. Richard.S. Sutton and Andrew G. Barto, Reinforcement Learning, second edition, MIT Press, 2018.
2. “Deep Learning” by Ian Goodfellow, YoshuaBengio, and Aaron Courville (MIT Press, 2016)
[http://www.deeplearningbook.org/;](http://www.deeplearningbook.org/)

Reference Books:

1. “Reinforcement Learning: An Introduction” by Richard S. Sutton and Andrew G. Barto
<http://incompleteideas.net/book/the-book-2nd.html>

Course Title	BLOCK CHAIN TECHNOLOGIES (Professional Elective Course – IV)				B.Tech. VII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039706	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> This course helps the students to understand about distributed computing and block chain. It helps to know about applications of block chain. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Describe the basic concepts and technology used for blockchain.							
CO 2	Describe the primitives of the distributed computing and cryptography related to blockchain.							
CO 3	Illustrate the concepts of Bitcoin and their usage.							
CO 4	Implement Ethereum block chain contract.							
CO 5	Apply security features in blockchain technologies.							
CO 6	Use smart contract in real world applications.							

UNIT – I

Introduction, Need for Distributed Record Keeping, Modeling faults and adversaries, Byzantine Generals problem, Consensus algorithms and their scalability problems, Nakamoto's concept with Blockchain based cryptocurrency, Technologies Borrowed in Blockchain – hash pointers, consensus, byzantine fault-tolerant distributed computing, digital cash etc.

UNIT – II

Basic Distributed Computing & Crypto primitives, Atomic Broadcast, Consensus, Byzantine Models of fault tolerance, Hash functions, Puzzle friendly Hash, Collision resistant hash, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems

UNIT – III

Bitcoin basics, Bitcoin blockchain, Challenges and solutions, proof of work, Proof of stake, alternatives to Bitcoin consensus, Bitcoin scripting language and their use

UNIT – IV

Ethereum basics, Ethereum and Smart Contracts, The Turing Completeness of Smart Contract Languages and verification challenges, Using smart contracts to enforce legal contracts, comparing Bitcoin scripting vs. Ethereum Smart Contracts, Writing smart contracts using Solidity & JavaScript.

UNIT – V

Privacy, Security issues in Blockchain, Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains: Sybil attacks, selfish mining, 51% attacks advent of algorand; Sharding based consensus algorithms to prevent these attacks

Case Studies: Block chain in Financial Service, Supply Chain Management and Government Services.

Text Books:

1. Narayanan, Bonneau, Felten, Miller and Goldfeder, “Bitcoin and Cryptocurrency Technologies—A Comprehensive Introduction”, Princeton University Press.
2. Josh Thompson, ‘Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming’, Create Space Independent Publishing Platform, 2017.

Reference Books:

1. Imran Bashir, “Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained”, Packt Publishing.
2. Merunas Grincalaitis, “Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols”, Packt Publishing.
3. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, “Blockchain Architecture Design and Use Cases” [MOOC], NPTEL: <https://nptel.ac.in/courses/106/105/106105184/>

Course Title	INTERNET OF THINGS (Professional Elective Course – V)					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039707	PEC	L	T	P	C	Continuous Internal Assessment	EndExam	Total
		3	0	0	3			
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			
Course Objectives: <ul style="list-style-type: none"> • Basic principles of IOT. • Various IOT platforms and application development. • To know about Arduino board. • To know about Raspberry pi. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Demonstrate knowledge on Protocols, functional blocks and communication models of Internet of Things.							
CO 2	Identify domain specific IoT's.							
CO 3	Design appropriate solutions for IoT applications.							
CO 4	Working with Arduino board.							
CO 5	Design and develop applications using Raspberry pi device.							

UNIT - I

Introduction to IoT: Definition and Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Development Templates

UNIT - II

Domain Specific IoTs: Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle.

UNIT - III

IOT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT

IoT Platform Design Methodology: Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring.

UNIT - IV

Introduction to Arduino: Introduction, The Arduino Way, The Arduino Platform, Getting started with Arduino, Advanced Input and Output, Sample Programs.

UNIT - V

IOT Physical Devices: What is an IOT device, basic building blocks of an IOT device, Exemplary device: Raspberry Pi, about the board, linux on raspberry Pi, raspberry Pi interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

Text Books:

1. Adrian McEwen, Hakin Cassimally “Designing the Internet of Things” Wiley India.
2. Getting Started with Arduino, 3rd Edition, Massimo Banzi and Michael Shiloh
3. Getting Started with Raspberry Pie, Matt Richardson & Shawn Wallace, O’Reilly-2014.
4. Arshdeep Bahga, Vijay Madisetti “Internet of Things (A hands on approach)” 1st Edition, VPI publications, 2014.

Reference Books:

1. Raj Kamal, “Internet of Things”, McGraw Hill, 1st Edition, 2016.
2. Internet of Things, Surya Durbha, Jyothi Joglekar, Oxford Higher Education.
3. The Internet of Things, Michael Miller, Pearson.
4. The Internet of Things, Samuel Greengard, The MIT Press Ltd.

Course Title	COGNITIVE SCIENCE (Professional Elective Course – V)					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039708	PEC	L	T	P	C	Continuous Internal Assessment	EndExam	Total
		3	0	0	3			
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			
Course Objectives:								
<ul style="list-style-type: none"> • Gain knowledge in basic human behavior, processing models in psychology. • Design hypothesis using machine learning algorithms. • Design hypothesis using machine learning algorithms. • Understand neural network models for a human behavior. • Apply their own model for an activity. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Understand the basic human behaviorism of psychology							
CO 2	Understand Information processing models of psychology							
CO 3	Evaluate the hypothesis for models							
CO 4	Apply the neural network models for processing							
CO 5	Design their own model for an activity							

UNIT – I

Introduction to Cognitive Science: The prehistory of cognitive science, The reaction against behaviorism in psychology, The theory of computation and the idea of an algorithm, Linguistics and the formal analysis of language, Information-processing models in psychology.

UNIT – II

The Integration Modelling: Language and micro-worlds, Information processing in mental imagery, An interdisciplinary model of vision, Cognitive systems as functional system, Extending computational modeling to the brain, Mapping the stages of lexical processing.

UNIT – III

Information-processing models of the mind: The physical symbol system hypothesis, From physical symbol systems to the language of thought, Expert systems, machine learning, and the heuristic search hypothesis, ID3: An algorithm for machine learning, WHISPER: Predicting stability in a block world.

UNIT – IV

Neural networks and distributed information processing: Neurally inspired models of information processing, Single-layer networks and Boolean functions, Multilayer networks, Information processing in neural networks: Key features.

UNIT – V

Neural network models of cognitive processes: Language and rules: The challenge for information-processing models, Language learning in neural networks, Object permanence and physical reasoning in infancy, Neural network models of children's physical reasoning

Text Books:

1. Jose leuz Bermudz, Cognitive Science: An introduction to science of mind, 2nd Edition, Cambridge University press, 2014

Reference Books:

1. Jay Friedenberg, Gordon Silverman, Cognitive Science: An introduction to science of mind, Sage publications, 2006.

Course Title	DIGITAL FORENSIC (Professional Elective Course – V)				B.Tech. VII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039709	PEC	L	T	P	C	Continuous Internal Assessment	EndExam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			
Course Objectives:								
<ul style="list-style-type: none"> To learn about forensic and how they are planned To learn about the tools used in forensic science. To learn about cyber crime and cyber security. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Understand the fundamental concepts of digital forensic, digital evidence and the incident response process.							
CO 2	Apply various data acquisition techniques and tools on the evidences.							
CO 3	Learn the methods applicable for different forensic investigations.							
CO 4	Usage of various forensic tools to analyze different forensics data							
CO 5	Gains knowledge on cloud forensic procedures and challenges.							
CO 6	Understand the concept of file system and their use in forensic analysis.							

UNIT-I

Digital forensics: Introduction, History, Rules of Computer/ Digital forensic, Digital forensic as a discipline, Definition of digital forensic, digital forensic investigations, Goal of digital forensic investigation.

Digital evidences: Introduction, what is digital evidence, rules of digital evidence, characteristics of digital evidence, types of evidence, challenges in evidence handling, volatile evidence, evidence handling procedures.

Incidence Response: Introduction, Goals of incident response, people involved in incident response, incident respond Methodology, Activities in initial response, Phases after detection of an incident.

UNIT-II

Data Collection: Introduction, the facts in a criminal case, people involved in data collection techniques, Live data collection, Live data collection examples-Windows, Unix.

Forensic Duplication: Introduction, Rules of forensic duplication (Thumb Rule), Necessity of forensic duplication, Forensic duplicates as admissible evidence, Important terms in forensic duplicate, Forensic duplication Tool requirements, Creating a Forensic duplicate of a Hard Drive, Creating a Qualified Forensic duplicate of a hard Drive.

UNIT-III

Network Forensics: Introduction to IDS (Intrusion Detection System), Types of IDS, Advantages and disadvantages, Understanding Network intrusions and Attacks, recognizing pre-intrusion/ Attack activities, Port Scans, Address Spoofing, Attacking with Trojans, Viruses and Worms, Understanding Password cracking, Understanding Technical Exploits, Collecting Network based evidence, Investigating routers, Network Protocols.

E-Mail Forensics: Importance of E-Mail as evidence, Working of E-Mail, Steps in E- mail communication, E-mail service protocols, E-Mail forensic analysis steps, E- Mail Forensic Tools.

UNIT-IV

Mobile Forensics: Mobile hacking- SMS and Call Forging, mobile phone forensics, Forensic procedures CIA Traid, Software and hardware mobile phone tricks, Android forensics, Mobile forensic Tools.

Computer Forensic Tools: Introduction, evaluating computer forensic tool needs, types of computer forensic tools, tasks performed by computer forensic tools, Tool comparisons, software tools, hardware tools, Various computer/ Digital forensic tools.

UNIT-V

Cloud Forensics: Introduction, Three dimensions of cloud forensics, usage of cloud forensic, challenges to cloud forensic. Impact of cloud computing on digital forensic, Cloud forensic Tools.

File systems: Various types of file systems, Introduction to storage layers, Hard disk drive, Forensic Analysis of file systems.

Text Books:

1. Dr.Neelakshijain and Dr.Dhanajay R. Kalbande, Digital Forensic: The Fascinating World of Digital Evidences, Wiley Publications, 2017.

Reference Books:

1. Kevin Mandia, Chris Proise, Incident Response and computer forensics, Tata McGraw Hill, 2006.
2. Nelson, Phillips Enfinger, Steuart, Computer Forensics and Investigations, CENGAGE Learning.
3. John R. Vacca, Computer Forensics, Computer Crime Investigation, Firewall Media, New Delhi.
4. <https://www.oreilly.com/library/view/digital-forensics-with/9781597495868/>

Course Title	CYBER SECURITY (Open Elective Course – III)					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
20OE504	PEC	L	T	P	C	Continuous Internal Assessment	EndExam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			
Course Objectives:								
<ul style="list-style-type: none"> To learn about cybercrimes and how they are planned To learn the vulnerabilities of mobile and wireless devices The learner will gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Understanding the basic cyber security concepts							
CO 2	Classifying the international laws and cyber forensics							
CO 3	Remembering to cyber-crime.							
CO 4	Recognizing cybercrime and cyber terrorism.							
CO 5	Understanding the privacy issues.							

UNIT - I

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

UNIT - II

Cyberspace and the Law & Cyber Forensics: Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

UNIT - III

Cybercrime: Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT - IV

Cyber Security: Organizational Implications: Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

UNIT - V

Privacy Issues: Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains medical, financial, etc.

Text Books:

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.
3. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
4. Introduction to Cyber Security, Chwan-Hwa(john) Wu, J. David Irwin, CRC Press T&F Group.

Reference Books:

1. Cyber Security Engineering: A Practical Approach for Systems and Software Assurance, Nancy R. Meade, Carol C. Woody, Addison Wesley.
2. The Cyber Security: Self help Guide, Arun Soni, CRC Press.
3. Cyber Security: Analytics, Technology & Automation, Martti Lehto, Pekka Neittaanmaki, Springer.
4. Cyber Security: Essentials, Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short, SYBEX.

Course Title	JAVA PROGRAMMING (Open Elective Course – III)				B.Tech. VII Sem (R20UG) AI&ML				
Course Code	Category	Hours / Week			Credits	Maximum Marks			
200E508	OEC	L	T	P	C	Continuous Assessment	Internal	End Exams	Total
		3	0	0	3	40	60	100	
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs				
Course Objectives:									
<ul style="list-style-type: none"> To give the students a firm foundation on Java concepts like Primitive data types, Java control flow, Methods, Object-oriented programming, Core Java classes, packages and interfaces, multithreading. To provide the students with an understanding of Java applets, Abstract Window, Toolkit and exception handling. 									
Course Outcomes: On successful completion of this course, the students will be able to									
CO 1	Solve problems using object oriented approach and implement them using Java								
CO 2	Apply the concept of inheritance, polymorphism and Packages, Interfaces								
CO 3	Implement Exception handling and able to develop multithreaded applications with synchronization.								
CO 4	Able to develop applets for web applications.								
CO 5	Able to design GUI based applications.								

UNIT – I

Object Oriented Programming basics: Need for OOP paradigm, Principles of OOP concepts.

Java Basics: History of Java, Java buzzwords, Simple java program, classes and objects – concepts of classes, objects, constructors, methods, Introducing access control, **this** keyword, overloading methods and constructors.

UNIT – II

Inheritance: Inheritance basics, Types of Inheritance, benefits of inheritance, **super** uses, using **final** with inheritance, polymorphism- method overriding, abstract classes.

Packages and Interfaces: Defining, Creating and Accessing a Package, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT – III

Exception handling and multithreading: Concepts of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, creating own exception sub classes. Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads.

UNIT – IV

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling Mouse and Keyboard events, Adapter classes, The AWT class hierarchy, user interface components- Labels, Button, Scrollbars, Text Components, Check box, Choices,

UNIT – V

Applets: Concepts of Applets, differences between applets and applications, life cycle of an Applet, creating applets, passing parameters to applets.

Text Books:

1. Java; the complete reference, 7th edition, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
3. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, eighth Edition, Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, eighth Edition, Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino and F.A.Hosch, John Wiley & Sons.
2. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

Course Title	DATA ANALYTICS WITH PYTHON (Open Elective Course – IV)					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
20OE503	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> • Understand programming skills using basics of Python language • To introduce the object-oriented programming concepts. • Acquire basics of how to translate problem into object-oriented form • To understand object-oriented programming concepts, and apply them in solving problems. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Demonstrate and acquire knowledge on usage of Data types, operators, input and output statements in python programming.							
CO 2	Analyze the given problem and develop python program to solve the problem.							
CO 3	Able to use proper iterative statements in problem solving.							
CO 4	Entity the right sequence to solve the real-world problems.							
CO 5	Apply object-oriented features to solve real time applications.							

UNIT - I

Features of python, Execution of a python program, comments, identifiers and variables, classification of data types, keywords, constants, Naming conventions in python, Operators and expressions, operator precedence and associativity, input and output statements.

UNIT - II

Control statements: simple if, if..else, nested if, if..elif..else statement. **Loops:** while loop, for loop, nested loops, break, continue, pass and assert statements, Arrays in python, Strings and their operations.

UNIT - III

Functions: define and calling a function, return statement, formal and actual arguments, local and global variables, passing arguments to function, anonymous functions, example programs on functions, recursion.

UNIT - IV

Sequences: Lists, Tuples, Sets, Dictionaries, Operations and methods on Tuples, Lists, Dictionaries.

Files: Types of files, opening file, closing a file, write data into a file, read data from a file.

UNIT - V

Introduction to OOPS: Introduction to class and objects, self-variable in python, constructor, types of variables and methods, Inheritance and polymorphism, abstract class.

Text Books:

1. Core python programming by Wesley J Chun, Prentice Hall, Second edition.
2. Introduction to Computation and Programming using Python, by John Guttag, PHI Publisher.
3. Learning python, Mark Lutz, O'Reilly publications, 5th edition, 2013.
4. Core python programming by Dr. R. Nageswara Rao, Dreamtech press, second edition, 2018

Reference Books:

1. Python: The complete reference by Martin C Brown, McGraw-Hill Publication, 2018.
2. Programming Python, Mark Lutz, 4th Edition, O'Reilly publications.
3. Dive into Python, Mark Pilgrim, A Press Media, LLC.

Course Title	WEB DESIGNING USING PHP (Open Elective Course – IV)					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
20OE505	OEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3			
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			
Course Objectives:								
<ul style="list-style-type: none"> Familiarize the tags of HTML. Write backend code in PHP language and writing optimized front end code HTML and Java Script. Understand, create and debug database related queries and Create test code to validate the applications against client requirement. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO1	Enumerate the Basic Concepts of Markup Languages.							
CO2	Develop web Applications using CSS and different page layout.							
CO3	Make use of decisions, loops, strings in PHP							
CO4	Make use of functions, creating HTML forms with PHP.							
CO5	Accessing database through PHP.							

UNIT – I

Structuring Documents for the Web: Introducing HTML and XHTML, Basic Text Formatting, Presentational Elements, Phrase Elements, Lists, Editing Text, Core Elements and Attributes, Attribute Groups.

Links and Navigation: Basic Links, Creating Links with the Element, Advanced E- mail Links.

Images, Audio, and Video: Adding Images Using the error! File name not specified Element, Using Images as Links Image Maps, Choosing the Right Image Format, Adding Flash, Video and Audio to your web pages.

Tables: Introducing Tables, Grouping Section of a Table, Nested Tables, Accessing Tables.

Forms: Introducing Forms, Form Controls, Sending Form Data to the Server.

Frames: Introducing Frameset, Element, Creating Links between Frames, setting a Default Target Frame Using Element, Nested Framesets, Inline or Floating Frames with.

UNIT – II

Cascading Style Sheets: Introducing CSS, where you can Add CSS Rules.

CSS Properties: Controlling Text, Text Formatting, Text Pseudo Classes, Selectors, Lengths, Introducing the Box Model.

More Cascading Style Sheets: Links, Lists, Tables, Outlines, the focus and activate Pseudo classes Generated Content, Miscellaneous Properties, Additional Rules, Positioning and Layout with CSS.

Page Layout: Understating the Site's Audience, Page Size, Designing Pages, coding your Design, Developing for Mobile Devices.

Design Issues: Typography, Navigation, Tables, Forms.

UNIT – III

Introducing PHP – What is PHP? Why PHP use? Evolution of PHP, Installing PHP, Other ways to run PHP, Creating your first script.

PHP Language Basics – Using variables, Understanding Data Types, Operators and Expressions, Constants.

Decisions and Loops – Making Decisions, Doing Repetitive Tasks with Looping, Mixing Decisions and Looping with HTML.

Strings – Creating and Accessing Strings, Searching Strings, Replacing Text with Strings, Dealing with Upper and Lowercase, Formatting Strings.

UNIT – IV

Arrays – Creating Arrays, Accessing Array Elements, Looping Through Arrays with for-each, Working with Multidimensional Arrays, Manipulating Arrays.

Functions – What is a Function? Why Functions are useful? Calling Functions, Working with Variable Functions, writing your own Functions, Working with References, Writing Recursive Functions.

Handling HTML Forms with PHP – How HTML form works, Capturing Form Data with PHP, Dealing with Multi-Value Fields, Generating Web Forms with PHP, Storing PHP Variables in Forms, Creating File Upload Forms, Redirecting After a Form Submission.

UNIT – V

Working with Files: Getting Information on Files, Opening and Closing Files, Reading and Writing to Files, Copying, Renaming, and Deleting Files.

Working with Databases and MySQL – Database Architectures, Database Models, Starting the MySQL Server, Setting Up the MySQL root Password, making a Connection, choosing a Database, creating a New Database, Reading Data, creating a Table, Adding Data to a Table, Reading Data from a Table, Updating Data in a Table, Deleting Data from a Table, Deleting Tables and Databases, Handling Errors.

Text Books:

1. Jon Duckett, Beginning HTML, XHTML, CSS and JavaScript
2. Matt Doyle, Beginning PHP 5.3 (Wrox – Wiley Publishing)

Reference Books:

1. Chris Bates, Web Programming
2. Ralph Moseley and M. T. Savaliya, Developing Web Applications
3. P.J. Deitel & H.M. Deitel, Internet and World Wide Web How to program
4. W. Jason Gilmore, Beginning PHP and MySQL From Novice to Professional
5. Andrew Curioso, Ronald Bradford, Patrick Galbraith, Expert PHP and MySQL
6. Luke Welling, Laura Thomson, PHP and MySQL Web Development
7. Brett McLaughlin, PHP & MySQL: The Missing Manual

Course Title	HUMAN RESOURCE DEVELOPMENT (Humanities & Social Sciences Elective)				B.Tech. VII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2006701	HSS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> To develop capability of all individuals working in an organization in relation to their present role. To develop team spirit. To develop co-ordination among different units of an organization. To develop organization health by continuous reveal of individual capability keeping pace with the technological changes. To develop better interpersonal & employer-employee relationships in an organization. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	To understand key functions in management as applied in practice.							
CO 2	To understand in more specific management related areas from planning till controlling.							
CO 3	To understand about the authority and responsibility, and different organizational structure.							
CO 4	To understand about the role of leadership, motivation and communication in an organization.							
CO 5	To understand the importance of globalization and diversity in modern organizations.							

UNIT – I

Introduction to Human Resource Development: Meaning, significance and objectives of Human Resource Development, Human Resource Management and Human Resource development functions, Human Resource Development challenges

UNIT – II

HRD Need Assessment & Designing of HRD programs: Strategic/ Organizational Analysis- Task Analysis- Person Analysis- prioritizing HRD needs, defining the objectives of HRD Intervention - Selecting the trainer - Selecting the Training methods - Preparing training material Scheduling an HRD program

UNIT – III

Implementation & Evaluation of HRD programs: Training methods - Classroom training Approaches - Computer based Training, Purpose of HRD Evaluation- Kirkpatrick's evaluation framework - Data collection for HRD Evaluation - Assessing the impact of HRD programs in Monetary Terms

UNIT – IV

Career Management and Development: Introduction to Career management, meaning - Stages of life and Career Development - process of career Development - Issues in career development.

UNIT – V

HRD & Diversity: Introduction – Organizational culture – Labor Market changes and discrimination adapting to demographic changes

Text Books:

1. Jon M Werner,Randy L DeSimone : Human Resource development (Thomson/Cengage)
2. Raymond A Noe : Employee Trainee Development (Tata McGraw Hill)

Reference Books:

1. John P. Wilson Human Resource Development (Kogan Page Business Books)
2. Tripathi P.C : Human Resource Development (Sultan Chand & Sons)
3. Uday Kumar Haldar : Human Resource Development (Oxford)

Course Title	DIGITAL MARKETING (Humanities & Social Sciences Elective)					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2006702	HSS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> To provide foundation in the key concepts on digital marketing. Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy. Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan. Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media Learn how to measure digital marketing efforts and calculate ROI 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO1	Analyze the confluence of marketing, operations, and human resources in real-time delivery.							
CO2	Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities.							
CO3	Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks.							
CO4	Investigate and evaluate issues in adapting to globalized markets that are constantly changing and increasingly networked.							
CO5	Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.							

UNIT – I

Understanding Digital Marketing Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

UNIT – II

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How Different Segments use Digital Media - Digital Media for Customer Loyalty.

UNIT – III

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan.

UNIT – IV

Search Engine Marketing and Online Advertising: Importance of SEM, Understanding Web Search – Keywords, HTML Tags, Inbound Links, Online Advertising vs. Traditional Advertising,

Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost-per-Click), Display Ads - Choosing a Display Ad Format, Landing Page and its Importance.

UNIT – V

Social Media Marketing: Understanding Social Media, Social Networking with Face book, LinkedIn, Blogging as a Social Medium, Social Sharing with YouTube. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

Text Books:

1. Seema Gupta, Tata McGraw Hill.
2. Dave Chaffey, Pearson Education
3. Dr Antony Puthussery

Reference Books:

1. Kevin Hartman, Digital Marketing Analytics,
2. Digital Marketing – Self learning management series, Vibrant Publishers
3. Digital Marketing, Vandana Ahuja, Oxford publishing house
4. Fundamentals of Digital Marketing, Puneet Singh Batia – Pearson Education
5. Digital Marketing by Seema Gupta (IIM-B)
6. Digital Marketing: Strategy, Implementation & Practice by Dave Chaffey & Fiona Ellis Chad wick
7. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation - Damian Ryan and Calvin Jones.

Course Title	PROJECT MANAGEMENT (Humanities & Social Sciences Elective)				B.Tech. VII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2006703	HSS	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3 Hrs			
Course Objectives:								
<ul style="list-style-type: none"> To impart the basic concepts of Project selection. To develop an understanding of Project Planning and design, construction and execution, monitoring and control, completion. To achieve the Project's main goal within the constraints. To optimize the allocated necessary inputs. To shape and reform the client's vision or tone got late with the masregards the project's objectives. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Remembering and recalling the principles of project management and methods involved in the process of project management.							
CO 2	Understanding of Project Planning, design, construction, execution, maintaining and controlling							
CO 3	Applying techniques in Project Evaluation, Scheduling and Controlling.							
CO 4	Classifying and analysis risks in Project management and project scheduling							

UNIT – I

Introduction to Project Management: Need for Project management, Taxonomy of project, Project life cycle, Project management Process, Principles of Project Management. Project Identification and Selection, Pre – feasibility study, Project Planning Process, Resources allocation, Project Break-even Point.

UNIT – II

Financial Evaluation of Projects: Cost of the Project, Means of finance, Financial Evaluation of projects – Payback period method, Accounting Rate of Return method, Net Present Value method, Internal Rate of Return method, Benefit Cost Ratio method (Profitability Index), (simple Problems).

UNIT – III

Project Risk & Quality Management: Introduction, Role of Risk management, Risk Identification – Steps in risk management –, Risk analysis (Sensitivity Analysis, Probability Analysis, Mean – Variance Analysis Decision trees, Simulation), Techniques for managing risk. Project Quality Management And Value Engineering: Quality, Quality Concepts and Value Engineering.

UNIT – IV

Project Scheduling (Network Analysis): Development of Project network, Time estimation, Determination of the critical Path, PERT Model, Project Crashing (Simple Problems)

UNIT – V

Project Execution & PMS: Process Of Project Execution and Control, Project Management Information System (PMIS), Project Performance Measurement and Evaluation (PPME).

Project Management Software: Essential Requirement of Project Management Software, Common Features available in most of the project management software.

Text Books:

1. Project management Best Practices: Achieving Global Excellence by Harold Kerzner; John Wiley & Sons; 3rd edition.
2. Project Management: Engineering, Technology and Implementation: united states Edition by Avraham Shtub and Jonathan F.Bard, Pearson; 1st edition.
3. The Essentials of Project Management by Dennis Lock; Routledge.
4. Prasanna Chandra, Projects, Tata Mc Graw Hill.
5. Nagarajan K, Project Management 4th edition, New Age International (P)Ltd.
6. LS Srinath, PERT/CPM, Affiliated East-West Press 2005.

Reference Books:

1. Project management by Stephen Hartley; Routledge, 4th Edition.
2. Project management: a systems Approach to Planning, Scheduling, and controlling by Harold Kerzner; Wiley; 12th edition.
3. Project Management & Appraisal by Sitangshu Khatua; published by Oxford University.
4. Nicholas J.M. & Steyn H., Project Management, Elsevier, Himalaya publications.
5. Narendra Singh, Project Management and Control, HPH, 2003.
6. Harvey Maylor, Project Management, Pearson Education.
7. Panneer selvam Senthil kumar, Project Management, PHI.

Course Title	INTERNSHIP					B.Tech. VII Sem (R20UG) AI&ML		
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039711	PROJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	0	3			
Internal Assessment								
Course Objectives:								
<ul style="list-style-type: none"> • Develop and improve business skills in communication, technology, quantitative reasoning, and teamwork. • Observe and participate in business operations and decision-making. • Meet professional role models and potential mentors who can provide guidance, feedback, and support 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Assess interests and abilities in their field of study and Integrate theory and practice							
CO 2	Develop communication, interpersonal and other critical skills in the job interview process.							
CO 3	Acquire employment contacts leading directly to a full-time job following graduation from college							
CO 4	Identify and carry out performance objectives related to their job assignment.							

Course Title	MULTIMEDIA AND APPLICATION LAB				B.Tech. VII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039712	SC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		1	0	0	2	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			
Course Objectives:								
<ul style="list-style-type: none"> • To adapt the architecture for design of multimedia system. • To solve issues related to multimedia file handling. • To adopt hypermedia standards in developing multimedia applications. • Know the basics of creating multimedia applications. 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Design the web-based multimedia components.							
CO 2	Create time-based and interactive multimedia components.							
CO 3	Create Animation Projects from its Conceptual Stage to the final Product.							
CO 4	Apply Audio and Video Production Techniques to an Animation Project.							

List of Experiments:

1. Design a web page to display student education details in a tabular format.
2. Write an HTML code to display the CV on a web page.
3. Design a Registration Form which includes a multimedia content. On submitting the form, the user should navigate to Home page.
4. Write an HTML code to create a Home page having three links: About Us, Our Services and Contact Us. Create separate web pages for the three links.
5. Design a web page which includes text, graphics, sound, video, and animation create your Institute website, Department Website and Tutorial website for specific subject.
6. Procedure to create an animation to change a Circle into a Square using flash.
7. Procedure to create an animation for a Boy playing with a Football.
8. Procedure to create an animation to show the ripple effect.
9. Procedure to create a scene to show the sunrise and sunset (using multiple layers and motion tweening)
10. Procedure to Create an animation for bus, car race in which both starts from the same origin point and the car winning the race.
11. Procedure for creating a Banner using Photoshop.
12. Procedure for creating a Audio file using free open source tools.
13. Procedure for creating a video: Editing, Mixing, Adding Sound to a video.
14. Procedure for Editing an Image using Photoshop/free open source tool
15. Procedure for working with text using Microsoft power point.

Additional Experiments:

1. Procedure to create an Animation to indicate a ball bouncing on the steps.
2. Procedure to create a simulation Animation of Moving Clouds.
3. Procedure to draw the fan blades and to give proper Animation.
4. Procedure to create an Animation with the following features:
5. *Letters should Appear one by one
6. *The fill color of the text should change to a different color after the display of full word
7. Procedure to simulate a ball hitting another ball.

Text Books:

1. “Multimedia: Computing, Communications and Applications”, Ralf Steinmetz and Klara Nahrstedt, Pearson Education.
2. “Multimedia: Making It work”, Tay Vaughan, Pearson Education.
3. “Multimedia Systems”, Koegel Buford, Pearson Education
4. “Fundamentals of Multimedia, Ze-Nian Li, Mark.S.Drew, Springer.

Reference Books:

1. “Multimedia System design “, Prabhat K. Andheigh, Kiran Thakrar, THM
2. “Multimedia Communication Systems: Techniques, standards and networks,K.R.Rao, D.Milovanovic.
3. Introduction to Multimedia, Ramesh Bangia, Firewall Media.
4. Principles of Multimedia, 2nd Edition, Ranjan Parekh, MAT Lab examples.

B.Tech. VIII Sem (R20UG)

S.No.	Course Code	Course Name	Category	Hours per Week			IM	EM	Credits
				L	T	P	40	60	
1	2039801	Project Work / Internship in Industry (6 months)	PROJ	0	0	0	40	60	12
		Total					40	60	12

Course Title	Project Work / Internship				B.Tech. VIII Sem (R20UG) AI&ML			
Course Code	Category	Hours / Week			Credits	Maximum Marks		
2039801	PROJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	0	12			
Course Objectives:								
<ul style="list-style-type: none"> Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions. Acquire and apply new knowledge as needed, using appropriate learning strategies 								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Demonstrate a sound technical knowledge of their selected project topic							
CO 2	Understand problem identification, formulation and solution							
CO 3	Design engineering solutions to complex problems utilizing a systems approach							
CO 4	Communicate with engineers and the community at large in written and oral form							
CO 5	Demonstrate the knowledge, skills and attitudes of a professional engineer							

GUIDELINES FOR PROJECT

The prime objective of the project work is to imbibe students with technical, analytical and innovative ideas. The students will be able to learn theoretical and practical approaches pertaining to software applications development. A team of 4-5 students formed as a group and work under the supervision of a departmental faculty. Associating the students to solve real world problems identified within the department. The project work normally includes:

1. Literature survey on existing problem/ topic from viable sources.
2. Eliciting the problem-solving approach/methodologies and making the feasibility study.
3. The team should perform an extensive software requirements analysis.
4. Preparing an abstract on the selected topic and present before Departmental Review Committee (DRC).
5. Preparing a roadmap to design, analyze, implement, evaluate / test considering functional, non-functional aspects and finally, deploy the application / product / software service.
6. Detailed Analysis/Design /Simulation as needed.
7. Final development of product / process conducting testing and specifying the results, conclusions and future scope.
8. Preparing a project report in the standard format for being evaluated by the Department Review Committee (DRC).
9. Final Project presentation / execution before Departmental Review Committee (DRC).