Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

IT2701: Laws for Engineers

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Professional Communication.

Course Objectives :

1.	To introduce engineering students to those aspects of law which are most relevant to engineering practice.
2.	To promote familiarity with and understanding of those areas of law.
3.	To develop skills of analysis and problem solving for patent writing.
4.	To facilitate effective written expression and argumentation.

	Course Contents	Hours
Unit 1	**Introduction to Copyright:** Origin of Copyright in Britain, Development of Copyright Law in India, TRIPs(Trade related Intellectual Property Rights), Concept of Copyright under Indian Law, Meaning of Copyright, Future of Copyright in India, Rights of Author"s-Global & International Perspective: World Intellectual Property Organization , Berne Convention for the Protection of Literary and Artistic Works,1886, Economic and Moral Rights of Authors, Universal Copyright Convention, 1952, WIPO Copyright Treaty, 1996 .	**(06)**
Unit 2	**Software Piracy:** Software Piracy-Definition, Software Piracy an Economic Offence, Types of Software Piracy , Legal Aspects of Software Piracy-Infringement of Copyright, Software Piracy, Case Study of Microsoft against KK Software (**Self Study:** Case Study of Tata Consultancy Services v State of Andhra Pradesh)	**(07)**
Unit 3	**Copyright on Internet:** Role of Internet Intermediaries in Online Copyright Infringement , Basic limits to Copy Internet Contents/Fair Use, WIPO Internet Treaties, Licence: Implied and Express, Online Copyright Issues , Hyper Linking, Copyright in Images and Photograph, Consequence of Copyright Infringement on Internet (**Self Study:** Free Speech and Internet)	**(07)**
Unit 4	**Understanding of Patents: Indian Perspectives (Patents Act, 1970):** Meaning of Patent, Inventions, Infringement of Patents, Defences in Suits for Infringements, Appointment of Scientific Advisor to assist the Court, Power of Controller, Appeals Penalties, Patent Agents, Patent Registration and Other Authorities: Application for Patent, Publication and Examination of Patent, Representation and Opposition, Secrecy of Invention, Grant of Patent and Rights of Patentee, Amendment of Applications and Specifications, Restoration of Lapsed Patent, Surrender and Revocation of Patent, Use of Inventions for Government purposes.	**(06)**
Unit 5	**Computer related Patent:** European Patent Convention, Software Patent in U.S. Indian Patent Law and Definition of Important Terms, Computer Programmes, A mathematical or business method or a computer programme per se or algorithms are not inventions and hence not patentable, Functions of Indian Patent Office as Receiving Office, Computer related Patent Applications, PCT (Patent Cooperation Treaty) application System, Utility Patents and cyber law.	**(06)**
Unit 6	**Understanding of Trademark:** Functions and Objectives of Trademark, Historical Background of Trademark Law in India, Meaning and Definition of Trademark, Classification of Trademark, The International Nature of Trademark Law, Trademark and Goodwill, Trademark Law-US Position, Assignment of Trademark, Existence of Trademark without Registrations.	**(08)**

Course Outcomes (CO):

Students will be able to

1.	Define the concept of copyright and relate it to internet cases.
2.	Identify Software Piracy cases.
3.	Explain the concept and process of patent filing and confirmation.
4.	Describe the concept of trademark.

Text Books

1.	V. K. Ahuja, "Law Relating to Intellectual Property Rights", LexisNexis, 2nd edition, 2007. (Unit: 1,2,3,4,5,6)
2.	B. L. Wadehra, "Patents, Trademarks, Designs and Geological Indications", Universal Law Publishing – Lexis Nexis, 2nd edition, 2005. (Unit:3,4)

Reference Books	
1.	P. Narayan, "Intellectual Property Law", Eastern Law House, 2nd edition, 2005.
2.	Prabudh Ganguli, "Gearing up for Patents: The Indian Scenario", Orient Longman, 2007.
3.	Intellectual Property Rights: Law and Practice, Module III by ICSI (only relevant sections).
Useful Links	
1.	https://www.coursera.org/learn/privacy-law-data-protection Lauren Steinfeld, University of Pennsylvania.
2.	https://nptel.ac.in/courses/110/106/110106081/ Prof. Feroz Ali, IIT Madras.
3.	https://www.ialm.academy/course/specialised-certification-in-engineering-laws Dr. Pinki Ghosh IALM Academy.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	3	1	-	-	-	-	-	-	-	-	3	2
CO 2	2	1	1	2	-	-	-	-	-	-	-	-	1	2
CO 3	3	1	3	1	-	-	-	-	-	-	-	-	3	2
CO 4	2	2	1	3	-	-	-	-	-	-	-	-	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	5	-	3	10
Apply	5	5	-	10
Analyse	-	5	3	10
Evaluate	-	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

IT2702: Robotics and Automation

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Engineering Graphics, Mathematics.

Course Objectives :

1.	To provide an introduction to Robotics and Automation including robot components and characteristics.
2.	To understand the basic concepts associated with the design and functioning of Robots.
3.	To study about the sensors used in Robots.
4.	To learn about application of robot.

	Course Contents	Hours
Unit 1	**Fundamentals:** Introduction to Robots, Classification of Robots, Robotics, History of Robotics, Advantages and Disadvantages of Robots, Robot Components, Robot Degrees of Freedom, Robot Joints, Robot Coordinates, Robot Reference Frames, Programming Modes, Robot Characteristics, Robot Workspace, Robot Languages, Robot Applications, Other Robots and Applications.	**(05)**
Unit 2	**Robotics:** The Seven Criteria of Defining a Robot, Robot Categories, Aerial and Underwater Robots, Sensors, Actuator, End-Effector, Controller, basic components of a microcontroller, Giving the Robot Instructions, Machine Language, Assembly Language, Robot Vocabularies, Identify the Actions, The Autonomous Robot"s ROLL Model, Robot Capabilities.	**(08)**
Unit 3	**Rsvp: Robot Scenario Visual Planning:** Mapping the Scenario, creating a Floor plan, The Robot"s World, Deterministic and Nondeterministic Environments, RSVP READ SET, Pseudocode and Flowcharting RSVP, State charts for Robots and Objects, Checking the Actual Capabilities of Your Robot, The Reality Check for the Microcontroller, Sensor Reality Check, Actuators End-Effectors Reality Check.	**(08)**
Unit 4	**Sensors:** Human and Robot Sensors, Types of Robot Sensors, Analog and Digital Sensors, Reading Analog and Digital Signals, Active and Passive Sensors, Sensor Interfacing with Microcontrollers, Attributes of Sensors, Range and Resolution, Precision and Accuracy, Linearity, Sensor Calibration, Calibration Methods.	**(07)**
Unit 5	**Automation and Programming the Robot:** Automation, Elements of Automated System, Advanced Automation Functions, Levels of Automation, Types of Automation, Reasons for Automating. Robot vision, Color sensor, Color Sensor Modes, Programming Motors And Servos, Motor Characteristics, Different Types of DC Motors, Typical Gears and Estimated Efficiency Constants, Servos: DC Motors with Geartrain, Motor Configurations: Direct and Indirect Drivetrains, Terrain Challenge for Indoor and Outdoor Robots. (**Self Study**:- Automated Vehicle)	**(08)**
Unit 6	**Robot Languages and Programming:** Robot Languages, Classification of Robot Languages, Computer Control and Robot Software, VAL system and Language, RoboML (**Self Study**:- Robot Operating System (ROS))	**(07)**

Course Outcomes (CO):

Students will be able to

1.	Understand the fundamentals of robotics and its components.
2.	Interface various Servo and hardware components with Controller based projects.
3.	Identify and analyze parameters required to be controlled in a Robot.
4.	Design and develop small automatic/autotronics applications with the help of Robotics.

Text Books

1.	Saeed B. Niku, "Introduction to Robotics: Analysis, Control, Applications", Wiley; Second edition, 1 January 2011. (Unit: 1)
2.	Cameron Hughes Tracey Hughes, "Robot Programming: A Guide to Controlling Autonomous Robots", 1/e First Edition, 2016, ISBN: 9789332577442. (Unit: 2,3,4,5)
3.	John J. Craig, "Introduction to Robotics: Mechanics and Control", Pearson; 3rd edition ,27 July 2004.(Unit: 6)

Reference Books

1.	Peter Corke, Robotics, "Vision and Control: Fundamental Algorithms in MATLAB", Springer, 1st Edition 2011.
2.	Schilling Robert J, "Fundamentals of Robotics: Analysis and Control", Prentice Hall India Learning Private Limited, 1 January 1996.

3.	King-Sun Fu, C. S. George Lee, Ralph Gonzalez, "Robotics: Control, Sensing, Vision and Intelligence", McGraw-Hill Education (ISE Editions), 1 June 1987.

Useful Links			
1.	https://nptel.ac.in/courses/112/105/112105249/	Prof. Dilip Kumar Pratihar, IIT Kharagpur	
2.	https://nptel.ac.in/courses/107/106/107106090/	Prof. Asokan T, IIT Madras.	
3.	https://nptel.ac.in/courses/112/101/112101098/	IIT Bombay	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	-	-	-	-	-	-	-	-	-	-	1	2
CO 2	-	3	-	-	-	-	-	-	-	-	-	-	1	2
CO 3	-	3	-	2	-	-	-	-	-	-	-	-	3	2
CO 4	-	-	3	-	1	-	-	-	-	-	-	-	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

IT2705: Information Security

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Computer Networks, Computer Algorithms

Course Objectives:

1.	To explain the basics of cryptography and some key encryption techniques.
2.	To develop an understanding of security policies such as authentication, integrity and confidentiality.
3.	To apply various cryptographic data integrity algorithms.
4.	To describe network security services and mechanisms.

	Course Contents	Hours
Unit 1	**Overview and Classical Encryption Techniques:** Computer Security Concepts, Security trends - Legal, Ethical and Professional Aspects of Security, Security Attacks, Services, Mechanisms, The OSI Security Architecture, A Model for Network Security. Classical encryption techniques- Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines. Block Ciphers and the Data Encryption Standard- Block Cipher Principles, The Data Encryption Standard (DES), A DES Example, The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles, Advanced Encryption Standard(AES)	**(09)**
Unit 2	**Asymmetric Cryptography:** Principles of Public-Key Cryptosystems, RSA cryptosystem – Key distribution, Key management, The RSA Algorithm, Diffie-Hellman Key Exchange, ElGamal Cryptosystem- Elliptic curve arithmetic-Elliptic curve cryptography.	**(06)**
Unit 3	**Cryptographic Data Integrity Algorithms:** Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Requirements and Security, Secure Hash Algorithm (SHA), SHA-3.	**(05)**
Unit 4	**Message Authentication Codes and Digital Signatures**: Message Authentication Requirements, Message Authentication Functions, Message Authentication Codes, Security of MACs, MACs Based on Hash Functions: HMAC, MAC Based on Block Ciphers: DAA and CMAC. Digital Signatures, ElGamal Digital Signature Scheme, Schnorr Digital Signature Scheme, Digital Signature Standard (DSS). (**Self Study:** Authentication Applications)	**(08)**
Unit 5	**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Public Key Infrastructure.	**(06)**
Unit 6	**Network and Internet Security:** Transport-Level Security -Web Security Issues, Secure Sockets Layer (SSL), Transport Layer Security (TLS), HTTPS Electronic Mail Security -Pretty Good Privacy (PGP). IP Security overview, system security: Intruders – Malicious software – viruses – Firewalls. (**Self Study:**Issues in Digital Security)	**(06)**

Course Outcomes (CO):

Students will be able to

1.	Describe fundamentals concepts of information security.
2.	Explain basic principles, techniques, challenges and scope of information security while designing a secure system.
3.	Demonstrate different cryptographic algorithms with understanding its importance.
4.	Identify network security applications, IPSec, Web security, Email security, and Malicious software etc.

Text Books

1.	Williams Stallings, "Cryptography and Network security principles and practices". Pearson Education (LPE), 5th edition, 2010. (Unit: 1,2,3,4,5,6)
2.	Nina Godbole, "Cyber Security", Wiley Publications, 1st edition. (Unit: 1,2,3,4,5,6)

Reference Books

1.	B. A. Forouzan, "Cryptography & Network Security", McGrawHill, 5th edition.
2.	Atul Kahate, "Cryptography and network security", TMGH, 2nd edition.
3.	Menezes, A. J., P. C. Van Oorschot, and S. A. Vanston, "Handbook of Applied Cryptography", 5th editions.
4.	C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd.

Useful Links

1.	http://nptel.ac.in/courses/106105031/ Dr. Debdeep Mukhopadhyay Department of Computer Science and

	Engineering, IIT Kharagpur.
2.	http://cse29-iiith.vlabs.ac.in/ Virtual Lab, An Initiative of Ministry of Education.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	2	2	1	1	-	-	-	-	-	-	-	3	2
CO 2	2	3	2	1	2	-	-	-	-	-	-	-	2	3
CO 3	2	2	2	2	2	-	-	-	-	-	-	-	2	2
CO 4	2	1	2	2	3	-	-	-	-	-	-	-	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	5	5	3	20
Apply	-	-	3	10
Analyse	-	-	-	-
Evaluate	5	5	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

IT2706: Cloud Computing and Infrastructure Services

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Computer Networks

Course Objectives :

1.	To introduce Cloud Computing and Virtualization.
2.	To discuss the architecture and infrastructure of Cloud Computing along with various types of clouds.
3.	To describe the security, privacy and interoperability of Cloud Computing.
4.	To acquire the knowledge of Cloud Programming and introduce different cloud platforms.

	Course Contents	Hours
Unit 1	**Introduction:** Cloud computing at a glance, The vision of cloud computing, Defining a cloud, The cloud computing reference model, Characteristics and benefits, Challenges ahead, Historical developments, Distributed systems, Virtualization, Web 2.0, Service-oriented computing, Utility-oriented computing, Building cloud computing environments.	**(06)**
Unit 2	**Introducing Virtualization:** Introduction, Characteristics of virtualized environments, Increased security, Managed execution, Portability, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Advantages of virtualization, The other side of the coin: disadvantages, Technology examples.	**(07)**
Unit 3	**Cloud Computing Architecture:** Introduction, The cloud reference model, Architecture, Infrastructure- and hardware-as-a-service, Platform as a service, Software as a service, Types of clouds, Public clouds, Private clouds, Hybrid clouds, Community clouds, Economics of the cloud, Open challenges.	**(07)**
Unit 4	**Data Security in the Cloud:** Challenges with Cloud Data – Data Redundancy, Disaster Recovery, Data Backup, Data Replication, Data Residency, Data Reliability, Data Fragmentation, Data Integration, Data Transformation, Data Security, Data Confidentiality and Encryption, Data Availability, Data Integrity, Cloud Data Management Interface (**Self Study:** Cloud Firewall, Virtual Firewall)	**(06)**
Unit 5	**Cloud Programming:** Programming Support for Google Apps Engine, Google File System, BigTable as Google"s NoSQL System, Programming Support for Amazon EC2, Amazon S3, Elastic Block Store (ESB), Amazon SimpleDB (**Self Study:** Aneka Cloud Platform)	**(06)**
Unit 6	**Future of Cloud Computing:** How the Cloud will change Operating Systems, Location – Aware Applications, Intelligent Fabrics, The Future of Cloud TV, Future of Cloud Based Smart Devices, Faster Time to Market for Software Applications, Home-Based Cloud Computing, Mobile Cloud, Automatic Cloud Engine, Multimedia Cloud, Energy Aware Cloud Computing, Docker at a Glance: Process Simplification, Broad Support and Adoption, Architecture, Getting the Most from Docker, The Docker Overflow, General Data Protection Regulation (GDPR).	**(08)**

Course Outcomes (CO):

Students will be able to

1.	Elaborate the concepts related to Cloud Computing and Virtualization.
2.	Identify the architecture and infrastructure of Cloud Computing including SaaS, PaaS, IaaS etc.
3.	Explain the core issues of Cloud Computing such as security, privacy and interoperability.
4.	Give technical overview of Cloud Programming and Services.

Text Books

1.	Rajkumar Buyya, "Cloud computing principles and paradigms", Wiley, 1st edition, 2011. (Unit: 1,2,3,4,5)
2.	Kailash Jayaswal, "Cloud computing", Black Book, Dreamtech Press, 1st edition.(Unit: 4,5)
3.	Barrie Sosinsky,"Cloud Computing", Wiley India, ISBN: 978-0-470-90356-8 (Unit:6)

Reference Books

1.	John W. Rittinghouse ,James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press; 1st edition
2.	Barrie Sosinsky, "Cloud Computing Bible" John Wiley and Sons, 1st edition, 2010.
3.	Dr. Kumar Saurabh,"Cloud Computing", Wiley Publication.

Useful Links

1.	https://nptel.ac.in/courses/106/105/106105223/	Prof. Soumya K Ghosh, IIT Kharagpur.
2.	https://nptel.ac.in/courses/106/104/106104182/	Dr. Rajiv MishraIIT Patna.
3.	https://nptel.ac.in/courses/106/105/106105167/	Prof. Soumya K Ghosh, IIT Kharagpur.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-	2
CO 2	-	2	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	-	-		-	-	-	-	-	-	-	-	-	1	-
CO 4	-	1	3	1	3	2	-	-	1	-	-	1	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
IT2707 : Robotics and Automation Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	25
Total Credits	01			

Prerequisite: Engineering Graphics, Programming in Python.

Course Objectives :

1.	To design and configure the robots for solving the real-world problems.
2.	To illustrate the movement of robotic joints with computers/microcontrollers.
3.	To gain knowledge on the robot programming packages.
4.	To analyze the applications of robots in various industrial application.

Course Contents

Experiment 1	Study of components of real robot and its performance.
Experiment 2	Basics of 3D modeling software.
Experiment 3	Modeling of Robot Joints.
Experiment 4	Virtual Robotics with Python: Write a python program to control motors of virtual robot on CodeSpace Simulation.
Experiment 5	Roboanalyzer: A learning software of robotics study.
Experiment 6	Introduction of MATLAB/Scilab and Robotic Toolkit.
Experiment 7	Modeling of 2 DOF Robot in MATLAB/Scilab.
Experiment 8	Simulation of simple robotic system using Scilab/ MATLAB/ MSC Adam software etc.
Experiment 9	Use of Robot Operating System (ROS) toolbox in Scilab/ MATLAB.
Experiment 10	Understand Robot Operating System (ROS) and inspect the simulation of a Super Mega Bot (SMB) robot.
Experiment 11	Programming of Robot using Robot Operating System (ROS).
Experiment 12	Study of the robotic programming language like AL and AML.

Course Outcomes (CO):

Students will be able to

1.	Applyspatial transformations associated with rigid body motions.
2.	Develop the student's knowledge in various robot structures and their workspace.
3.	Design structure of robot using simulation software..

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	1	-	-	-	2	1
CO2	-	-	3	1	2	-	-	-	1	-	-	-	2	1
CO3	-		3	-	2	-	-	-	1	-	-	-	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Exp 11	Exp 12	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	05	05	
CA													

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
IT2709 : Information Security Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	25
Total Credits	01		ESE	25

Prerequisite : Computer Network, Computer algorithm

Course Objectives :

1.	To describe different cipher techniques.
2.	To implement an algorithms DES, RSA, AES, SHA, Key Exchange Algorithms and Digital Signature Standard.
3.	To utilize Network Security Tools.

Course Contents

Experiment 1	Implement the following substitution techniques: a) caesar cipher b) Playfair cipher c) Hill cipher d) Vigenere cipher
Experiment 2	Implement the following transposition techniques: a) Row columnar b) Rail fence
Experiment 3	Implement Data Encryption Standard.
Experiment 4	Implement Advance Encryption Standard.
Experiment 5	Implement RSA algorithm.
Experiment 6	Implement Diffie Hellman Key exchange algorithm.
Experiment 7	Implement and write advantages of Poly-alphabetic Cipher.
Experiment 8	Implement SHA algorithm.
Experiment 9	Implement digital signature standard.
Experiment 10	Study of automated attack and penetration tools like Metasploit, acunetix, canvas etc.
Experiment 11	Perform a case study on roll of Private & Public Key.
Experiment 12	Demonstrate various methods of Message Authentication.

Course Outcomes (CO):

Students will be able to

1.	Analyse the Cryptographic algorithms.
2.	Implement Symmetric and Asymmetric Encryption algorithms.
3.	Implement Block and Stream Cipher algorithms.
4.	Apply Network and Internet Protocol technique.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	1	1	3	1	1	-	-	-	-	-	3	3
CO2	3	2	2	2	2	1	1	-	-	-	-	-	2	2
CO3	3	2	2	2	2	1	1	-	-	-	-	-	2	2
CO4	2	.3	2	1	2	2	1	-	-	-	-	-	2	1

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
IT2710 : Cloud Computing and Infrastructure Services Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	25
Total Credits	01		ESE	25

Prerequisite : Programming in C, C++, Java.

Course Objectives :

1.	To perform installation and configuration of tools and softwares required for the cloud computing.
2.	To develop various cloud applications.
3.	To use different cloud services.

Course Contents

Experiment 1	Installation and Configuration of virtualization.
Experiment 2	Implementation of Xen Server or Docker.
Experiment 3	Installation and Configuration of Google App Engine.
Experiment 4	Design an Assignment to retrieve, verify and store user credentials using Firebase Authentication, Google App Engine Standard Environment and Google Cloud Data Store.
Experiment 5	Installation and Configuration of Hadoop/Eucalyptus. Develop MapReduce application (example-URL Pattern count and others) using Hadoop cluster set up (Single node and multi node).
Experiment 6	Implement Infrastructure as a Service using OpenStack.
Experiment 7	Design and develop custom Application (Mini Project) using Salesforce Cloud.
Experiment 8	Implement "Software as a Service" (SaaS) model using Google Cloud Platform (GCP) or any other.
Experiment 9	Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform.
Experiment 10	Mini project: Creating a cloud like social site for institute or any other Applications useful to institute using Cloud.

Course Outcomes (CO):

Students will be able to

1.	Design and Implement applications on the Cloud.
2.	Install and use various cloud computing platform.
3.	Explain different cloud services.

List of Submission: **Every year course coordinator will give new problem statement based on above list of experiments.**

1.	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	1	3	-	3	-	-	1	1	-	-	1	2	1
CO2	-	1	2	1	2	-	-	1	1	-	-	1	2	1
CO3	-	1	-	-	2	-	-	-	1	-	-	1	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

IT2711: Seminar

Teaching Scheme			Examination Scheme	
Lectures	-		CA	25
Tutorials	01Hr/week		ESE	25
Total Credits	01			

Course Objectives:

1.	To Understand the themes of this seminar.
2.	To Identify, understand and discuss current, real-world issues.
3.	To Improve oral and written communication skills.

Course Contents

Students should deliver seminar individually. It should consist of a talk of 20 minutes on a topic preferably from the area in which a student intends to work for his project in final year B.Tech or any upcoming technology not covered in syllabus.

Selection of Seminar Topic

1. Select a seminar topic relevant to Information Technology, Computer Science and Engineering.

Domains areas in Information Technology:

- Internet of Things
- Cyber Security
- Software Tools and Programming Languages
- Web and Mobile Development
- Augmented Reality and Virtual Reality
- DevOps
- Artifical Intelligence
- Blockchain
- Cloud Computing
- Big Data Analytics
- Data Science
- Machine Learning
- Data Mining
- Natural Language Processing

For selection topics refer Scopus Index Journal papers and innovative ideas.

2. Get the topic approved by the seminar guide well in advance.

Preparation

1. Find the relevant information for the selected research topic and prepare the literature survey.
2. The presentation slides should include list of key points, figures, charts and tables. There should not be running paragraphs.
3. The slides should be readable – Font size used should be at least 20.
4. The figures, tables etc. should be relevant to content and should not be for only namesake.
5. Figures should be very clear. Develop the habit of drawing your own figures using suitable software tools for better clarity.
6. For the presentation: adopt simple theme, unnecessary animations and sound effects.
7. The presentation should be approved by the seminar guide for corrections if any.
8. Report of the seminar should contain the following.
    a. Title of the seminar.
    b. Abstract of the topic.
    c. Name and other details of student and the guide.
    d. List of references strictly in IEEE format.

Presentation

1. Keep a hand-out of presentation. This will help organise the talk better.
2. There should be proper self-introduction at the beginning.
3. Introduce the topic and highlight its significance.
4. Have good voice projection; deliver in modest pace; modulation of voice is desirable.
5. Keep eye contact with the audience.
6. Face the audience – Don't talk to the screen.
7. Familiarise with presentation aids.
8. Avoid repeated use of certain words/gestures.

9. Give a proper conclusion.

Assessment Guideline:

• Student has to meet weekly to the guide and whereas internal guide has to keep track on the progress of the seminar and also has to maintain attendance report. This progress report can be used for awarding CA marks.

• There will be two presentations first will be based on industrial training / mini project and another on topic to be selected for seminar in consultation with guide.

• The seminar to be delivered by students should be assessed by a panel of at least two senior faculties within the department.

• The assessment for the seminar should include but not limited to following points.

1) Novelty of the topic
2) Technical depth
3) Organization of the topic
4) Presentation skills
5) Communication skills
6) Question-Answer session

• Student will have to submit the seminar report.

Teaching Load:

One supervisor from the department shall be assigned five students for seminar. Weekly load for the supervisor is 1 Hr/week.

Course Outcomes (CO):

Students will be able to

1.	Design and Implement applications on the Cloud.
2.	Install and use various cloud computing platform.
3.	Explain different cloud services.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	3	3	-	1	-	1	1	2	-	1	2	2	1
CO 2	-	2	2	1	2	2	1	3	3	3	1	3	1	1
CO 3	-	2	3	2	2	-	1	3	3	-	1	2	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

IT2712 : Industrial Training

Laboratory Scheme:			Examination Scheme:	
Practical	02 Hrs/week		CA	50
Total Credits	01			

Course Objectives :

1.	Getting familiar to Industry work Environment.
2.	Analyzing various issues and problems in the IT Industry.
3.	Implement a project considering industry oriented approach.

Course Contents

PART I : Industrial Training

The students must undergo an industrial training of minimum two-three weeks in an industry preferably dealing with computer and IT industry during the semester break after Sixth semester and complete within 15-21 calendar days before the start of Seventh semester. It is expected that students should complete work assignment given by industry.

Industrial Training Report Format:

Maximum fifteen students in one batch, involving three groups of maximum five students, shall work under one Faculty. However, each student should have different industrial training and its presentation. The report should be of 20 to 30 pages. For standardization of the report the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point. Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point., Bold Face
10. Certificate: All students should attach standard format of certificate as described by the department. Certificate should have signatures of Guide, Head of Department and Principal/Director.
11. The entire report should be documented as
    - Name of Industry with address along with completed training certificate.
    - Area in which Industrial training is completed. All Students must present their reports individually.

Internship Guidelines

Student internships for credit at GCE Karad are carefully monitored, work experiences in which students have intentional learning goals gained through experience in a professional workplace under the general supervision of an experienced professional.

General Information

- It is the student's responsibility to seek the internship and successfully go through the hiring process of the company they choose.
- Internships may vary in duration but generally for 96 hours (minimum).
- Attendance sheets are required and it is the responsibility of the student to submit a time sheet after two weeks (signed by their supervisor) via paper copy to their Internship Coordinator directly.
- Internship hours must be completed with one company for the duration of the semester.
- Transferring hours from one company to another for the same applied credit during the same semester will not be allowed.

Assessment Guideline:

The students must submit a report of the training undergone and present the contents of the report before the evaluation committee constituted by the department.

An internal evaluation will be conducted for examining the quality and authenticity of contents of the report and award the marks at the end of the semester.

Course Outcomes (CO):

Students will be able to	
1.	Apply the knowledge of Information Technology taught in the lecture rooms in real industrial situations and get a feel of the work environment.
2.	Define and analyse the industrial problem.
3.	Design, develop and implement in group project.

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	3	-	1	1	-	-	2	1	2	2	1	2
CO2	-	3	1	2	1	1	-	-	2	1	2	2	2	1
CO3	-	-	3	1	2	1	-	-	2	1	2	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

Elective-III: IT2713: Machine Learning

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Artificial Intelligence, Discrete Mathematics

Course Objectives :

1.	To introduce students to the basic concepts and techniques of Machine Learning.
2.	To be able to formulate machine learning problems corresponding to different applications.
3.	To develop skills of using recent machine learning software for solving practical problems.
4.	To understand a range of machine learning algorithms along with their strengths and weaknesses.

	Course Contents	Hours
Unit 1	**Introduction to Machine Learning:** Different types of Learning: Supervised, Unsupervised, Semi Supervised, Hypothesis space. Machine Learning Models: Geometric, Logical and probabilistic. Features: Types and Selection Methods.	**(06)**
Unit 2	**Regression and Classification:** Regression: Simple Linear Regression, Multiple Linear Regression, Other Considerations in the Regression Model. Classification: Logistic Regression: The Logistic Model, Estimating the Regression Coefficients, Making Predictions, Multiple Logistic Regression. Performance Evaluation: Error, Accuracy, Precision, Recall. Sampling Methods: Train/Test Sets, Cross Validation, Difficulties in evaluating hypothesis, Sample Error, True Error. What to measure: Precision and Recall, accuracy, AUC, ROC, How to measure: Cross Validation, how to interpret (**Self Study:** Principal Component Analysis and Linear Discriminant Analysis)	**(07)**
Unit 3	**Linear and Probabilistic Models:** Linear Model: Least Square Method, Multivariate Linear regression, least square regression for classification, Support Vector Machine. Probabilistic Model: Normal Distribution and its geometric interpretation, Naïve Bayes model for classification.	**(07)**
Unit 4	**Model Ensembles:** Bagging and Random Forest, Boosting: Boosted Rule Learning, Mapping the ensemble landscape: Bias, Variance and Margins.	**(06)**
Unit 5	**Introduction to Deep Learning:** The Neural Network: The Neuron, Feed-forward neural networks, Linear neurons and their limitations, Sigmoid, Activation Functions: Tanh and ReLU Networks, Softmax output layers. Training Feed-forward neural networks: Gradient Descent, Learning Rates, Gradient Descent with Sigmoid neurons, The Back Propagation algorithm, Test sets, Validation Sets and over fitting, preventing over fitting in Deep Neural Networks.	**(06)**
Unit 6	**Convolutional Neural Networks**: Architectural Description of Convolution Networks, Filters and Feature Maps, Back propagation in CNN (**Self Study:** Business Applications of CNN)	**(08)**

Course Outcomes (CO):

Students will be able to

1.	Introduce machine learning techniques.
2.	Become aware of various parametric and non-parametric methods in machine learning.
3.	Understand a wide variety of learning algorithms.
4.	Design and implement various machine learning algorithms in a range of real-world applications.

Text Books

1.	Peter Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”, Cambridge University Press Edition 2012. (Unit: 1)
2.	Sanjeev J. Wagh, Manisha S. Bhende and Anuradha D. Thakare“Fundamentals of Data Science”, A Chapman & Hall Book, CRC Press, 1st Edition 2021. (Unit: 2)
3.	Hastie, Tibshirani, Friedman, “Introduction to Statistical Machine Learning with Applications in R”, Springer, 2nd Edition, 2012. (Unit: 3,4,5,6)

Reference Books

1.	Nikhil Buduma, “Fundamentals of Deep Learning, O'Reilly”, 1st Edition, ISBN NO. 978-14-919-2561-4.

2.	Ethem Alpaydin, “Introduction to Machine Learning”, PHI, 2nd Edition, 2013.
3.	C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer 1st Edition, 2013.
4.	Tom Mitchell, “Machine Learning, Mcgraw-Hill”, 1st Edition, ISBN No. 0-07-115467-1.
Useful Links	
1.	https://nptel.ac.in/courses/106/106/106106139/ Prof. Balaraman Ravindran, IIT Madras.
2.	https://nptel.ac.in/courses/106/105/106105152/ Prof. Sudeshna Sarkar, IIT Kharagpur.
3.	https://nptel.ac.in/courses/106/106/106106202/ Prof. Carl Gustaf Jansson, KTH.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-	2
CO 2	-	3	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

Elective-III: IT2723: Gaming Architecture and Design

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Engineering Mathematics, Computer Algorithms

Course Objectives :

1.	To acquire the knowledge of basics of computer game.
2.	To compare and contrast the different technologies used in game development.
3.	To recognise and follow the keys phases of computer game development.

	Course Contents	Hours
Unit 1	**A Brief History of Video Games:** Overview, The First Video Games, Games for the Masses, The Console Kings, Home Computers, The Designers, The Phenomenon, The Studios, A Brief Overview of Genres, Games and Society, Overview, Why Do People Play Video Games, Audience and Demographics, Societal Reaction to Games, Cultural Issues, Society within Games.	**(07)**
Unit 2	**Game Design:** Game Designer, Special Definitions, A Model of Games, Game, Player, Experience, Play Mechanics, Actions, Interface, Game Systems, Content, Design Work, Prototyping and Play testing Cycles, Play testing, Game Writing and Interactive Storytelling, Know Your Audience, Budget and Other Limitations, Basic Storytelling Techniques, Plot Types, Backstory, The Interactive Story, Story Mechanisms, Interactive Storytelling Techniques, Characters, Dialogue.	**(07)**
Unit 3	**Game Programming- Languages and Architecture:** Teams and Processes, Programming Teams, Methodologies, Common Practices, Quality, Leveraging Existing Code, Platforms, C++ and Game Development, Java, Scripting Languages, Game Architecture, Overview, Bird's-Eye View of a Game, Initialization/Shutdown Steps, Main Game Loop, Game Entities.	**(07)**
Unit 4	**Math, Collision Detection, and Physics:** Mathematical Concepts, Overview, Applied Trigonometry, Vectors and Matrices, Transformations, Geometry, Collision Detection and Resolution, Collision Detection, Overlap Testing, Intersection Testing, Dealing with Complexity, Simplified Geometry, Bounding Volumes, Achieving O(n) Time Complexity, Terrain Collision Detection, Collision Resolution, Real-Time Game Physics, Rewind: A Fresh Look at Basic Physics, Introduction to Numerical Physics Simulations, Beyond Particles, Third-Party Physics Engines (**Self Study**: Laws of Physics)	**(08)**
Unit 5	**Graphics and Animation:** Overview, Graphics Fundamentals, Higher Level Organization, Types of Rendering Primitives, Textures, Lighting, The Hardware-Rendering Pipeline, Character Animation, Fundamental Concepts, Animation Storage, Playing Animations, Blending Animations, Motion Extraction, Mesh Deformation, Inverse Kinematics, Attachments, Collision Detection.	**(07)**
Unit 6	**Game Production and Business of Game:** Overview, Concept Phase, Preproduction Phase, Production Phase, Post production, Game Industry Roles and Economics, Game Developers, Publishers, Platform Holders, The Publisher-Developer Relationship, Sowing the Seeds, The Developer/Publisher Divide, The Pitching Process, The Deal, Deal Dynamics, Payment Negotiation, Development Milestones (**Self Study**: Game Marketing)	**(07)**

Course Outcomes (CO):

Students will be able to

1.	Understand the fundamentals of games and key game genres.
2.	Analyse the mechanics, issues in game design.
3.	Identify the keys phases of computer game development.
4.	Design the games based on different game design technique.

Text Books

1.	Steve Rabin,Stacy L. Hiquet, Sarah Panella and Jessica McNavich, "Introduction to Game Development : Comprehensive, International Edition", Cengage Learning, 2nd edition,2009, ISBN-10 **4844431433 :** (Unit: 1,2,3,4,5,6)
2.	Ernest Adams, "Fundamentals of Game Design", Pearson publication, 3rd edition, 2013. (Unit:1)

Reference Books

1.	Jeannie Novak, "Game Development Essentials", Delmar Cengage Learning, 3rd edition, 2011.

2.	David H. Eberly, "3D Game Engine Design, Second Edition: A Practical Approach to Real-Time Computer Graphics" Morgan Kaufmann Publication, 2nd edition, 2006.
3.	Jason Gregory, "Game Engine Architecture", A K Peters, 4th edition, 2009.
Useful Links	
1.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-189-multicore-programming-primer-january-iap-2007/lecture-notes-and-video/l16-introduction-to-game-development/ Mike Acton, Insomiac Games
2.	http://www.vancouver.wsu.edu/fac/peabody/game-book/Coverpage.html. Crawford, The Art of Computer Game Design, 1982.
3.	https://www.gamedev.net/forums/topic/639110-game-architecturedesign-pattern/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	-	-	-	-	-	-	-	-	-	-	1	2
CO 2	-	3	-	-	-	-	-	-	-	-	-	-	1	2
CO 3	-	3	-	2	-	-	-	-	-	-	-	-	3	2
CO 4	-	-	3	-	1	-	-	-	-	-	-	-	2	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

Elective-III: IT2733: Information Retrieval

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: DBMS, Data warehousing and Mining

Course Objectives :

1.	To demonstrate genesis and diversity of information retrieval situations for text and hyper media.
2.	To describe hands-on experience store, and retrieve information from www using semantic approaches.
3.	To demonstrate the usage of different data/file structures in building computational search engines.
4.	To analyse the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia.

	Course Contents	Hours
Unit 1	**Introduction:** Basic Concepts of IR, Data Retrieval & Information Retrieval, IR system block diagram. Automatic Text Analysis: Luhn's ideas, Conflation Algorithm, Indexing and Index Term Weighing, Probabilistic Indexing. Automatic Classification: Measures of Association, Classification Methods, Cluster Hypothesis (**Self-study:** Clustering Algorithms, Single Link Algorithm).	**(06)**
Unit 2	**Indexing, Modeling and Searching Techniques:** Indexing & searching: Inverted file, Suffix trees & suffix arrays, Signature Files, Scatter storage or hash addressing, Clustered files. Modeling: Basic concepts, Boolean Model, Vector Model, probabilistic Model Searching strategies: Boolean Search, Serial search, cluster based retrieval. Query languages: Types of queries, Patterns matching, structural queries.	**(07)**
Unit 3	**Text and Multimedia Languages:** Introduction, Metadata, Text, Mark-up Languages, Multimedia, Trends and Research Issues.	**(07)**
Unit 4	**Retrieval and Text Operations:** Retrieval Evaluation: Precision and recall, alternative measures. Text Operations: Introduction, Document Pre-processing, Document Clustering, Text Compression, Comparing Text Compression techniques.	**(06)**
Unit 5	**Distributed and Multimedia IR:** Distributed IR: Introduction, Collection Partitioning, Source Selection, Query Processing, web issues. Multimedia IR: Introduction, Data Modeling, Query languages, Generic multimedia indexing approach, One dimensional time series (**Self-study:** Two dimensional color images, Automatic feature extraction)	**(06)**
Unit 6	**Searching the Web:** Searching the Web: Challenges, Characterizing the Web, Search Engines, Browsing, Mata-searchers, Finding needle in the Haystack, Searching using Hyperlinks.	**(08)**

Course Outcomes (CO):

Students will be able to

1.	Learn basic concept of information retrieval process.
2.	Understand the indexing and searching techniques of information retrieval.
3.	Understand the use of IR in distributed and multimedia IR, Web Search.
4.	Describe web mining and understand the need for web mining.

Text Books

1.	C.J. Rijsbergen, "Information Retrieval", Butterworth-Heinemann publisher, 2nd edition, 1979 ISBN-13: 978-0408709293. (Unit:1)
2.	Yates, Neto, "Modern Information Retrieval", Pearson Education, 1stedition, 2010, ISBN 81-297-0274-6. (Unit: 2,3,4)
3.	Bing Liu, "Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data, 2nd edition, Springer, 2011, ISBN-10: 3642194591. (Unit: 5,6)

Reference Books

1.	Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, "Information Retrieval Implementing and Evaluating Search Engines", MIT Press, 1st edition, 2010.
2.	Pang-Ning Tan, Michael Steinbach, and Vipin Kumar, "Introduction to Data Mining", Pearson/Addison Wesley, 2006, ISBN-10: 0321321367.

3.	Anthony Scime,"Web Mining: Applications and Techniques", IDEA group publishing.
4.	Soumen Chakrabarti, "Mining the Web: Discovering Knowledge from Hypertext Data".
Useful Links	
1.	https://nptel.ac.in/courses/106/101/106101007/ Prof. Pushpak Bhattacharya.
2.	https://nptel.ac.in/courses/106/105/106105174/ Prof. Pabitra Mishra.
3.	http://openlib.org/home/krichel/courses/lis618/readings/rijsbergen79_infor_retriev.pdf
4.	http://people.ischool.berkeley.edu/~hearst/irbook/print/chap10.pdf

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-	2
CO 2	-	3	2	-	-	-	-	-	-	-	-	-	3	-
CO 3	2	-	3	-	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	-	1	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

Elective-III: IT2743: Distributed Systems

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Data Structure and Algorithms, Operating Systems

Course Objectives :

1.	To learn the fundamental principles and architecturesused indistributed systems.
2.	To illustrate DFS with object, time and State management.
3.	To explore the working principles of replication and Fault Tolerance in distributed systems.
4.	To analyze the current distributed systems applications.

	Course Contents	Hours
Unit 1	**Introduction to Distributed System:** Introduction to Distributed System, Examples of Distributed System, Characteristics of Distributed System, Advantages and Disadvantages of Distributed System, Design Goals, Main Problems, Models of Distributed System, Resource Sharing and Web Challenges, Grid, Cluster and Cloud System.	**(06)**
Unit 2	**Distributed Objects and File System:** Introduction to Distributed Object, Distributed Objects Communication, Remote Procedure Call, Events and Notifications, JAVA RMI Case Study, Introduction to DFS, File Service Architecture, SUN Network File System, Name Services, DNS, Comparison of Different Distributed File Systems (**Self-Study:** Google FS, HADOOP)	**(07)**
Unit 3	**Time and State in Distributed System** Time in DS, Physical Clock, Logical Clock, Vector Clock, Global State and State Recording, Distributed Debugging. Coordination and Agreement: Mutual Exclusion in DS, Mutual Exclusion Algorithms, Distributed Election, Multicast Communication, Consensus.	**(07)**
Unit 4	**Replication:** Replication and its Reasons**,** Object Replication**,** Replication as Scaling Technique**,** Fault Tolerant and Highly Available Services, Transaction and Concurrency Control: Transactions and Nested Transactions, Locks, Optimistic Concurrency Control, Timestamp Ordering, Comparison of Concurrency Control Methods, Introduction to Distributed Transaction, Flat and Nested Distributed Transaction, Atomic Commit Protocol, Distributed Deadlock, Transaction Recovery.	**(08)**
Unit 5	**Fault Tolerance** Introduction to Fault Tolerance**,** Process Resilience**,** Reliable Client Server Communication**,** Distributed Commit**,** Distributed Recovery **(Self Study:** Case Study - Distributed System CORBA**,** Mach**,** JINI**,** TIB/Rendezvous)	**(06)**
Unit 6	**Operating System Support and Distributed Heterogeneous Applications** OS Layer, Protection, Process and Thread, Communication and Invocation, OS Architecture. Distributed Heterogeneous Applications and CORBA: Heterogeneity in DS, Middleware, CORBA Approach.	**(06)**

Course Outcomes (CO):

Students will be able to

1.	Elucidate the foundations and issues of distributed systems.
2.	Explore the features of Mutual Exclusion and distributed file systems.
3.	Describe the agreement protocols and fault tolerance mechanisms in distributed systems.
4.	Understand the various synchronization issues and global state for distributed systems.

Text Books

1.	George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems – Concept and Design", Pearson Publication, 5th Edition,2017 (Unit:1,2,3,4,5,6)

Reference Books

1.	Andrew S. Tanenbaum and Maarten Van Steen, "Distributed Systems Principles and Paradigms", Pearson Publication, 2nd Edition, 2006.
2.	Mukesh Singhal, "Advanced Concepts in Operating Systems", McGraw-Hill Series in Computer Science.

Useful Links

1.	https://nptel.ac.in/courses/106/106/106106168/ Prof. Rajiv Mishra IIT Patna.
2.	https://nptel.ac.in/courses/106/104/106104182/ Prof. Rajiv Mishra IIT Patna.
3.	https://nptel.ac.in/courses/106/106/106106107/# Prof. V.S.Anantnarayana NITK Surathkal.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	3	-	2	-	-	-	-	-	1	-	-	1	-
CO 2	-	-	2	-	3	-	-	-	-	-	-	-	2	-
CO 3	-	-	2	3	1	-	-	-	-	-	-	-	2	-
CO 4	-	3	-	2	-	-	-	-	-	1	-	-	1	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

Elective-IV: IT2714: Cognitive Computing

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Artificial Intelligence, Big Data Analytics.

Course Objectives :

1.	To develop potentially successful applications in Cognitive Computing.
2.	To use the Innovation Canvas to justify potentially successful products.
3.	To explain various ways in which to develop a product idea.
4.	To explain the process of taking a product to market.

	Course Contents	Hours
Unit 1	**Foundation of Cognitive Computing:** Cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition. Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation and visualization services.	**(06)**
Unit 2	**Natural Language Processing in support of a Cognitive System:** Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems. Representing knowledge in Taxonomies and Ontologies: Representing knowledge, Defining Taxonomies and Ontologies, knowledge representation, models for knowledge representation, implementation considerations.	**(07)**
Unit 3	**Relationship between Big Data and Cognitive Computing :** Dealing with human-generated data, defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data Applying Advanced Analytics to cognitive computing: Advanced analytics is on a path to cognitive computing, Key capabilities in advanced analytics, Using advanced analytics to create value, Impact of open source tools on advanced analytics.	**(07)**
Unit 4	**The Business Implications of Cognitive Computing :** Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with a cognitive systems approach, meshing data together differently, using business knowledge to plan for the future, answering business questions in new ways, building business specific solutions, making cognitive computing a reality (**Self Study:** cognitive application changing the market)	**(06)**
Unit 5	**The process of building a cognitive application:** Emerging cognitive platform, defining the objective, defining the domain, understanding the intended users and their attributes, questions and exploring insights, training and testing.	**(06)**
Unit 6	**Case Studies: Building a cognitive health care application:** Foundations of cognitive computing for healthcare, constituents in healthcare ecosystem, learning from patterns in healthcare data, Building on a foundation of big data analytics, cognitive application for healthcare**,** Smarter cities -Cognitive Computing in Government: cities operation, characteristics of smart city, rise of open data movement with fuel cognitive cities, building a smarter transportation infrastructure (**Self Study:** creating a cognitive community infrastructure, next phase of cognitive cities)	**(08)**

Course Outcomes (CO):

Students will be able to

1.	Define the basic concepts of Cognitive Computing.
2.	Relate Natural language processor role in Cognitive Computing.
3.	Synthesize applications in Cognitive Computing.
4.	Evaluate the process of taking a product to market.

Text Books

1.	Judith H. Hurwitz, Marcia Kaufman, Adrian Bowles, “Cognitive computing and Big Data Analytics”, Wiley, 2005. (Unit: 1,2,3,4,5,6)
2.	Masood Adnan, Hashmi, Adnan, “Cognitive Computing Recipes-Artificial Intelligence Solutions Using Microsoft Cognitive Services and TensorFlow”, O‟reilly, 2015. (Unit:6)

Reference Books	
1.	Gerardus Blokdyk, “Cognitive Computing Complete Self-Assessment Guide”, 2018.
2.	Peter Fingar, “Cognitive Computing: A Brief Guide for Game Changers”, PHI Publication, 2015.
3.	Rob High, Tanmay Bakshi, “Cognitive Computing with IBM Watson: Build smart applications using Artificial Intelligence as a service”, IBM Book Series, 2019.
Useful Links	
1.	https://nptel.ac.in/courses/109/104/109104123/ Prof. Ark Varma, IIT Kanpur.
2.	https://ocw.mit.edu/courses/brain-and-cognitive-sciences/9-66j-computational-cognitive-science-fall-2004/ Prof. Joshua Tenenbaum, MIT OpenCourseWare.
3.	https://www.coursera.org/learn/philosophy-cognitive-sciences, Prof. Michela Massimi, The University of Edinburgh

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	1	3	1	-	-	-	-	-	-	-	-	1	2
CO 2	2	3	2	2	-	-	-	-	-	-	-	-	1	3
CO 3	2	1	1	2	-	-	-	-	-	-	-	-	3	2
CO 4	1	2	3	2	-	-	-	-	-	-	-	-	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern **(with revised Bloom’s Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	5	-	3	10
Apply	5	5	-	10
Analyse	-	5	3	10
Evaluate	-	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

Elective-IV: IT2724: Human Computer Interface

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Computer Algorithms

Course Objectives :

1.	To learn the foundations of Human Computer Interaction.
2.	To become familiar with the design technologies for individuals and persons with disabilities.
3.	To be aware of mobile HCI.
4.	To learn the guidelines for user interface.

	Course Contents	Hours
Unit 1	**Foundations of HCI:** The Human: I/O channels, Memory, Reasoning and problem solving; The Computer: Devices, Memory, processing and networks; Interaction: Models, frameworks, Ergonomics, styles, elements, interactivity, Paradigms, and Case Studies.	**(06)**
Unit 2	**Design and Software Processes:** Interactive Design: Basics, process, scenarios, navigation, screen design, Iteration and prototyping. HCI in software process: Software life cycle, usability engineering, Prototyping in practice, design rationale, Design rules: principles, standards, guidelines, rules, Evaluation Techniques: Universal Design .	**(07)**
Unit 3	**Models and Theories:** HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements, Communication and collaboration models-Hypertext, Multimedia and WWW.	**(07)**
Unit 4	**Mobile HCI:** Mobile Ecosystem: Platforms, Application frameworks,Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools - Case Studies.	**(06)**
Unit 5	**Web Interface Design:** Designing Web Interfaces: Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow: Case Studies.	**(06)**
Unit 6	**Process of Interaction Design:** Introduction, Establishing Requirements: Data Gathering for Requirements, Task Description, Task Analysis, Design, Prototyping and Construction: Prototyping and Construction, Conceptual Design and Physical Design-Using Scenarios, Prototypes in Design. (**Self Study:** Evaluation, Introduction-Evaluation Framework).	**(08)**

Course Outcomes (CO):

Students will be able to

1.	Apply an interactive design process and universal design principles to designing HCI systems.
2.	Design effective HCI for individuals and persons with disabilities.
3.	Describe and use HCI design principles, standards and guidelines.
4.	Analyse Human-Computer Interaction principle and designs in Information Systems.

Text Books

1.	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (Unit: 1,2,3,4,5)
2.	Brian Fling, "Mobile Design and Development", 1st Edition, O,,Reilly Media Inc., 2009 (Unit: 6)
3.	Bill Scott and Theresa Neil, "Designing Web Interfaces", 1st Edition, O,,Reilly, 2009. (Unit: 6)

Reference Books

1.	Sharp H., Rogers Y, and Preece J, "Interaction Design: Beyond Human – Computer Interaction", 3rd Edition, John Wiley & Sons, Inc., 2011.

Useful Links

1.	https://nptel.ac.in/courses/106/103/106103115/ Dr. Samit Bhattacharya
2.	https://nptel.ac.in/courses/106/106/106106177/ Prof. K Ponnurangam, IIT Delhi.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	-	3	-	2	-	-	-	-	-	-	-	-	2
CO 2	1	3	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	2	-	1	-	-	-	-	-	-	-	3	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

Elective-IV: IT2734: ERP and Business Intelligence

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisites: Database Management System, Data Warehousing and Mining

Course Objectives:

1.	To understand the structure of ERP and SCM.
2.	To implement ERP.
3.	To use Business Intelligence.
4.	To design and build a Business Intelligence solution.

	Course Contents	Hours
Unit 1	**Enterprise Resource Planning:** Introduction to ERP, Business processes, basic ERP concepts, Risks of ERP, Benefits of ERP, ERP and related technologies.	**(06)**
Unit 2	**Business Modules of ERP Package and ERP implementation:** Business Modules and Functional modules of ERP software, Financial, Manufacturing, Plant maintainance, Materials Management, Quality management and Marketing Module, Integration of ERP (**Self-Study**: Supply Chain and Customer Relationship Applications)	**(07)**
Unit 3	**ERP Implementation:** ERP Implementation Basics, Life cycle, Package selection, Transition strategies, Deployment models and Implementation process, Success and failure factors of ERP implementation, ERP operation and maintenance.	**(07)**
Unit 4	**Business Intelligence**: Origins of Business Intelligence (BI), Main characteristics of BI, Architecture of BI, Data Warehouse: concepts, process, architectures and development, OLAP vs OLTP (**Self-Study**: Data Warehouse Administration, security issues and future trends)	**(07)**
Unit 5	**Business Reporting, Visual Analytics and Business Performance Management:** Business Reporting, Data and information visualization, Different types of charts and graphs, performance dashboards, Business Performance Management, performance measurement, balanced scorecard , Dashboard vs scorecard.	**(07)**
Unit 6	**Business Analytics: Emerging Trends and Future Impacts:** Location–based analytics for organizations, Analytics applications for consumers, Recommendation Engines,Web 2.0 and Online social networking, Cloud Computing and BI, Impacts of analytics in organization, Issues of Legality, Privacy and Ethics, Overview of Analytics Ecosystem, Case study on SAS. (**Self-study:** Different open source BI Tools:Fine Report, Tableau Public, BIRT, KNIME, Databox, Metabase etc.)	**(06)**

Course Outcomes (CO):

Students will be able to

1.	Conceptualize the basic structure of ERP and SCM.
2.	Identify implementation strategy and apply different emerging technologies for implementation of ERP used for ERP.
3.	Plan to implement a Business Intelligence Solution.
4.	Learn the skills to make the best use of Business Intelligence.

Text Books:

1.	Alexis Leon, "Enterprise Resource Planning", McGraw Hill, 4th Edition**,** 2019, ISBN-13:978-93-5316-782-0**.** (Unit**:** 1,2**,**3)
2.	Sharda, R., Delen, D.**,** Turban, E., **"**Business IntelligenceAndAnalytics: Systems for Decision Support", Pearson**,** 2018**,**ISBN 978-93-528-6648-9.(Unit**:** 4,5**,**6)
3.	V K Garg, N. K. Venkatakrishnan, "Enterprise Resource Planning Concepts and Practice", PHI Publication, 2nd edition, 2003.(Unit 1,2,3)
4.	Dr. Lineke Sneller, "A Guide to ERP:benefits, implementation and Trends", 1st edition, 2014, ISBN978-87-403-0729-0. (Unit 1,2,3)

Reference Books

1.	Rahul Altekar,"Enterprise Wide Resource Planning: Theory and Practice", PHI, 2004.
2.	R. P. Mohanty, S. G. Deshmukh, "Supply Chain Management Theories and Practices", Dreamtech Press, 1st edition, 2005.
3.	Rick Sherman, "Business Intelligence Guidebook" Publisher(s): Morgan Kaufmann ISBN:

	9780124115286, November 2014.
4.	Business Intelligence Strategy and Big Data Analytics by Steve Williams Released April 2016 Publisher(s): Morgan Kaufmann ISBN: 9780128094891.
Useful Links	
1.	http://www.nptelvideos.in/2012/12/operations-and-supply-chain-management.html Prof. G. Srinivasan , IIT Madras.
2.	https://nptel.ac.in/courses/110/105/110105089/ Prof. Rudra Pradhan IIT Kharghar.
3	https://www.coursera.org/specializations/information-systems Gautam Ray.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	2	3	2	2	-	-	-	-	-	-	-	3	2
CO 2	3	3	1	3	3	-	-	-	-	-	-	-	1	2
CO 3	3	2	3	3	3	-	-	-	-	-	-	-	2	3
CO 4	2	1	2	2	1	-	-	-	-	-	-	-	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

Elective-IV: IT2744: Object Oriented Modelling and Design

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Software Engineering

Course Objectives :

1.	To learn the fundamental principles of Object Oriented Designs.
2.	To explore the working principles of Behavioral State Machines and components
4.	To analyze current Web application Designs.

	Course Contents	Hours
Unit 1	**Introduction of Object Oriented Modeling:** Introduction to Object-Oriented, Object-Oriented Development, Object-Oriented Themes, Evidence for Usefulness of Object-Oriented Development. Modeling, The Object Modeling Technique, object modeling, Objects and Classes, Links and Associations, Advanced Link and Association Concepts, Generalization and Inheritance, Grouping Constructs.	**(06)**
Unit 2	**Introduction to UML and Structural Modeling:** An Overview of the UML, A Conceptual Model of the UML: Building Blocks of the UML Rules of the UML, Common Mechanisms in the UMLs, constraints, Introduction to UML2.0, Object Diagram Terms and Concepts, Class Diagram Classes, Attributes, Operations, Abstract Classes Relationships: Dependency, Association, Aggregation, Composition, Generalization, Realization Association Classes, Association Qualifiers, Interfaces, Templates, Composite structure diagram.	**(07)**
Unit 3	**Behavioral Modeling:** Use case Diagram: Names, Use Cases and Actors, Use Cases and Flow of Events, Use Cases and Scenarios, Use Cases and Collaborations, Organizing Use Cases, Common Properties, Contents, Common Uses Sequence Diagram, Collaboration Diagram, Communication diagram, Timing diagram.	**(07)**
Unit 4	**Behavioral State Machines**: State chart Diagram , States, Composite States, Submachine States, Transitions, Activity Diagram: Common Properties, Contents, Action States and Activity States, Branching, Forking andJoining, Swimlanes, Object Flow, Interaction overview diagram.	**(08)**
Unit 5	**Architectural Modeling:** Component Diagram: Terms and Concepts, Names, Components and Classes, Components and Interfaces, Kinds of Components Deployment: Terms and Concepts, Names, Nodes and Components, Connections, Package Diagram: Terms and Concepts, Names, Owned Elements, Visibility, Importing and Exporting (**Self Study**: UML design tool)	**(06)**
Unit 6	**Design for web apps:** Design issues, WebE design pyramid, interface design, aesthetic design, content design, architecture design, navigation design, component level design, hyper media design patterns, object oriented hypermedia design methods, design metrics for web Apps (**Self Study:** Testing for Web Apps)	**(06)**

Course Outcomes (CO):

Students will be able to

1.	Design techniques of object modelling.
2.	Design structural and behavioural model.
3.	Design web apps using various design tools.

Text Books

1.	James Rumbaugh , Michael Blaha , William Premerlani, Frederick Eddy, William Lorensen ,"Object- Oriented Modeling and Design", Pearson Education, 1st edition,2005 (Unit: 1)
2.	Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education., 2nd edition,2015. (Unit: 2, 3,4,5)
3.	Roger S. Pressman "Software Engineering- A Practitioner's Approach" TMH, 6th edition,2019 (Unit: 6)

Reference Books

1.	Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Addision Wesley, 3rd edition,1997.
2.	Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", Pearson Education, 1st edition, 2000.
3.	Atul Kahate, "Object Oriented Analysis & Design", Tata McGraw-Hill,1st edition, 2004.
4.	Gerti Kappel, Birgit, Siegfried Reich, Werner Retschitzegger, "Web Engineering: The Discipline of Systematic

	Development of Web Applications", John Wiley, 1st edition, May2006.
Useful Links	
1.	http://nptel.ac.in/courses/106101061/ Prof. N. L. Sarda IIT Bombay.
2.	https://nptel.ac.in/courses/106/101/106101061/ Prof. Umesh Bellur IIT Bombay.
3.	http://www.digimat.in/nptel/courses/video/106105153/L51.html Prof. P. P. Das IIT Kharghar.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-	2
CO 2	-	3	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
Elective-III Lab: IT2718: Machine Learning Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	25
Total Credits	01			

Prerequisite : R Programming, Python

Course Objectives :

1.	To introduce students to the basic concepts and techniques of Machine Learning.
2.	To develop skills of using recent machine learning software for solving practical problems.
3.	To gain experience of doing independent study and research.
4.	To recognize the characteristics of machine learning that make it useful to real-world problems.

Course Contents

Experiment 1	Study of basics of data normalization using any tool.
Experiment 2	Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
Experiment 3	Implement Linear regression algorithm on a suitable dataset.
Experiment 4	Implement Multiple Linear Regression algorithm on a sample training data set.
Experiment 5	Implement Logistic Regression algorithm on a sample training data set.
Experiment 6	Implement SVM for classification with proper data set of your choice.
Experiment 7	Implement Naïve Bayesian Classifier for a sample training data set.
Experiment 8	Implement Random Forest algorithm by selecting any random samples from suitable dataset.
Experiment 9	Compare different classification algorithms (considering suitable data and problem statements) using precision, recall and accuracy.
Experiment 10	Design a feed-forward neural network (also popularly known as a Multilayer Perceptron) classifier considering suitable task.
Experiment 11	Design CNN considering a suitable dataset.
Experiment 12	Develop a Mini Project based on maching learning algorithms using modern tool such as Statistica software.

Course Outcomes (CO):

Students will be able to

1.	Make use of Data sets in implementing the machine learning algorithms.
2.	Implement the machine learning concepts and algorithms in any suitable language of choice.
3.	Identify and apply Machine Learning algorithms to solve real world problems.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1	2	-	2	2	-	1	-	-	-	-	-	1	1
CO2	2	1	-	1	1	-	2	-	-	-	-	-	1	2
CO3	3	1	-	2	2	-	1	-	-	-	-	-	3	1
CO4	-	1	-	2	3	-	1	-	-	-	-	-	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
Elective-III Lab: IT2728: Gaming Architecture and Design Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	25
Total Credits	01			

Prerequisite: Engineering Mathematics, Python Programming

Course Objectives :

1.	To get familiar with different game development platforms.
2.	To identify the processes and issues in game architecture and design.
3.	To implement a game based on design requirements
4.	To Integrate and use existing development tools in the construction of computer games

Course Contents

Experiment 1	Installation of OpenGL, WebGL and other Graphics Libraries.
Experiment 2	Installation of different Game Engines.
Experiment 3	Program to create a 2D house like figure and rotate it about a given fixed point using OpenGL functions.
Experiment 4	Program to draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing. Use OpenGL functions.
Experiment 5	Draw a Rotating 3D Cube using WebGL.
Experiment 6	Implement Dino Game in Python Programming Language
Experiment 7	Implement Snake Game in Python Programming Language
Experiment 8	Write a program to implement blender game engine.
Experiment 9	Study Google"s Applied CS with Android for building games. https://cswithandroid.withgoogle.com/
Experiment 10	Students are suggested to choose at least one game idea, possibly: 1. Single player (Puzzle, Educational, Strategy etc.) 2. Multiplayer (Adventure, fighting, sports etc.) Following are the Open Source Game Engine Tools recommended for implementation. 1. GDevelop 2. PlayConvas 3. Unity 4. Aleph One 5. Adventure Game Studio 6. Crystal Space 7. Delta 3D 8. Game Play 3D and many more

Course Outcomes (CO):

Students will be able to

1.	Understand the basics of different game principles.
2.	Analyze the various processes and techniques of game development.
3.	Identify the issues in gaming architecture and design.
4.	Design the game using various gaming development platforms.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Minimum number of Experiments : 10

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	-	-	-	-	-	-	-	-	-	-	-	1	2
CO 2	-	3	-	-	-	-	-	-	-	-	-	-	1	2
CO 3	-	3	-	2	-	-	-	-	-	-	-	-	3	2
CO 4	-	-	3	-	1	-	-	-	-	-	-	-	2	2

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad					
Final Year (Sem – VII) B. Tech. Information Technology					
Elective-III Lab: IT2738: Information Retrieval Lab					
Laboratory Scheme:			**Examination Scheme:**		
Practical	02 Hrs/week		**CA**	25	
Total Credits	01				

Prerequisite : Java, Python Programming

Course Objectives :

1.	To retrieve the information from the provided dataset.
2.	To gain an understanding of the basic concepts and techniques in IR.
3.	To understand how statistical models of text can be used to solve problems in IR.
4.	To demonstrate diversity of information retrieval situations for text and hyper media.

Course Contents

Experiment 1	Write a program to create an inverted index for a given text file.
Experiment 2	Perform the experiment to demonstrate Lemmatization and Stemming on given text.
Experiment 3	Write a program to search for words and patterns in a given text file using inverted index.
Experiment 4	Write a program to Perform data pre-processing tasks on suitable data sets.
Experiment 5	Perform the experiment for Information extraction (e.g. named entities, address, point-of-interest, etc.) from unstructured text documents.
Experiment 6	Perform experiment to find association between data and to find the frequent item set for text mining.
Experiment 7	Build the Data Warehouse and Explore considering suitable database.
Experiment 8	Write a program to implement web crawling using BFS/DFS.
Experiment 9	Perform experiment to apply the web mining technique clustering algorithm on the suitable dataset.
Experiment 10	Perform the experiment for Text Transformation using Webpage Classifier.
Experiment 11	Perform the experiment to apply web mining technique clustering algorithm on the suitable dataset.
Experiment 12	Perform the experiment to find association between data and to find the frequent item set for text mining.

Course Outcomes (CO):

Students will be able to

1.	Become familiar with classic and recent developments in Web search and data mining.
2.	Choose a suitable classification or clustering method depending on the problem constraints at hand.
3.	Understand common text compression algorithms and their role in the efficient building and storage of inverted indices.
4.	Acquire statistical techniques to analyze complex information and social networks.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	2	-	2	2	-	1	-	-	-	-	-	1	1
CO2	2	3	-	1	3	-	2	-	-	-	-	-	1	2
CO3	3	1	-	2	2	-	1	-	-	-	-	-	3	1
CO4	-	1	-	2	3	-	1	-	-	-	-	-	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
Elective-III Lab: IT2748: Distributed Systems Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		**CA**	25
Total Credits	01			

Prerequisite : Data Structure and Algorithms, Operating Systems , C/C++ Programming

Course Objectives :

1.	To learn algorithms and programming models used indistributed systems.
2.	To implement the concepts of RPC and details ofdistributed file systems.
3.	To simulate distributed algorithms for realities of Distributed Systems.

Course Contents

Experiment 1	Implement concurrent echo client-server application.
Experiment 2	Program to implement Chat Server.
Experiment 3	Program to implement Remote Procedure Call.
Experiment 4	Simulate Berkeley's algorithm for clock synchronization.
Experiment 5	Simulate Cristian's algorithm for clock synchronization
Experiment 6	Simulate Lamport's algorithm for clock synchronization.
Experiment 7	Simulate the centralized algorithm for mutual exclusion
Experiment 8	Program to Implement non token based algorithm for Mutual Exclusion.
Experiment 9	Simulate the Ring election algorithm.
Experiment 10	Simulate the Bully election algorithm.
Experiment 11	Simulate the distributed algorithm for mutual exclusion.
Experiment 12	Program to implement termination detection.

Course Outcomes (CO):

Students will be able to

1.	Experiment with both the abstraction and details of distributed file systems.
2.	Develop distributed applications using performance and flexibility issues related to systems design decisions.
3.	Describe the real-world constraint and realities of Distributed Systems.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	-	-	2	3	1	-	-	-	-	-	-	-	2	-
CO 2	-	-	3	1	-	-	-	-	-	-	-	-	-	1
CO 3	-	-	-	1	-	3	-	-	-	-	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

IT2809: Augmented Reality and Virtual Reality

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		**CT – 1**	15
Tutorials	00 Hrs/week		**CT – 2**	15
Total Credits	03		**TA**	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Artificial Intelligence

Course Objectives :

1.	To understand geometric modelling and Virtual environment.
2.	To study about Virtual Hardware tools.
3.	To study about Virtual Software development and applications.
4.	To develop Virtual Reality applications.

	Course Contents	Hours
Unit 1	**Introduction to Virtual Reality:** Definition, Terms for understanding VR, Virtuality, Virtual object/image, Virtual world/environment, Presence, Telepresence, Types of VR, Immersive VR, Non-Immersive VR, Current VR Technologies, Hardware, HMDs (Head-Mounted Displays) as an Output, Understanding HMDs, Tethered HMDs, Mobile phone integrated HMDs, Stand-alone HMDs, Inputs, Software	**(06)**
Unit 2	**Current VR Technologies:** 3D modelling tools, 360° Video editing, Benefits, Disadvantages, Examples of VR applications, VR in Education, VR in Medicine, VR in the Military, VR in Engineering, VR in Architecture, VR in Entertainment	**(08)**
Unit 3	**Introduction to Augmented Reality:** Terminology associated with AR, Types of AR, Marker-based AR, Markerless-based AR, Current AR Technologies, Hardware, Tracking systems for AR, AR Displays, Head attached displays (HADs), Handheld displays, Spatial Displays, Software,	**(07)**
Unit 4	**AR interfaces** Interaction in AR interfaces, Tangible AR interfaces, Collaborative AR interfaces, Hybrid AR interfaces, Multimodal AR interfaces, AR development tools, Vuforia, EasyAR, Wikitude, Kudan, ARToolKit, ARCore, ARKit, Benefits of AR, Disadvantages, Examples of AR Applications, AR in Education, AR in Medicine, AR in the Military, AR in Engineering and Architecture, AR in Entertainment	**(06)**
Unit 5	**AR and VR Applications:** VR in Education, Mathematics and geometry, Science, Medicine, Architecture and engineering, Art, VR applications for in-service & professional training, AR in Education, AR applications for primary school, AR applications for science training	**(07)**
Unit 6	**Unity:** Overview, Building Your Project and Character, Getting Animated, The Town View, Working with Unity's UI System, NPCs and Interactions, The World Map, Encountering Enemies and Running Away	**(08)**

Course Outcomes (CO):

Students will be able to

1.	Define fundamental computer vision, computer graphics and human-computer interaction techniques related to VR/AR.
2.	Explain geometric modelling and Virtual environment.
3.	Differentiate between VR/AR technologies.
4.	Apply various types of Hardware and software in virtual Reality systems and applications.

Text Books

1.	Zeynep Tacgin, "Virtual and Augmented Reality: An Educational Handbook", Cambridge Scholars Publisher, 2020 (Unit – 1,2,3,4,5)
2.	Mastering Unity 2D Game Development - Second Edition,AshleyGodbold, Simon Jackson, Packt Publishing, October 2016, ISBN: 9781786463456 (Unit - 6)

Reference Books	
1.	Steven M. LaValle, “Virtual Reality”, Cambridge University Press, 2016.
2.	Alan Craig, William Sherman and Jeffrey Will, “Developing Virtual Reality Applications, Foundations of Effective Design”, Morgan Kaufmann, 2009.
3.	John Vince, “Virtual Reality Systems”, Pearson Education Asia, 2007.

Useful Links	
1.	https://stanford.edu/class/ee267/syllabus.html Prof. Ivan Sutherland, Standford University.
2.	https://nptel.ac.in/courses/106/106/106106138/ Prof. Steve Lavalle,IIT Madras.
3.	https://nptel.ac.in/courses/121/106/121106013/ Prof. Dr. M. Manivannan,IIT Madras.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	2	2	1	-	-	-	-	-	-	-	-	3	2
CO 2	2	1	3	2	-	-	-	-	-	-	-	-	2	3
CO 3	2	2	3	2	-	-	-	-	-	-	-	-	2	3
CO 4	2	2	3	3	-	-	-	-	-	-	-	-	1	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	5	-	3	10
Apply	5	5	-	10
Analyse	-	5	3	10
Evaluate	-	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

IT2810 : Augmented Reality and Virtual Reality Lab

Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	50
Total Credits	01		ESE	50

Prerequisite : Programming in C, C#

Course Objectives :

1.	To describe how VR systems work and list the applications of VR.
2.	To understand the design and implementation of the hardware that enables VR systems to be built.
3.	To understand the system of human vision and its implication on perception and rendering.
4.	To explain the concepts of motion and tracking in VR systems.

Course Contents

Experiment 1	Installation of Unity and Visual Studio, setting up Unity for VR development, understanding documentation of the same.
Experiment 2	Create an animation for 3-D objects (eg. Ball bouncing) using animation pane in unity.
Experiment 3	Develop a scene in Unity that includes a cube, plane and sphere, apply transformations on the 3 game objects.
Experiment 4	Develop a scene in Unity that includes a video and audio source.
Experiment 5	Import external game objects into unity and study them.
Experiment 6	Develop a scene in Unity that includes a cube, plane and sphere. Create a new material and texture separately for three Game objects. Change the colour, material and texture of each Game object separately in the scene. Write a C# program in visual studio to change the colour and material/texture of the game objects dynamically on button click.
Experiment 7	Develop a scene in Unity that includes a sphere and plane. Apply Rigid body component, material and Box collider to the game Objects. Write a C# program to grab and throw the sphere using vr controller.
Experiment 8	Develop a simple UI(User interface) menu with images, canvas, sprites and button. Write a C# program to interact with UI menu through VR trigger button such that on each successful trigger interaction display a score on scene.
Experiment 9	Build an AR app that overlays virtual object onto the real world using Vuforia on AR Foundation.
Experiment 10	Create an AR experience that detects and tracks real-world markers to trigger virtual content.
Experiment 11	Hand Gesture Recognition: Implement hand gesture recognition to allow users to interact with AR objects using hand movements.
Experiment 12	Full VR Application Development – combining the understanding of environment design, movement interactive objects, and UI design to create a complete, immersive, and interactive VR application.

Course Outcomes (CO):

Students will be able to

1.	Create and deploy a VR application.
2.	Explore the physical principles of VR.
3.	Create a comfortable, high-performance VR application using Unity.
4.	Examine and develop software that reflects fundamental techniques for the design and deployment of VR experiences.

List of Submission: **Every year course coordinator will give new problem statement based on above list of experiments.**

Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2	2	1	-	-	-	-	-	3	2
CO2	2	2	2	2	2	3	3	-	-	-	-	-	2	1
CO3	2	1	3	2	2	2	2	-	-	-	-	-	2	2
CO4	2	1	2	2	2	1	2	-	-	-	-	-	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

IT2805: Project

Teaching Scheme			Examination Scheme	
Lectures	-		CA	200
Practical	20 Hrs/week		ESE	200
Total Credits	10			

Prerequisites: Seminar

Course Objectives:

1.	To apply SDLC and meet the objectives of proposed development or research work**.**
2.	To test rigorously before deployment of work in objective 1**.**
3.	To validate the work undertaken during objective 1 and 2**.**
4.	To consolidate the development or research work as project report.

Course Contents

I Guidelines:

• Select a topic relevant to the Information Technology, Computer Science and Engineering.
• For selection of topic refer Scopus Index Journals, innovative ideas and societal use application.
• The project will be undertaken preferably by a group of 3-4 students who will jointly work and implement the project. The group will select a project with approval from a committee formed by the department of senior faculty to check the feasibility and approve the topic.
• The project work can be undertaken in own organisation/company/any reputed R&D Lab.
• Student must consult project guide in selection of topic.
• Projects should have preferably industrial exposure, societal use application and researchoriented.
• Student should report weekly to the project guide and log book of activities should be maintained for continuous assessment of the project work. The log book should be used for awarding CA marks.

II Project Report Format:

Report should be of 40 to 60 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point Bold Face
10. Certificate: All students should attach standard format of Certificate as described by the department. Certificate should be awarded to the group and not to individual student. Certificate should have signatures of guide, Head of Department and Principal/ Director.
11. The project report contains the details.
    1. Problem definition
    2. Requirement specification
    3. System design details (UML diagrams)
    4. System implementation – code documentation – dataflow diagrams/ algorithm, protocolsused.
    5. Test result and procedure
    6. Conclusions.
    7. Appendix
        a) Tools used
        b) References
12. References: References should have the following format

For Books: “Title of Book”, Authors, Publisher, Edition
For Papers: “Title of Paper”, Authors, Journal/Conference Details, Year(IEEE format)

III. Assessment Guideline:

• Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability and so on would be considered.
• There shall be at least two reviews in semester-VIII by the review committee constituted at department level by the programme head which includes presentations and demonstration of the work carried out by the students.
Review 3: Implementation status and testing document.
Review 4: Final Project Demonstration, Project Report and Result analysis.
• End semester examination should be conducted by the panel of internal examiner and external examiners from reputed

institute or industry.
• The final certification and acceptance of work ensures the satisfactory performance on the above aspects.

List of Submission:

1. Working model of the software /Hardware project.
2. Project report.
3. Presentation and demonstration of project in exhibition.

Teaching Load :

One supervisor from the department shall be assigned four groups of project and weekly load forsupervisor is 20 Hrs/week.

Course Outcomes (CO):

Students will be able to

1.	Convert idea in to product.
2.	Adapt new tools and technologies.
3.	Exhibit ccommunication skills and team work.
4.	Write project report and research paper.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	3	2	3	2	2	3	2	2	2	3	3	3
CO 2	2	3	3	2	3	2	1	2	3	2	2	3	3	3
CO 3	2	3	3	2	3	2	2	2	2	3	2	3	3	3
CO 4	2	3	3	2	3	2	1	2	2	3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

Elective-V : IT2812: Natural Language Processing

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Artificial Intelligence

Course Objectives :

1.	To describe approaches to syntax and semantics in NLP.
2.	To enlist approaches to discourse, generation, dialogue and summarization within NLP.
3.	To apply current methods for statistical approaches to machine translation.
4.	To understand machine learning techniques used in NLP.

	Course Contents	Hours
Unit 1	**Introduction to Natural Language:** The Study of Language Applications of Natural Language Understanding, Evaluating Language Understanding Systems The Different Levels of Language Analysis, Representations and Understanding The Organization of Natural Language Understanding Systems.	**(06)**
Unit 2	**Linguistic Background: Grammars and Parsing:** An Outline of English Syntax Words- The Elements of Simple Noun Phrases Verb Phrases and Simple Sentences Noun Phrases Revisited Adjective Phrases Adverbial Phrases, Grammars and Sentence Structure What Makes a Good Grammar A Top-Down Parser A Bottom-Up Chart Parser Top-Down Chart Parsing Finite State Models and Morphological Processing Grammars and Logic (**Self Study**: Programming Parsing tools such as Stanford Parser.)	**(07)**
Unit 3	**Features and Augmented Grammars:** Feature Systems and Augmented Grammars Some Basic Feature Systemsfor English Morphological Analysis and the Lexicon A Simple Grammar Using Features Parsing with Features, Augmented Transition Networks Definite Clause Grammars Generalized Feature Systems and Unification Grammars.	**(07)**
Unit 4	**Toward Efficient Parsing:** Human Preferences in Parsing Encoding Uncertainty: Shift-Reduce Parsers Statistical Methods-Basic Probability Theory Estimating Probabilities Part-of-SpeechTagging Obtaining Lexical Probabilities Probabilistic Context-Free Grammars Best-First Parsing A Simple Context- Dependent Best-First Parser.	**(06)**
Unit 5	**Semantic Interpretation and Ambiguity Resolution:** Semantics and Logical Form Word Senses and Ambiguity The Basic Logical Form, Language Encoding Ambiguity in Logical Form Verbs and States in Logical Form Case Relations.Representation of meaning – model theoretic representation, description logic, Lexical Resources such as WordNet (**Self Study**: Semantic web Ontologies).	**(06)**
Unit 6	**Applications and Recent Trends in NLP:** Information Extraction, Question answering, Machine Translation, MT evaluation tools such as Bleu, (word error rate) WER etc. Automatic text summarization, Sentiment Speech Recognition, Semantic web search, Automatic text Clustering.	**(08)**

Course Outcomes (CO):

Students will be able to

1.	Define core concepts of Natural language processing and levels of language analysis.
2.	Explore learning state of art NLP research areas such as parsing algorithms, ambiguity resolution and machine translation.
3.	Identify the Automatic processing and information extraction of human language using computer.
4.	Apply Natural Language Processing concepts in Information extraction, semantic web search, machine translation, text summarization, spam detection.

Text Books

1.	James Allen, “Natural Language Understanding”, Pearson Publication, 2nd Edition, ISBN: 978-81-317-0895- 8 (Unit 1, 2, 3, 4, 5).
2.	D. Jurafsky, J. H. Martin, “Speech and Language Processing”, Pearson Education, 2002 (Unit 6).

Reference Books

1.	Christopher D. Manning, Hinrich Schutze, “Foundations of Statistical Natural Language Processing”, The MIT Press, Cambridge, Massachusetts, 1999.
2.	Tiwary, U. S., and Tanveer Siddiqui. “Natural language processing and information retrieval” Oxford University Press, Inc., 2008.

3.	Bikel, Daniel, and Imed Zitouni. "Multilingual natural language processing applications" from theory to practice. IBM Press, 2012.
Useful Links	
1.	https://nptel.ac.in/courses/106/105/106105158/ Prof. Pawan G., IIT Kharagpur.
2.	https://nptel.ac.in/courses/106/106/106106211/ Prof. RamseshanRamchandran IIT Madras.
3.	https://www.coursera.org/learn/language-processing Prof. Anna Potapenko School of Economis Heights.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	1	3	1	-	-	-	-	-	-	-	-	1	2
CO 2	2	3	2	2	-	-	-	-	-	-	-	-	1	3
CO 3	2	1	1	2	-	-	-	-	-	-	-	-	3	2
CO 4	1	2	3	2	-	-	-	-	-	-	-	-	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	5	-	3	10
Apply	5	5	-	10
Analyse	-	5	3	10
Evaluate	-	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

Elective-V : IT2832: Software Testing and Quality Assurance

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite: Software Engineering.

Course Objectives :

1.	To understand test management strategies and tools for testing.
2.	To explain quality assurance and various tools used in quality management.
3.	To learn in detail about various quality assurance models.

	Course Contents	Hours
Unit 1	**Introduction:** Software Failures, Testing Process, Terminologies: Program and Software, Verification and Validation, Fault, Error, Bug and Failure, Test, Test Case and Test Suite, Deliverables and Milestones, Alpha, Beta and Acceptance Testing, Static and Dynamic Testing, Testing and Debugging, Limitations of Testing, V Shaped software life cycle model.	**(03)**
Unit 2	**Software Verification:** Verification Methods, SRS document verification, SDD document verification, Source code reviews, User documentation verification, Software project audit Creating test cases from SRS and Use cases: Use Case Diagram and Use Cases, Generation of test cases from use cases, Guidelines for generating validity checks.	**(08)**
Unit 3	**Levels of Testing:** The Need for Levels of Testing, Unit Test: Functions, Procedures, Classes, and Methods as Units, The Need for Preparation, Designing the Unit Tests, The Class as a Testable Unit, Running the Unit Tests and Recording Results, Integration Test: Integration Strategies for Procedures and Functions, Integration Strategies for Classes, Designing Integration Tests, System Test: Stress Testing, Security Testing, Recovery Testing.	**(07)**
Unit 4	**Regression Testing:** Regression Test cases selection, Reducing the number of test cases, Code coverage prioritization techniques Testing Web applications: web testing, functional testing, UI testing, usability testing, configurations and compatibility testing, performance testing.	**(08)**
Unit 5	**Measurement in software engineering:** Scope of software metrics, Classifying software measures, Applying the framework, Software measurement validation, Measuring internal product attributes: size, aspects of software size, length, reuse, functionality.	**(08)**
Unit 6	**Measuring internal product attributes:** Structure, Types of structural measures, Control-flow structure, Modularity and information flow attributes, Measuring external product attributes: Modeling software quality, McCall‟s quality factors, ISO 9126 quality characteristics. (**Self Study**: ISO 9000:2000, Measuring aspects of quality)	**(06)**

Course Outcomes (CO):

Students will be able to

1.	Understand various software testing methods and strategies.
2.	Identify defects and manage those defects for improvement in software quality.
3.	Design test cases and execute them for software quality control and assurance.
4.	Apply different quality measurement metrics on software.

Text Books

1.	Yogesh Singh, “Software Testing”, Cambridge University Press, 1st edition, 2013. (Unit:1,2,4)
2.	Ilene Burnstein, “Practical Software Testing”, Springer professional computing, 1st edition, ISBN 0-387-95131-8 (Unit:3)
3.	N. E. Fenton, S. L. Pfleeger, “Software Metrics-A Rigorous and Practical Approach”, PWS publisher, 2nd edition, ISBN: 0-534-95425-1 (Unit:5,6)

Reference Books

1.	Aditya P. Mathur, “Foundations of Software Testing”, Pearson Education, 2nd edition, 2008.
2.	Renu Rajani, Pradeep Oak, “Software Testing – Effective Methods, Tools and Techniques”, Tata McGraw Hill, 1st edition, 2004.
3.	Srinivasan Desikan and Gopalaswamy Ramesh, “ Software Testing – Principles and Practices”, Pearson education, 2006.
4.	M. G. Limaye, “Software Testing Principles, Techniques and tools”, McGraw Hills, 1st edition, 2009.

5.	Rahul Shende, "Testing in 30+ Open Source Tools", SPD publication, 2nd edition, 2012.
Useful Links	
1.	http://nptel.ac.in/courses/106105150 Software Testing, Dr. Rajib Mal, Department of CSE, IIT Kharagpur.
2.	http://nptel.ac.in/courses/106101061/18 Software Testing, Prof. R. K. Joshi, Department of CSE, IIT Bombay.
3.	http://www.softwaretestingmentor.com/istqb-videos/ Software Testing, Manish Varma.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	1	-	3	-	2	-	-	-	-	-	-	-	-	2
CO 2	-	3	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	-	-	3	-	-	-	-	-	-	-	-	-	2	-
CO 4	-	1	2	-	-	-	-	-	-	-	-	-	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	-	-	-	-
Apply	5	5	3	10
Analyse	-	5	3	20
Evaluate	5	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

Elective- V : IT2842: High Performance Computing

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		CT – 1	15
Tutorials	00 Hrs/week		CT – 2	15
Total Credits	03		TA	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Operating Systems

Course Objectives :

1.	To provide systematic and comprehensive treatment of the hardware and the software high performance techniques involved in current day computing.
2.	To illustrate the cache coherence and consistency problems in multiprocessors, and their existing solutions.
3.	To provide systematic and comprehensive treatment of the components in the pipeline that extract instruction level parallelism.
4.	To introduce the fundamentals of high performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.

	Course Contents	Hours
Unit 1	**Introduction to Parallel Computing:** Motivating Parallelism**,** Scope of Parallel Computing**,** Parallel Programming Platforms, Implicit Parallelism: Trends in Microprocessor Architectures, Limitations of Memory System Performance, Dichotomy of Parallel Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process Processor Mapping and Mapping Techniques.	**(07)**
Unit 2	**Principles of Parallel Algorithm Design:** Preliminaries**,** Decomposition Techniques**,** Characteristics of Tasks and Interactions**,** Mapping Techniques for Load Balancing**,** Methods for Containing Interaction, Parallel Algorithm Models.	**(06)**
Unit 3	**Basic Communication Operations**: One-to-All Broadcast and All-to-One Reduction, All-to-All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather, All-to-All Personalized Communication.	**(07)**
Unit 4	**Shared Memory Parallel Programming:** Symmetric and Distributed architectures, OpenMP Introduction, Thread creation, Parallel regions, Work sharing, Synchronization. Message Passing Interface: MPI Introduction, Collective communication, (**Self Study:** Data grouping for communication)	**(06)**
Unit 5	**Graphics Processing Units:** Introduction to Heterogeneous Parallel Computing, GPU architecture, Thread hierarchy, (**Self Study**: Memory Hierarchy)	**(06)**
Unit 6	**Many Integrated Cores:** Introduction to Many Integrated Cores, MIC, Xeon Phi architecture, Thread hierarchy, Memory Hierarchy, Memory Bandwidth and performance considerations.	**(08)**

Course Outcomes (CO):

Students will be able to

1.	Define the concepts of Modern Processors.
2.	Explore the optimization techniques for serial code.
3.	Describe the Parallel Computing Paradigms.
4.	Select the appropriate Parallel Programming tool from OpenMP, MPI, GPU and many integrated cores.

Text Books

1.	Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, “Introduction to Parallel Computing”, Addison-Welsey, 2nd edition, 2003. (Unit: 1,2,3)
2.	Wen-Mei W Hwu, David B Kirk, “Programming Massively Parallel Processors A Hands-on Approach”, Morgann Kaufmann, 3rd edition, 2005. (Unit: 4,5,6)

Reference Books

1.	Rezaur Rahman, “Intel Xeon Phi Coprocessor Architecture and Tools”, Apress Open, 2013.
2.	Barbara Chapman, Gabriele Jost, Ruud van der Pas, “Using OpenMP”, MIT Press, 2008.
3.	Gropp, Lusk, Skjellum, “Using MPI”, 2014.

Useful Links

1.	https://developer.nvidia.com/udacity-cs344-intro-parallel-programming Dr. David Luebke, NVIDIA
2.	https://developer.nvidia.com/educators/existing-courses Wen-mei W. HwuUniversity of Illinois
3.	https://ocw.mit.edu Parallel Programming for Multicore Machines Using OpenMP and MPI, Dr. Constantinos Evangelinos

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	3	3	-	-	-	-	-	-	-	-	3	2
CO 2	2	3	2	2	-	-	-	-	-	-	-	-	1	3
CO 3	2	3	1	2	-	-	-	-	-	-	-	-	3	2
CO 4	3	2	3	2	-	-	-	-	-	-	-	-	2	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern **(with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	5	-	3	10
Apply	5	5	-	10
Analyse	-	5	3	10
Evaluate	-	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

Elective V - IT2852: Computer Graphics

Teaching Scheme			Examination Scheme	
Lectures	03 Hrs/week		**CT – 1**	15
Tutorials	00 Hrs/week		**CT – 2**	15
Total Credits	03		**TA**	10
			ESE	60
			Duration of ESE	02 Hrs 30 Min

Prerequisite : Data Structures & Files, Java Programming

Course Objectives :

1.	To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
2.	To learn the basic principles of 3- dimensional computer graphics
3.	To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications
4.	To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications.

	Course Contents	Hours
Unit 1	**Graphics System and Models** Pixels and the Frame Buffer, The CPU and the GPU, Output Devices, Physical Input Devices, Logical Devices, Input Modes, Images: Physical And Synthetic, Imaging Systems, Graphics Architectures, Graphics Functions, Imaging Systems, The OpenGL Interface, Coordinate Systems, Primitives And Attributes.	**(06)**
Unit 2	**2D and 3D Transformation** Scalars, Points, And Vectors, 2D Scan conversion & polygon filling: Active-Edge List, scan conversion of lines & polygons; Edge fill , simple Seed fill and Scan line seed fill algorithms. 2D Geometric transformations: Introduction to representation of 2D objects as matrices; transformation matrices for scaling, shear, rotation, reflection 3D Geometric transformations: Introduction to representation of 3 D objects as matrices; transformation matrices for scaling, shear, rotation, reflection	**(08)**
Unit 3	**2D and 3D Clipping** Clipping against regular window, Explicit line clipping; Line-Segment Clipping, Sutherland and Cohen line clipping, Liang-Barsky Clipping, Polygon Clipping, Bounding Boxes and Volumes, Curves, Surfaces, and Text, Clipping in the Frame Buffer, Rasterization.	**(07)**
Unit 4	**Projection** Introducing the idea of projecting 3D object on to 2D plane; broad classification – parallel & perspective projection; different types of parallel projection & examples of each; formal definition of 3D to 2D projection and derivation of projection matrix; 1-point, 2-point and 3-point perspective projection; formal derivation of vanishing point(s) and physical implication of the same.	**(08)**
Unit 5	**Computer Animation** Key frame animation, Construction of an animation sequence, Graphical Objects-cube, Scene Graphs, Open Scene Graphs, Graphics And The Internet, Tree Structures- Constructive solid geometry (CSG) Trees, Binary space partitioning (BSP) tree.	**(07)**
Unit 6	**Image Manipulation and Storage** Image, Digital image file formats, Image compression standard – JPEG, Image Processing - Digital image enhancement, contrast stretching, Histogram Equalization, smoothingand median Filtering	**(06)**

Course Outcomes (CO):

Students will be able to

1.	Perceive the fundamental concepts of Computer Graphics
2.	Handle different 2D and 3D transformation concepts with clipping techniques
3.	Execute different Projection and Computer Animation perspectives.
4.	Appraise acquired transformations with image manipulation using modern tools

Text Books

1.	Edward Angel, “Interactive Comp. Graphics, A Top-Down Approach using OpenGL”,Pearson, 5th Edition, 2011 (Unit: 1,2,3,4,5,6)
2.	David F. Rogers, J Alan Adams, “Mathematical Elements for Computer Graphics”, TMGH, 2nd Edition (Unit: 1,2)

Reference Books

1.	David F.Rogers, “Procedural Elements for Computer Graphics” TMH publication, 2001.

2.	D. Hearn and M.P. Baker "Computer Graphics, C version" by, Pearson Education, 2002.
3.	J.D. Foley, A. van Dam, S.K. Feiner and J.F. Huges," Computer Graphics: principles & practices", Addison Wesley, 2013

Useful Links	
1.	https://nptel.ac.in/courses/106106090 Prof. Sukhendu Das, IIT Madras.
2.	https://onlinecourses.nptel.ac.in/noc20_cs90/preview Prof. Samit Bhattacharya IIT Guwahati
3.	https://www.geeksforgeeks.org/

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	-	2	-	3	-	-	-	-	-	-	-	-	-	1
CO 2	-	-	3	2	-	-	-	-	-	-	-	-	1	-
CO 3	-	1	3	2	-	-	-	-	-	-	-	-	2	-
CO 4	-	-	2	3	-	-	-	-	-	-	-	-	1	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	20
Understand	5	-	3	10
Apply	5	5	-	10
Analyse	-	5	3	10
Evaluate	-	-	1	10
Create	-	-	-	-
TOTAL	15	15	10	60

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Elective-V Lab : IT2814 : Natural Language Processing Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	50
Total Credits	01			

Prerequisite : Programming in C,C++, Python

Course Objectives :

1.	To describe approaches to syntax and semantics in NLP.
2.	To enlist approaches to discourse, generation, dialogue and summarization within NLP.
3.	To apply current methods for statistical approaches to machine translation.
4.	To understand machine learning techniques used in NLP.

Course Contents

Experiment 1	Explore morphological features of a word by analysing it.
Experiment 2	Explore the Herman Melville novel Moby Dick using NLTK toolkit.
Experiment 3	Generate word forms from root and suffix information.
Experiment 4	Explore the morphology of a word by the use of Add-Delete table.
Experiment 5	Calculate bigrams from a given corpus and calculate probability of a sentence.
Experiment 6	Apply add-one smoothing on sparse bigram table.
Experiment 7	Create a spelling recommender function that uses nltk to find words similar to the misspelling.
Experiment 8	Calculate emission and transition matrix which will be helpful for tagging Parts of Speech using Hidden Markov Model.
Experiment 9	Find POS tags of words in a sentence using Viterbi decoding.
Experiment 10	Explore the importance of context and size of training corpus in learning Parts of Speech.
Experiment 11	Explore the concept of chunking and get familiar with the basic chunk tagset.
Experiment 12	Explore the importance of selecting proper features for training a model and size of training corpus in learning how to do chunking.
Experiment 13	Implement NLP for Sentiment Analysis.
Experiment 14	Create NLP applications in web mining and text mining.

Course Outcomes (CO):

Students will be able to

1.	Define and explore the basics of Natural Language Processing.
2.	Apply algorithmic strategies while solving Natural Language Processing problems.
3.	Explore Natural Language Processing and Machine learning paradigms.
4.	Write programs using Natural Language Processing open source tools.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1	2	1	1	2	2	1	-	-	-	-	-	1	2
CO2	2	1	2	2	1	3	3	-	-	-	-	-	2	1
CO3	2	1	3	2	2	2	2	-	-	-	-	-	2	3
CO4	2	1	1	2	3	1	2	-	-	-	-	-	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Elective-V Lab : IT2834: Software Testing and Quality Assurance Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	50
Total Credits	01			

Prerequisite: Software Engineering

Course Objectives :

1.	To provide learner with knowledge in Software Testing techniques.
2.	To understand how testing methods can be used as an effective tool in providing quality assurance concerning for software.
3.	To provide skills to design test case plan for testing software.

Course Contents

Experiment 1	Write programs in C Language to demonstrate the working of the following constructs with different range of values and test cases: i) do...while ii) while….do iii) if…else iv) switch v) for.
Experiment 2	A program written in C language for matrix multiplication fails "Introspect the causes for its failure and write down the possible reasons for its failure".
Experiment 3	Prepare SRS document, use case specification document and create test case matrix for use cases for any application.
Experiment 4	Demonstrate automated functionality testing tool (e.g. Winrunner/ Rational robot/UFT).
Experiment 5	Demonstrate web application testing tool (e.g. Selenium).
Experiment 6	Demonstrate Unit testing tool(e.g. JUnit/NUnit).
Experiment 7	Demonstrate bug tracking tool (e.g. Bugzilla).
Experiment 8	Demonstrate test management tool (e.g. Test Director/ Testuff).
Experiment 9	Demonstrate web based open source testing tool (e.g. Test Link).
Experiment 10	Demonstrate automated testing tool for desktop, web based and mobile applications. (e.g. TestComplete).
Experiment 11	Study of software quality model and estimation model.

Course Outcomes (CO):

Students will be able to

1.	Understand basic concepts of software testing.
2.	Identify and execute test cases for manual as well as automated testing.
3.	Apply different testing methods for software quality improvement.

List of Submission: **Every year course coordinator will give new problem statement based on above list of experiments.**

1.	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	-	-	2	0
CO2	-	3	2	-	-	-	-	-	-	-	-	-	2	0
CO3	2	-	-	3	1	-	-	-	-	-	-	-	2	0

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Exp 11	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	05	
CA												

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Elective-V Lab : IT2844: High Performance Computing Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	50
Total Credits	01			

Prerequisite: Distributed Systems, C Programming

Course Objectives :

1.	To introduce the learner to fundamental and advanced parallel algorithms through the shared memory architecture and message passing interface.
2.	To introduce the fundamentals of high performance computing with the graphics processing units and many Integrated cores.
3.	To provide a strong foundation on memory hierarchy design and tradeoffs in both uniprocessor and Multiprocessors.
4.	To provide systematic and comprehensive treatment of the components in the pipeline that extract instruction level parallelism.

Course Contents

Experiment 1	To study the system commands of linux related to parallel programming.
Experiment 2	Installation and study of basics of OpenMP API (Open Multi-Processor API).
Experiment 3	To implement sharing of work among threads using Loop Construct in OpenMP.
Experiment 4	To implement Clauses in Loop Construct.
Experiment 5	To implement sharing of work among threads in an OpenMP program using „Sections Construct" and Single Construct.
Experiment 6	Installation and study of basics of MPI (Message Passing Interface).
Experiment 7	To implement the directives for communication between MPI processes.
Experiment 8	To implement MPI collective operations using Synchronization.
Experiment 9	To implement MPI Non-Blocking operation.
Experiment 10	Execution of a simple CUDA C Program.
Experiment 11	To implement Matrix Multiplication in CUDA C.
Experiment 12	To implement tiled Matrix-Matrix Multiplication in CUDA C.

Course Outcomes (CO):

Students will be able to

1.	Explore various computing technology architecture for parallel computing.
2.	Convert sequential program into its parallel program.
3.	Apply new trends in parallel computing.
4.	Discuss the advantages of deploying parallel computing technology in terms of performance gain.

List of Submission: Every year course coordinator will give new problem statement based on above list of experiments.

1.	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	3	2	1	1	2	2	1	-	-	-	-	-	3	2
CO2	2	2	2	2	2	3	3	-	-	-	-	-	2	1
CO3	2	1	3	2	2	2	2	-	-	-	-	-	2	2
CO4	2	1	2	2	2	1	2	-	-	-	-	-	3	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Elective-V Lab : IT2854: Computer Graphics Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	02 Hrs/week		CA	50
Total Credits	01			
Prerequisite : Java Programming, Data Structure				
Course Objectives :				
1.	To learn the basic principles of 3- dimensional computer graphics.			
2.	To be able to discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications.			
3.	To comprehend and analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications.			
4.	To analyze the fundamentals of animation, virtual reality, underlying technologies, principles, and applications.			

Course Contents	
Experiment 1	Implementation of Line drawing using Bresenham's Algorithm.
Experiment 2	Implementation of Circle drawing using Mid-Point Algorithm.
Experiment 3	Design different shapes like Triangle, Tetrahedron, Torus using OpenGL.
Experiment 4	Visualize the Data Sets. 4. 2D Transformations.
Experiment 5	Implement the 3D Transformations like e translation, scaling, rotation, shearing and reflection.
Experiment 6	Implement the program to clip the line using Cohen Sutherland algorithm
Experiment 7	Implement Polygon filling algorithms.
Experiment 8	Implement Hidden line/surface elimination algorithms (Z Buffer)
Experiment 9	Implement a program to draw Cubic spline, Bezier curves.
Experiment 10	Develop a scene in Unity that includes a sphere and plane.
Experiment 11	Create a Bouncing Ball using Key frame animation and Path animation
Experiment 12	Study of Multimedia BMP-JPG/WAV-MP3/DAT-MPG etc.

Course Outcomes (CO):	
Students will be able to	
1.	Outline the fundamental concepts of Computer Graphics.
2.	Illustrate the fundamental concepts of computer graphics with its different transformations using algorithms.
3.	Solve different algorithms on 2D clipping
4.	Investigate acquired transformations with projection.
List of Submission: **Every year course coordinator will give new problem statement based on above list of experiments.**	
	Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	-	3	1	2	-	-	-	-	-	-	-	-	-	2
CO2	-	-	2	3	-	-	-	-	-	-	-	-	2	1
CO3	-	-	3	2	-	-	-	-	-	-	-	-	-	2
CO4	-	1	3	2	-	-	-	-	-	-	-	-	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	
Task II	05	05	05	05	05	05	05	05	05	05	
Task III	05	05	05	05	05	05	05	05	05	05	
CA											

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

IT2806: MOOC-I

Teaching Scheme			Examination Scheme	
Lectures	-		TA/CA	-
Tutorials	-		ESE	100
Total Credits	04			

Course Objectives :

1.	To apply critical and analytical thinking across a broad array of liberal arts and science disciplines.
2.	To demonstrate proficiency in written communication.
3.	To demonstrate proficiency in oral communication.
4.	To develop cultural competencies and global awareness.

Course Contents

Student should complete any one of the MOOC course certification and submit the copy of certificate to controller of examinations, GCE, Karad through program coordinator prior to ESE.
The list of Courses which is not limited to followingare as follows:

Liberal Arts Subjects-

- Constitution of India
- Pedagogy Studies
- Stress Management by Yoga
- Personality Development through Life Enlightenment Skills
- Disaster Management
- Sanskrit for Technical Knowledge
- Research Paper Writing
- Cognition, Transformation and Lives
- Soft Skill for Business Negotiations and Marketing Strategies
- Innovation, Business Models and Entrepreneurship

Guidelines:

- Duration for completion of MOOC-I is minimum 8 Weeks.
- Platform: NPTEL(strictly Prefer either for MOOC-I or MOOC-II)
- Other Platforms: Udacity, Stanford, Edx

Course Outcomes (CO):

Students will be able to

1.	Demonstrate understanding of major findings and ideas in a variety of disciplines beyond the major**.**
2.	Demonstrate understanding of methods, skills, tools and systems used in a variety of disciplines, and historical, theoretical, scientific, technological, philosophical, and ethical bases in a variety of disciplines**.**
3.	Understand and articulate the importance and influence of diversity within and among cultures and societies**.**
4.	Communicate effectively, through written and oral communication and through other forms as appropriate.

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

IT2807: MOOC-II

Teaching Scheme			Examination Scheme	
Lectures	-		TA/CA	-
Tutorials	-		ESE	100
Total Credits	04			

Prerequisite : NA

Course Objectives :

1.	To learn to synthesize knowledge.
2.	To learn to apply knowledge.
3.	To understand fundamental concepts.

Course Contents

Student should complete any one of the MOOC course certification and submit the copy of certificate to controller of examinations, GCE, Karad through program coordinator prior to ESE.

The list of Certification Courses which is not limited to the following:

- Digital Forensics/Ethical Hacking
- Soft Computing
- Blockchain Technology
- Computer Vision
- Big Data Analytics/Computing
- Augmented Reality and Virtual Reality
- Data Mining
- Machine Learning
- Deep Learning
- Data Science/Analytics
- Natural Language Processing
- Cyber Security

Guidelines:

- Duration for completion of MOOC-II is minimum 8 Weeks.
- Platform: NPTEL(strictly Prefer either for MOOC-I or MOOC-II),
- Other Platforms: Udacity, Stanford, Edx

Course Outcomes:

Students will be able to

1.	Analyze the conceptualize knowledge.
2.	Apply the knowledge.
3.	Learn the critical and practical thinking.

Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

IT2808: Project

Teaching Scheme			Examination Scheme	
Lectures	-		CA	250
Practicals	-		ESE	300
Total Credits	10			

Prerequisites: Seminar, Programming languages

Course Objectives:

1.	To apply SDLC and meet the objectives of proposed development or research work**.**
2.	To test rigorously before deployment of work in objective 1**.**
3.	To validate the work undertaken during objective 1 and 2**.**
4.	To consolidate the development or research work as project report.

Course Contents

I. Guidelines for Industry mode Project / Dissertation

1. Finalization of project in industry through proper channel and allotment / permission by respective Head of Department before commencement of the corresponding semester
2. Information of such student(s) / group of students to Dean Academics commencement of the corresponding semester to make necessary course registration arrangement for such student(s) / group of students through MIS.
3. Guide allotment (a) one internal i.e. from the institute and (b) one from corresponding industry as per applicable UG/PG rules and regulations
4. Mandatory reporting by the student to the institutional guide once in fortnight and submission of progress report once in a month with requisite signature(s) to the department
5. Mandatory visits to the industry; where the student(s) is permitted for project; by the guide and / or department committee as decided once in a fortnight.
6. Final report preparation and submission in the mode as for academic mode structure.
7. Final examinations in the same mode as for academic mode structure i.e. in presence of external examiner along-with internal examiner (institute and industry guide).

In exception case of hardware based OR model-based industry project, if it is not possible to carry the project from industry to institute for examination purpose, examination may be conducted in the industry with written permission of respective Head of Department.

8. Other processes remain the same as per applicable rules and regulations.

II. Project Report Format:

Report should be of 40 to 60 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point Bold Face
10. Certificate: All students should attach standard format of Certificate as described by the department. Certificate should be awarded to the group and not to individual student. Certificate should have signatures of guide, Head of Department and Principal/ Director.
11. The project report contains the details.
    1. Problem definition
    2. Requirement specification
    3. System design details (UML diagrams)
    4. System implementation – code documentation – dataflow diagrams/ algorithm, protocolsused.
    5. Test result and procedure
    6. Conclusions.
    7. Appendix
        a) Tools used
        b) References
12. References: References should have the following format

For Books: “Title of Book”, Authors, Publisher, Edition

For Papers: “Title of Paper”, Authors, Journal/Conference Details, Year(IEEE format)

III. Assessment Guideline:

• Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability and so on would be considered.

• There shall be at least two reviews in semester-VIII by the review committee constituted at department level by the programme head which includes presentations and demonstration of the work carried out by the students.

Review 3: Implementation status and testing document.

Review 4: Final Project Demonstration, Project Report and Result analysis.

• End semester examination should be conducted by the panel of internal examiner andexternal examiners from industry.

• The final certification and acceptance of work ensures the satisfactory performance on the above aspects.

Course Outcomes (CO):

Students will be able to

1.	Convert the ideas in to product.
2.	Improve presentation and communication skills.
3.	Communicate effectively.
4.	Write project report and research paper.

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	3	3	2	3	2	2	3	2	2	2	3	3	3
CO 2	2	3	3	2	3	2	1	2	3	2	2	3	3	3
CO 3	2	3	3	2	3	2	2	2	2	3	2	3	3	3
CO 4	2	3	3	2	3	2	1	2	2	3	3	3	3	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
Audit Course Lab I: IT2715: Foundations of Data Science and Machine Learning Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Mathematics, Basic Programming skills				
Course Outcomes (CO): Students will be able to				
CO1	Analyze and visualize data using statistical methods and tools to extract meaningful insights.			
CO2	Implement and manage efficient data storage, retrieval, and preprocessing for decision-making.			
CO3	Develop and evaluate machine learning models and neural networks to solve complex problems.			
CO4	Utilize cloud computing resources and ensure ethical considerations in the design of AI systems.			

Course Contents		**CO**
Implementation of following concepts		
Experiment 1	Data visualization effectiveness evaluation with Python and Tableau	**CO1**
Experiment 2	Real-world dataset exploratory analysis using Python /R	**CO1**
Experiment 3	Common data cleaning challenges and solutions using Python and SQL	**CO2**
Experiment 4	Database performance optimization strategies assessment.	**CO2**
Experiment 5	Machine learning algorithm performance comparison using TensorFlow, PyTorch, and scikit-learn	**CO3**
Experiment 6	Machine learning model monitoring framework development using TensorFlow Serving and Prometheus	**CO3**
Experiment 7	Neural network architecture comparison for image classification tasks using TensorFlow and PyTorch with and without Hyperparameter tuning	**CO3**
Experiment 8	Transfer learning techniques implementation and evaluation	**CO3**
Experiment 9	Scalability assessment using containerization technologies like Docker and Kubernetes.	**CO4**
Experiment 10	Serverless architecture implementation and efficiency evaluation.	**CO4**
Experiment 11	Bias detection experiments using fairness metrics and diverse datasets and Fairness-aware model training techniques exploration	**CO4**
Experiment 12	Regulatory compliance analysis and strategies development	**CO4**
List of Submission:		
Minimum No. of Experiments: 10		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3	3	3	3	1	-	-	-	-	-	2	-	2
CO 2	2	2	2	2	3	2	-	-	2	2	2	2	1	-
CO 3	3	3	3	3	3	-	1	2	1	2	3	2	-	1
CO 4	2	3	2	3	3	2	2	2	2	2	1	2	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
Audit Course Lab I: IT2725: AIoT Development Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-

Prerequisite : Mathematics, Basic Programming skills

Course Outcomes (CO): Students will be able to

CO1	Understand the fundamentals of IoT hardware and software.
CO2	Develop proficiency in programming and simulating IoT devices.
CO3	Gain knowledge of artificial intelligence concepts and their integration with IoT systems.
CO4	Explore the practical applications and implications of IoT technologies in various domains.

Course Contents		CO
Implementation of following concepts		
Experiment 1	Familiarization with IoT development kits (e.g., Raspberry Pi, Arduino, ESP32)	**CO1**
Experiment 2	Understanding the components and capabilities of IoT hardware platforms	**CO1, CO2**
Experiment 3	Exploring different types of sensors (temperature, humidity, motion, light, etc.)	**CO2, CO3**
Experiment 4	Hands-on exploration of actuators (motors, servos, relays) and their applications in IoT	**CO1**
Experiment 5	Using IoT Circuit Designing Software to build circuits with drag & drop features	**CO4**
Experiment 6	Programming IoT devices using Block Designer Software	**CO1**
Experiment 7	Simulating IoT circuits in a virtual environment	**CO2**
Experiment 8	Hands-on practice with IoT development boards and sensors	**CO4**
Experiment 9	Programming AI models using Block Designer Software	**CO3**
Experiment 10	Implementing Python scripts for data analysis and AI applications	**CO2, CO3**
Experiment 11	Integrating AI models with IoT devices for smart solutions	**CO1**
Experiment 12	Overview of Artificial Intelligence (AI) and its applications	**CO4**
Experiment 13	Introduction to the Internet of Things (IoT) and its significance	**CO2**
Experiment 14	Understanding the concept of Artificial Intelligence of Things (AIoT)	**CO3**
Experiment 15	Exploring the role of IoT gateways in bridging mobile devices and IoT networks	**CO4**
Experiment 16	Techniques for establishing seamless connections between mobile devices and IoT gateways	**CO1**
Experiment 17	Hands-on exercises demonstrating the setup and configuration of mobile-to-IoT connections	**CO4**
Experiment 18	Overview of sensor technologies commonly used in IoT applications	**CO3**
Experiment 19	In-depth exploration of various types of sensors and their academic underpinnings	**CO1**
Experiment 20	Practical demonstrations showcasing the functionality and applications of sensors in IoT systems	**CO4**
List of Submission:		
Minimum No. of Experiments: 18		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3	3	2	2	2	-	-	2	2	2	3	2	2
CO 2	2	3	2	2	2	2	-	-	3	2	2	3	2	1
CO 3	2	2	3	2	2	2	-	-	2	2	2	2	-	1
CO 4	2	2	2	3	2	2	1	2	3	2	2	3	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
Audit Course Lab I: IT2735: Immersive Game Development Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Mathematics, Basic Programming skills				
Course Outcomes (CO): Students will be able to				
CO1	Apply Unity and 3D content creation basics for virtual environment design.			
CO2	Analyse Unity animations and physics for engaging gameplay.			
CO3	Synthesize UI/UX design and scripting for user-friendly Unity interfaces.			
CO4	Design, optimize, and deploy AR/VR experiences in Unity with audio-visual enhancements.			

	Course Contents	**CO**
Implementation of following concepts		
Experiment 1	**Real-time Rendering Comparison** • Understand real-time rendering and compare it with offline rendering. • Research and present the concept of real-time rendering, • Discuss the importance of optimization in real-time rendering.	**CO1**
Experiment 2	**Unity Interface Exploration** • Explore Unity's interface and features, • Experiment with various tools available in Unity. • Create a simple scene and organize objects within it.	**CO1**
Experiment 3	**Introduction to 3D Modelling** • Learn basics of 3D modelling. • Understand fundamental 3D modelling concepts, tools, and techniques. • Practice creating basic 3D models using modelling software.	**CO1**
Experiment 4	**Animation Basics in Unity** • Understand animation concepts and tools in Unity. • Learn about key frame animation, skeletal animation, and animation blending. • Create simple animations for objects and characters in Unity.	**CO2**
Experiment 5	**Unity's Physics Engine** • Introduction to Unity's physics engine. • Learn about Unity's physics components like Rigid body, Collider, and Physics materials. • Implement basic physics interactions in Unity scenes.	**CO2**
Experiment 6	**UI Design and Scripting** • Learn UI/UX design principles and basic scripting in Unity. • Create UI elements using Unity's UI system. • Learn basics of C# programming language and Write scripts for UI interactions and applications.	**CO3**
Experiment 7	**Audio and Visual Effects Implementation** • Add audio assets and visual effects to Unity projects. • Implement sound effects, background music, and spatial audio. • Incorporate visual effects using Unity's VFX Graph.	**CO3**
Experiment 8	**Unity Project Optimization** • Learn techniques for optimizing Unity projects. • Implement LOD (Level of Detail), batching, and occlusion culling. • Optimize performance in Unity projects.	**CO3**
Experiment 9	**Augmented Reality Setup and Interaction** • Understand AR hardware and develop AR experiences. • Set up AR sessions and detect/tracking surfaces. • Place virtual objects in the real world and implement interactions.	**CO4**

Experiment 10	**Virtual Reality Development** • Develop VR experiences using Unity. – • Configure Unity for Oculus development. – • Develop a VR experience for the Meta Quest platform. - Implement VR interactions like grabbing and teleportation.	**CO4**
List of Submission:		
Minimum No. of Experiments: 10		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3	1	3	2	3	-	-	1	2	3	3	2	2
CO 2	1	1	3	2	2	1	-	-	3	3	1	1	-	-
CO 3	1	3	1	3	1	3	1	3	1	1	3	3	1	1
CO 4	1	1	3	1	3	3	2	1	3	3	1	1	1	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

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Government College of Engineering, Karad

Final Year (Sem – VII) B. Tech. Information Technology

Audit Course Lab I : IT2745 : ABAP Programming for SAP HANA Lab

Laboratory Scheme:			**Examination Scheme:**	
Practical	4 Hrs/week		**ISE**	-
Total Credits	Audit Course		**ESE**	-

Prerequisite : Java Programming

Course Outcomes (CO): Students will be able to

CO1	Understand SAP HANA concepts, key technologies, and use of SAP HANA Studio and ADT
CO2	Identify and address ABAP code performance issues and understand SAP HANA's technical requirements and deployment options
CO3	Utilize Enhanced Open SQL, Core Data Services (CDS), and develop with SAP HANA Native SQL and ABAP Managed Database Procedures
CO4	Integrate SAP HANA models into ABAP, transport objects, and optimize reports with Full Text Search.

Course Contents		**CO**
Experiment 1	Introduction:-SAP HANA Basics and Technical Concepts, SAP HANA Studio, ABAP and SAP HANA	**CO1**
Experiment 2	Introducing the ABAP Development Tools (ADT), • Taking ABAP to SAP HANA, • SAP HANA as Secondary Database– Access via Open SQL.	**CO1**
Experiment 3	Code Checks to Prepare ABAP Code for SAP HANA, • Tools to Analyse Potential Performance Issues, • Guided Performance Analysis.	**CO2**
Experiment 4	SQL Performance Rules for SAP HANA, • Database Independent Code-to-Data • Classical Open SQL and Its Limitations.	**CO2**
Experiment 5	Enhanced Open SQL, • The Basics of Core Data Services in ABAP, • Associations in Core Data Services, • Outlook: More Interesting Features of CDS.	**CO3**
Experiment 6	SAP HANA specific Code-to-Data, • The Syntax of SAP HANA Native SQL, • ABAP Managed Database Procedures, • ABAP Managed Database Procedures.	**CO3**
Experiment 7	Use of SAP HANA Information Models in ABAP, • Advanced Topics, • Transporting SAP HANA Objects with ABAP Transport Requests.	**CO4**
Experiment 8	Using SAP HANA Full Text Search, • ABAP List Viewer with Integrated Database Access (ALV IDA), • Case Study: Optimize a Report on Flight Customer Revenue	**CO4**
Experiment 9	Describing SAP HANA, • Understanding the Need for a Modern Digital Platform, • Describing How SAP HANA Powers a Digital Platform,	**CO1**
Experiment 10	Key Technologies of SAP HANA, • Deploying SAP HANA, • Identifying the Key Roles in an SAP HANA Implementation.	**CO1**
Experiment 11	Technical Requirements of SAP HANA, Technical Deployment Options	**CO2**
Experiment 12	High Availability and Disaster tolerance, SAP HANA Lifecycle Management Tools	**CO2**

List of Submission:

Minimum number of Experiments : 10

Mapping of COs and POs

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	3	-	-	-	1	-	-	-	1	2	-	1	2	1
CO 2	3	2	-	3	3	-	-	-	3	3	-	1	1	2
CO 3	3	3	3	3	3	1	-	1	2	3	-	1	-	1
CO 4	3	3	3	3	3	1	-	1	3	3	2	1	2	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

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Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
Audit Course Lab I: IT2755: EV design and 3D Modelling lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		**ISE**	--
Total Credits	Audit Course		**ESE**	--

Course Outcomes (CO): Students will be able to

CO1	Demonstrate various softwares needed for 3D modelling
CO2	Design 3D model of EV components
CO3	Design of EV Assembly and integration
CO4	Create Visualization renders of EV

Course Contents		CO
Experiment 1	Explore 3D modeling softwares	**CO1**
Experiment 2	Introduction Solidwork software	**CO1**
Experiment 3	3D modeling of EV components	**CO2**
Experiment 4	Drafting of EV components in solidworks	**CO2**
Experiment 5	Basic sketching techniques need for EV components	**CO2**
Experiment 6	EV layout design	**CO3**
Experiment 7	Structure design of EV in solidworks	**CO2**
Experiment 8	parts design of EV component	**CO2**
Experiment 9	Surface modeling of EV components	**CO2**
Experiment 10	Assembly sequencing of EV components.	**CO3**
Experiment 11	Vehicle integration of EV parts	**CO3**
Experiment 12	Visualization techniques for 3D data	**CO4**
List of Submission:		
Minimum No. of Experiments: 10		

Mapping of COs and POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO 1	2	2	1	2	3	1	2	1	2	1	1	2	-	1
CO 2	3	2	1	3	3	2	2	1	1	1	1	2	1	2
CO 3	2	3	3	1	3	1	3	2	2	2	2	3	-	1
CO 4	3	3	3	3	3	1	3	1	2	2	2	3	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
Audit Course Lab I: IT2765: Foundation of Electrical Vehicle Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Mathematics, Basic Programming skills				
Course Outcomes (CO): Students will be able to				
CO1	Perform experiments by interfacing sensor with microcontroller			
CO2	Illustrate the MATLAB programming for EV systems			
CO3	Develop and execute the Simulink model for different EV units			
CO4	Design the power supply EV unit on PCB.			

Course Contents		**CO**
Implementation of following concepts		
Experiment 1	Introduction to booting process of raspberry pi	**CO1**
Experiment 2	Perform experiment to control the speed of dc motor	**CO1**
Experiment 3	Interface IR/ PIR sensor with microcontroller	**CO1**
Experiment 4	Interface ultrasonic sensor with microcontroller and find distance	**CO1**
Experiment 5	Developing SIMULINK Models for Vehicle Units	**CO3**
Experiment 6	Programming EV Systems in MATLAB	**CO2**
Experiment 7	Application of Data Analysis Techniques in EV Electrical system	**CO2**
Experiment 8	Design a power supply unit and create a PCB design for same.	**CO4**
Experiment 9	Modelling and simulation of EV powertrain components in MATLAB	**CO3**
Experiment 10	Analysis of EV powertrain components in ANSYS	**CO3**
Experiment 11	Battery Management System modelling	**CO3**
Experiment 12	Modelling of Li-ion battery pack using MATLAB and ANSYS	**CO3**
List of Submission:		
Minimum No. of Experiments: 10		

Mapping of COs and POs

PO →	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	2	3	1	3	-	1	-	2	-	2	2	-	1
CO 2	1	2	3	2	3	-	1	-	2	-	2	2	1	2
CO 3	1	2	3	3	3	-	1	-	2	-	2	2	-	1
CO 4	1	2	3	3	3	-	1	-	2	-	2	2	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
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- Communication and presentation skills.
- Collaboration and peer review contributions.

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Government College of Engineering, Karad				
Final Year (Sem – VII) B. Tech. Information Technology				
Audit Course Lab I: IT2775: Fundamentals of Image Processing Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite :				
Course Outcomes (CO): Students will be able to				
CO1	Understand fundamentals of Image Processing Operations			
CO2	Apply and analyse rendering and visualisation of 2D and 3D images			
CO3	Analysis of various transforms & signals			
CO4	Design and Evaluation of Various Classification, detection and segmentation techniques			

Course Contents		**CO**
Implementation of following concepts		
Experiment 1	Sampling and Quantization operation using Image processing.	**CO1**
Experiment 2	Data Augmentation techniques for Computer vision	**CO1**
Experiment 3	Histogram Analysis for Various medical analysis	**CO1**
Experiment 4	Apply volume rendering and volume visualizing approaches on 2D/3D Images	**CO2**
Experiment 5	Visualize and explore 2D images and 3D volumes.	**CO2**
Experiment 6	Implement multi-resolution techniques on large-scale high-resolution images	**CO2**
Experiment 7	EEG brain signal analysis using wavelet transform	**CO3**
Experiment 8	ECG heart signal enhancement	**CO3**
Experiment 9	Brain Tumor detection and classification	**CO3**
Experiment 10	Fast Bilateral Filter – To eliminate the noise and smoothen the medical image	**CO4**
Experiment 11	CLAHE – To improve the contrast of the medical image	**CO4**
Experiment 12	Convolutional Neural Network (CNN) – To segment the tumor part	**CO4**
List of Submission:		
Minimum No. of Experiments:10		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	2	3	1	3	-	1	-	2	-	2	2	2	1
CO 2	1	2	3	2	3	-	1	-	2	-	2	2	1	2
CO 3	1	2	3	3	3	-	1	-	2	-	2	2	-	1
CO 4	1	2	3	3	3	-	1	-	2	-	2	2	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

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Government College of Engineering, Karad

Final Year (Sem – VIII) B. Tech. Information Technology

Audit Course Lab II: IT2811: Advanced AI Techniques and Applications Lab

Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-

Prerequisite : Mathematics, Basic Programming skills

Course Outcomes (CO): Students will be able to

CO1	Apply advanced techniques in NLP and Computer Vision to analyse and process diverse data types.
CO2	Develop AI solutions for solving complex decision-making problems in dynamic environment.
CO3	Implement industry-specific AI solutions ensuring ethical considerations and regulatory standards.
CO4	Utilize advanced ML techniques for time series forecasting and interpretability of AI models through explainable AI methods.

	Course Contents	**CO**
Implementation of following concepts		
Experiment 1	**Advanced NLP Experiment** • Build and evaluate a text classification model using advanced NLP techniques. • Utilize transformers and pre-trained models from Hugging Face.	**CO1**
Experiment 2	**Image Classification with CNNs** • Design and train a convolutional neural network (CNN) for image classification. • Experiment with data augmentation techniques to improve model performance.	**CO1**
Experiment 3	**Object Detection and Segmentation** • Implement object detection algorithms (e.g., YOLO, Faster R-CNN). • Perform image segmentation using models like U-Net or Mask R-CNN.	**CO1**
Experiment 4	**Reinforcement Learning Experiment** • Develop and train a reinforcement learning agent using OpenAI Gym. • Experiment with different RL algorithms like Q-learning or policy gradients.	**CO2**
Experiment 5	**Business Process Automation (BPA)** • Automate a business process using robotic process automation (RPA) tools. • Integrate machine learning models for intelligent decision-making in workflows.	**CO2**
Experiment 6	**Industry-Specific AI Solutions** • Develop a predictive maintenance model for manufacturing. • Implement a fraud detection system for financial transactions.	**CO3**
Experiment 7	**Cutting-Edge AI Research Experiment** • Conduct an experiment in a cutting-edge AI research area (e.g., GANs, BERT). • Analyze and document the research findings and their implications.	**CO3**
Experiment 8	**Scalable Machine Learning on Cloud Platforms** • Implement a distributed machine learning training pipeline on a cloud platform. • Utilize containerization and orchestration tools like Docker and Kubernetes.	**CO2**
Experiment 9	**Advanced Model Deployment and Monitoring** • Deploy a machine learning model in a production environment. • Set up monitoring tools to track model performance and detect anomalies.	**CO2**
Experiment 10	**Ethics and Fairness in AI Applications** • Evaluate an AI application for ethical considerations and fairness. • Propose and implement measures to address identified ethical concerns.	**CO3**
Experiment 11	**Time Series Forecasting with Deep Learning** • Develop a deep learning model for time series forecasting (e.g., using LSTM or GRU). • Compare the performance with traditional time series models.	**CO4**
Experiment 12	**Explainable AI (XAI)** • Implement explainability techniques (e.g., SHAP, LIME) for a complex model. • Analyze and interpret the model's predictions to ensure transparency and trustworthiness.	**CO4**

List of Submission:	
Minimum No. of Experiments: 10	

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	3	3	3	3	1	-	-	-	-	-	2	2	1
CO 2	2	2	2	2	3	2	-	-	2	2	2	2	1	2
CO 3	3	3	3	3	3	-	1	2	1	2	3	2	-	2
CO 4	2	3	2	3	3	2	2	2	2	2	1	2	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion.

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Audit Course Lab II: IT2821: Advance AI and IoT Integration Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Mathematics, Basic Programming skills				
Course Outcomes (CO): Students will be able to				
CO1	Understanding AIoT Foundations.			
CO2	Apply Hands-on Implementation Skills.			
CO3	Analysis of Sensor Technologies.			
CO4	Design and deploy Innovative Solution.			

	Course Contents	**CO**
Implementation of following concepts		
Experiment 1	Explore various AI applications across industries.	**CO1**
Experiment 2	Study the significance of IoT in the modern interconnected world.	**CO1**
Experiment 3	Understand the concept of AIoT and its potential impact.	**CO1**
Experiment 4	Explore the role of IoT gateways in bridging mobile devices and IoT networks.	**CO1**
Experiment 5	Perform hands-on exercises for setting up and configuring mobile-to-IoT connections.	**CO1**
Experiment 6	Conduct a comprehensive overview of sensor technologies used in IoT.	**CO3**
Experiment 7	Perform an in-depth exploration of various types of sensors and their academic underpinnings.	**CO3**
Experiment 8	Engage in practical demonstrations and experiments showcasing sensor functionality and applications in IoT systems.	**CO3**
Experiment 9	Develop a smart traffic signal system for colorblind individuals using AIoT technologies.	**CO2**
Experiment 10	Implement an AIoT-based plant health analysis system.	**CO2**
Experiment 11	Create a smart door access control system using AIoT technologies.	**CO2**
Experiment 12	Design and implement a weather forecasting system using AIoT technologies.	**CO2**
Experiment 13	Integrate real-time weather data from sensors with AI algorithms for accurate predictions.	**CO2**
Experiment 14	Engage in hands-on exercises for building, testing, and refining weather forecasting systems.	**CO2**
Experiment 15	Develop and deploy smart solutions utilizing AIoT principles.	**CO2**
Experiment 16	Study case studies and real-world examples of successful smart solutions in various domains.	**CO4**
Experiment 17	Participate in project-based learning to conceptualize, design, and implement AIoT solutions.	**CO4**
List of Submission:		
Minimum No. of Experiments: 14		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	3	3	2	2	2	-	-	-	-	2	-	2	2	1
CO 2	3	2	2	2	2	1	-	-	3	2	1	2	1	2
CO 3	2	2	3	2	2	-	1	1	3	2	-	2	1	1
CO 4	2	2	2	3	2	1	1	1	2	2	2	2	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation

for the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Audit Course Lab II: IT2831:Advanced ARVR Techniques and Applications Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-

Prerequisite : Mathematics, Basic Programming skills

Course Outcomes (CO): Students will be able to

CO1	Analyse the Evolution and Applications of Virtual Production Technique
CO2	Apply Proficiency in Unity Game Engine for Virtual Production
CO3	Evaluate Lighting Techniques and Design Principles for Virtual Environment
CO4	Demonstrate Practical Implementation Skills in Virtual Production Projects

Course Contents		CO
Implementation of following concepts		
Experiment 1	**Historical Overview and Evolution of Virtual Production** • Research and present a historical overview of virtual production techniques. • Analyze the evolution of virtual production in film, television, and other media industries. • Discuss the applications and benefits of virtual production in modern media production.	**CO1**
Experiment 2	**Green Screen Studio Setup and Operation** • Explore green screen studios and their setup. • Learn lighting techniques for green screen setups. • Operate a green screen studio to capture footage for virtual production.	**CO3**
Experiment 3	**Introduction to Unity Game Engine** • Overview of Unity Game Engine and its features. • Import assets into Unity for virtual production purposes. • Set up virtual environments within Unity for production purposes.	**CO2**
Experiment 4	**Real-time Rendering Techniques** • Understand real-time rendering and its importance in virtual production. • Explore techniques for achieving realistic visuals in real-time environments. • Utilize Unity's rendering capabilities for high-quality visual output.	**CO4**
Experiment 5	**Virtual Set Design Principles** • Study virtual set design principles and layout. • Design immersive virtual environments for different production needs. • Incorporate props, set dressing, and lighting to enhance realism and aesthetics.	**CO3**
Experiment 6	**Overview of Virtual Camera Systems** • Learn about different types of virtual cameras and their functionalities. • Understand the importance of virtual cameras in scene composition and framing. • Explore virtual camera operation within Unity for virtual production.	**CO3**
Experiment 7	**Lighting Techniques for Virtual Production** • Study different lighting setups and their effects on virtual production. • Experiment with various lighting techniques in a virtual environment. • Apply appropriate lighting to enhance the realism and aesthetics of virtual scenes.	**CO1**
Experiment 8	**Asset Importing and Management in Unity** • Learn best practices for asset importation into Unity. • Organize assets within Unity's project structure. • Understand asset optimization techniques for efficient usage in virtual production.	**CO2**
Experiment 9	**Creating Virtual Environments in Unity** • Utilize Unity's terrain and environment tools to build virtual landscapes. • Populate virtual environments with assets and objects.	**CO2**

	• Apply textures, materials, and effects to enhance the realism of virtual environments.	
Experiment 10	**Practical Application of Virtual Production Techniques** • Plan and execute a virtual production project using green screen studios and Unity. • Incorporate elements of virtual set design, lighting, and camera composition. • Produce a final virtual production project demonstrating mastery of virtual production techniques.	**CO4**
List of Submission:		
Minimum No. of Experiments:10		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	2	2	2	2	2	1	-	-	2	1	1	1	-	1
CO 2	3	2	1	2	2	1	-	-	2	1	1	1	1	2
CO 3	2	2	2	2	2	1	-	-	2	1	1	2	-	1
CO 4	2	2	2	3	2	1	-	-	2	1	2	2	2	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

- Technical skills and proficiency.
- Creativity and problem-solving abilities.
- Communication and presentation skills.
- Collaboration and peer review contributions.

This approach ensures that students gain practical experience and valuable feedback, enhancing their learning without the pressure of formal exams.

Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Audit Course Lab II : IT2841: ABAP programming in Eclipse LAB				
Laboratory Scheme:			**Examination Scheme:**	
Practical	4 Hrs/week		**ISE**	-
Total Credits	Audit Course		**ESE**	-

Prerequisite : Java Programming

Course Outcomes (CO): Students will be able to

CO1	Explain the role and functionality of Eclipse in SAP development, including installation and navigation
CO2	Develop ABAP projects by creating, editing, and debugging repository objects using Eclipse
CO3	Assess ABAP code performance and quality using static testing tools, ABAP Unit Tests, and the ABAP Profiler within Eclipse
CO4	Design and implement advanced SAP applications, including Web Dynpro components and ABAP Dictionary Objects, utilizing Eclipse's development environment

Course Contents		CO
Experiment 1	Introduction to Eclipse, Understanding How SAP Uses Eclipse, Installing Eclipse	**CO 1**
Experiment 2	Defining an ABAP Project, Organizing Work with the Eclipse Workbench, The ABAP Development Cycle in Eclipse.	**CO 2**
Experiment 3	Creating Repository Objects, Editing a Repository Object, Debugging ABAP in Eclipse.	**CO 2**
Experiment 4	Function Groups and Function Modules.	**CO 2**
Experiment 5	ABAP Dictionary Objects in Eclipse, Working With Data Element, Working With Structures, Modelling Views with ABAP Core Data Services	**CO 4**
Experiment 6	ABAP Objects and Eclipse, Creating a Global Class, Refactoring	**CO 4**
Experiment 7	Web Dynpro Development, Creating Web Dynpro Components	**CO 4**
Experiment 8	Navigating in Eclipse, Searching in Eclipse	**CO 1**
Experiment 9	Managing Version Control, Identifying Sources of Help and Information	**CO 1**
Experiment 10	Testing and Analysis, Performing Static Testing with the Syntax Check, Performing Static Testing with the ABAP Test Cockpit.	**CO 3**
Experiment 11	Performing ABAP Unit Tests, Analysing Performance with the ABAP Profiler.	**CO 3**
Experiment 12	Eclipse: An Extensible Toolkit, Lesson: Extending Eclipse Functionality with Other SAP Tools.	**CO 1**

List of Submission:

Minimum No. of Experiments : 10

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	3	2	-	-	2	-	-	-	2	2	-	1	3	1
CO2	3	1	3	2	2	-	-	-	2	2	-	1	2	-
CO3	3	3	3	3	2	-	-	1	3	3	-	1	1	-
CO4	3	2	3	3	3	1	1	1	3	3	1	1	1	2

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Audit Course Lab II:IT2851: EV Design Analysis and simulation Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		**ISE**	--
Total Credits	Audit Course		**ESE**	--
Prerequisite : Basic Electrical Engineering				
Course Outcomes (CO): Students will be able to				
CO1	Demonstrate various softwares needed for analysis and simulation			
CO2	Design 3D mesh of EV components			
CO3	Analysis 3D data with different simulation softwares			
CO4	Thermal analysis of battery components			

Course Contents		CO
Experiment 1	Introduction to ANSYS	**CO1**
Experiment 2	Mesh model development using Hyper mesh- 2D	**CO1**
Experiment 3	Mesh model development using Hyper mesh- 3D	**CO2**
Experiment 4	Modelling and simulation of EV powertrain components in MATLAB	**CO2**
Experiment 5	3D modelling of EV powertrain components in ANSYS	**CO3**
Experiment 6	Simulation of EV powertrain components in ANSYS	**CO2**
Experiment 7	EV design and structural analysis:	**CO2**
Experiment 8	FEA analysis for EV engineering with Abaqus	**CO2**
Experiment 9	Analyze EV dynamic and simulation:	**CO1**
Experiment 10	CFD analysis for EV	**CO3**
Experiment 11	Thermal Analysis of Liquid-Cooled Radiator in ANSYS	**CO3**
Experiment 12	CFD Study of External Cooling Mechanism	**CO4**
List of Submission:		
Minimum No. of Experiments: 10		

Mapping of COs and POs:

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	2	1	2	2	1	2	1	2	1	1	2	2	2
CO2	3	2	1	3	2	2	2	1	1	1	1	2	-	1
CO3	2	3	3	3	3	1	3	2	2	2	2	3	-	-
CO4	3	3	3	3	3	1	3	1	2	2	2	3	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for
the course completion

*Note: Provide detailed feedback on each experiment and overall performance, focusing on:

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- Communication and presentation skills.
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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Audit Course Lab II: IT2861:: Advanced Electrical Vehicle Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-

Prerequisite : Mathematics, Basic Programming skills

Course Outcomes (CO): Students will be able to

CO1	Understand basics of Various convertors & VSI grid integration
CO2	Analyze Battery controller, cell balancing and SoC control
CO3	Evaluate speed control operations using Modelling & Simulation
CO4	Design and Simulate Electric Vehicle and Battery modding

Course Contents		**CO**
Implementation of following concepts		
Experiment 1	Simulation of SPWM technique for electric vehicle converter using MATLAB/Simulation.	**CO1**
Experiment 2	Simulation of three phase VSI for grid integration in EV using MATLAB/Simulation..	**CO1**
Experiment 3	Design of bidirectional battery circuit using Buck/Boost converter using MATLAB/simulation.	**CO1**
Experiment 4	Battery controller based on SoC for charging and discharging of battery in EV using MATLAB Simulation.	**CO2**
Experiment 5	Modelling and Simulation of BMS for passive cell balancing in EV using MATLAB Simulation.	**CO2**
Experiment 6	SoC control of Lithium Ion battery in MATLAB/ Simulink for EV	**CO2**
Experiment 7	Simulation of bidirectional operation in Electric Vehicle Charger using single phase model.	**Co3**
Experiment 8	Modelling and simulation to calculate electric vehicle speed from motor torque.	**CO3**
Experiment 9	Speed control of electric vehicle using BLDC or PMSM in MATLAB/Simulink.	**Co4**
Experiment 10	Simulation of electric vehicle using MATLAB/Simulink.	**CO4**
List of Submission:		
Minimum No. of Experiments :10		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	2	3	1	3	-	1	-	2	-	2	2	2	2
CO 2	1	2	3	2	3	-	1	-	2	-	2	2	-	1
CO 3	1	2	3	3	3	-	1	-	2	-	2	2	-	-
CO 4	1	2	3	3	3	-	1	-	2	-	2	2	1	2

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
Audit Course Lab II: IT2871: Advanced Image Processing Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	04 Hrs/week		ISE	-
Total Credits	Audit Course		ESE	-
Prerequisite : Image Processing				
Course Outcomes (CO): Students will be able to				
CO1	Apply Support Vector Machine for image classification.			
CO2	Articulate image enhancement and restoration techniques			
CO3	Examining image compression Techniques			
CO4	Implementing image segmentation Techniques and Object recognition.			

Course Contents		CO
Implementation of following concepts		
Experiment 1	Support Vector Machine (SVM) – To classify the cancer tumor	**CO1**
Experiment 2	Automated Segmentation and analysis of skeletal structure images and scans	**CO4**
Experiment 3	Classifying and locating morphological patterns in an automatic way (on CT and radiographs)	**CO1**
Experiment 4	Brain tumor and also tissue segmentation	**CO4**
Experiment 5	Age and also gender classification using Brain MRI	**CO2**
Experiment 6	Computer aided diagnosis using Mammography	**CO2**
Experiment 7	Lung cancer detection using medical image processing	**CO2**
Experiment 8	Kidney stone detection using medical image processing	**CO3**
Experiment 9	Study of color image compressing using image processing	**CO3**
Experiment 10	Skin cancer detection	**CO4**
List of Submission:		
Minimum No. of Experiments:10		

Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO 1	1	2	3	1	3	-	1	-	2	-	2	2	1	-
CO 2	1	2	3	2	3	-	1	-	2	-	2	2	-	1
CO 3	1	2	3	3	3	-	1	-	2	-	2	2	-	-
CO 4	1	2	3	3	3	-	1	-	2	-	2	2	2	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Guideline: Course coordinator will decide the suitable assessment method for internal evaluation for the course completion

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