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Government College of Engineering, Karad

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

IT3801: Cloud Computing

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	MSE	20
Tutorials	00 Hrs/week	ISE	20
Total Credits	03	ESE	60
		Duration of ESE	02 Hrs 30 Min

Prerequisite : Computer Networks, Basic programming

Course Outcomes (CO): Students will be able to

CO1	Understand fundamental concepts, architecture of cloud computing and virtualization techniques.
CO2	Differentiate cloud services and deployment models and select appropriate solutions.
CO3	Identify and analyse cloud security challenges and risks.
CO4	Acquire and apply the knowledge of cloud programming platforms, DevOps, and emerging trends in cloud computing.

Course Contents

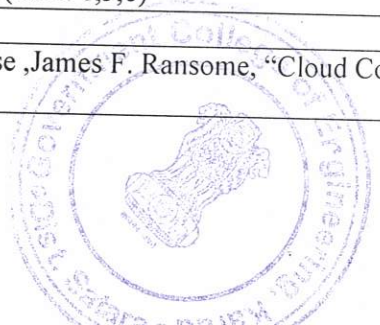
Unit	Course Contents	CO	Hours
Unit 1	Introduction to Cloud Computing: Cloud computing at a glance, The vision of cloud computing, Defining a cloud, The cloud computing reference model, Characteristics and benefits, Challenges ahead, Historical Developments, Distributed systems, Virtualization, Web 2.0, Service-oriented computing, Utility- oriented computing, Building cloud computing environments.	CO1	(06)
Unit 2	Virtualization: Virtualization reference model, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples:VMWare: Full Virtualization, Xen: Para Virtualization, Microsoft Hyper - V.	CO1 CO2	(07)
Unit 3	Cloud Computing Architecture: Cloud reference model and Architecture, Infrastructure- and hardware-as-a-service, Platform as a service, Software as a service, Types of clouds: Public, Private, Hybrid and Community cloud, Economics of the cloud, Open challenges in cloud computing.	CO2	(06)
Unit 4	Data Security in the Cloud: Aspects of cloud data security, Cloud security challenges and risks, Infrastructure Security, Data Security and Storage, Identity and Access Management, Security management in the cloud (Self Study: Network security in cloud).	CO3	(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, Cloud Storage Programming, (Self Study: Aneka Cloud Platform).	CO4	(07)
Unit 6	Cloud Application Development and Emerging Trends: Cloud based application architecture, Containers & Micro services: Docker, Kubernetes, DevOps practices in the cloud, Emerging trends in cloud technology, Server less Computing, Edge Computing, (Self Study: Real-time applications).	CO3 CO4	(08)

Text Books

1. Rajkumar Buyya, "Cloud computing principles and paradigms", Wiley, 1st edition, 2011. (Unit: 1,2,3,5)
2. Tim Mather, Subra Kumaraswamy, and Shahed Latif, "Cloud Security and Privacy – An Enterprise Perspective on Risks and Compliance", O'Reilly Media, 2009 (Unit: 4)
3. Kailash Jayaswal, "Cloud computing", Black Book, Dreamtech Press, 1st edition.(Unit: 2,5,6)
4. Thomas Erl_Zaigham Mahmood_Recardo Puttini, "Cloud Computing Concepts, Technology & Architecture", Prentice Hall, 2013. (Unit: 1,3,6)

Reference Books

1. John W. Rittinghouse ,James F. Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press; 1st edition



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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/106105167 Cloud Computing, Prof. Soumya Kanti Ghosh, IIT Kharagpur.
2.	https://nptel.ac.in/courses/106104182 Cloud Computing and Distributed Systems, Dr. Rajiv Mishra IIT Patna.
3.	https://aws.amazon.com/devops/what-is-devops/ DevOps on AWS

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	PSO 1	PSO 2
CO 1	2	1	1	-	-	-	-	-	-	-	-	1	2
CO 2	3	3	3	1	2	-	-	-	-	-	-	1	2
CO 3	1	3	2	-	-	1	-	-	-	-	-	1	2
CO 4	1	1	2	1	3	-	-	-	-	-	1	1	2

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	5	5	10
Apply	5	5	10
Analyse	-	5	20
Evaluate	5	-	10
Create	-	-	-
TOTAL	20	20	60



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Government College of Engineering, Karad
Final Year (Sem-VIII) B. Tech Information Technology
IT3802: Cryptography & Cyber Security

Teaching Scheme

Lectures	03 Hrs/week
Tutorials	00 Hrs/week
Total Credits	03

Examination Scheme

MSE	20
ISE	20
ESE	60
Duration of ESE	02 Hrs 30 Min

Prerequisite: Basic Programming Skills, Computer Networks Fundamentals.

Course Outcomes (CO): Students will be able to

CO1	Explain and analyze the fundamentals of cybersecurity, information security, network security.
CO2	Apply mathematical foundations and implement symmetric key cryptographic techniques.
CO3	Design and evaluate asymmetric cryptographic mechanisms and digital signature systems.
CO4	Analyze and apply network and internet security protocols and emerging cryptographic trends and vulnerabilities.

Course Contents

	CO	Hours
Unit 1 Introduction & Mathematical foundation: Cybersecurity, Information Security, and Network security. OSI security architecture, Security services, Security mechanisms, Security attacks, Classical encryption techniques and their cryptanalysis. Prime Number, Modular Arithmetic, Fermat's and Euler's Theorem, The Euclidean Algorithms (Self Study: Extended Euclidean Algorithms)	CO1, CO2	(07)
Unit 2 Symmetric Key Ciphers: Feistel Networks, Modern Block Ciphers, Modes of Operation, Data Encryption standard (DES), Cryptanalysis of Symmetric Key Ciphers: Linear Cryptanalysis, Differential Cryptanalysis	CO2	(05)
Unit 3 Asymmetric Cryptography: RSA, AES, Key Distribution and Management: Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, Message Digest algorithms: MD5, Secure Hash algorithm (SHA), Message Authentication Codes.	CO3	(07)
Unit 4 Key management & Authentication: Symmetric key distribution using asymmetric and asymmetric encryption, Distribution of public keys, Digital Signatures, Authentication Protocols: Kerberos, X.509 Digital Certificate Standard, Pretty Good Privacy, Secure Socket Layer (Self Study: Secure Electronic Transaction).	CO3	(07)
Unit 5 Network & Internet Security: Web security considerations, Transport Layer security, HTTPS, Secure Shell (SSH), Mail architecture, S/MIME, Firewalls, Intrusion Detection System, Malicious Software, DDOS attack. (Self Study: Firewall design principles)	CO4	(08)
Unit 6 Emerging Trends & Security Vulnerabilities in Cryptography: Random number generation and entropy sources, Side-channel attacks, Timing, power analysis, fault injection, Post-quantum cryptography (overview of NIST PQC standards), Key management & hardware security modules (HSM), Real-world crypto failures and lessons, Heartbleed, WPA2 KRACK attack, Weak RNG failures.	CO4	(08)

Text Books

1. "Cryptography and Network Security, Principles and Practices", William Stallings, Pearson Education, Eighth Edition, and ISBN: 0-13-60970-9.
2. "Serious Cryptography A Practical Introduction to Modern Encryption", Jean-Philippe Aumasson Foreword by Matthew D. Green. (Unit 6)
3. "Quantum Computing, Cyber Security and Cryptography: Issues, Technologies, Algorithms, Programming and Strategies" (Springer 2025). (Unit : 6).

Reference Books

1. B. A. Forouzan, "Cryptography & Network Security", McGrawHill, 5th edition.
2. Cryptography and Information Security", V. K. Pachghare, 3rd edition, PHI Learning, ISBN: 978-93-89-347-10-4. □ "Network Security: Private Communication in a Public World", Charlie Kaufman, Radia Perlman, and Mike Speciner, Prentice Hall, ISBN 0-13-046019-2.
3. Atul Kahate, "Cryptography and network security" TMGH, 2nd edition.



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Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc25_cs16/preview “Cryptography and Network Security” By Prof. Sourav Mukhopadhyay IIT Kharagpur
2.	https://onlinecourses.nptel.ac.in/noc22_cs03/preview Foundations of Cryptography By Prof. Ashish Choudhury, IIIT Bangalore
3.	https://onlinecourses.swayam2.ac.in/ntr26_ed89/preview Information Security By Dr. J. Kokila, IIIT, Tiruchirappalli

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	PSO 1	PSO 2
CO 1	3	2	-	-	2	1	1	-	1	-	1	3	2
CO 2	3	2	-	-	2	1	1	-	1	-	1	3	2
CO 3	3	3	3	2	3	1	2	-	1	-	1	3	3
CO 4	3	3	2	3	3	2	2	1	1	-	2	3	3

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

Assessment Pattern (with revised Bloom’s Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60



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Government College of Engineering, Karad
Final Year (Sem – VIII) B. Tech. Information Technology
RM3803: Research Methodology

Teaching Scheme

Lectures	03 Hrs/week
Tutorials	00 Hrs/week
Total Credits	03

Examination Scheme

MSE	20
ISE	20
ESE	60
Duration of ESE	02 Hrs 30 Min

Prerequisite: Basic understanding of core concepts, mathematics, statistics, critical/scientific thinking skills.

Course Outcomes (CO): Students will be able to

- CO1** understand fundamentals of research, research process, methods and methodology.
- CO2** apply research design and problem formulation techniques to solve research problem.
- CO3** analyse data using statistical tools and methods. (Use of latest data processing tools)
- CO4** prepare reports, research papers/ following research ethics and publish research in various forms.

Course Contents

		CO	Hours
Unit 1	Introduction: Meaning and objective of research, motivations in research, characteristics components of research work, criteria of good research, Research process, type of research, fundamental, pure or Theoretical research, Applied Research, Descriptive Research, Evaluation Research, Experimental research, Survey Research, Qualitative Research, Quantitative Research, interdisciplinary Research.	CO1	(08)
Unit 2	Literature review- purpose, sources, and importance, research gap, Objectives, problem statement. Research Design: Research design, definition, essentials of research design, Research problem steps in research design, good research design, important concepts.	CO2	(08)
Unit 3	Data collection and Analysis: Sources of data collection, Library sources, E- sources, primary data, secondary data, data collection methods, interviews, questionnaire schedule. Measurement, sampling, scaling - sample design, types of sample design, different scales, sampling error, Normal distribution.	CO3	(06)
Unit 4	Data Analysis and tools: Data processing, Classification, Statistical series, Qualitative vs Quantitative data analyses, Interpretation of data, Hypothesis testing, Measures of central tendency and dispersion, mean, media, mode, range, variance, standard deviation.	CO3	(06)
Unit 5	Research Report Writing: Research report, Different types, contents of report, executive summary, chapterization – contents of chapter, report writing, different report formats, bibliography/references, Research and publication ethics: significance of research ethics Citation, plagiarism, publishing process journal publication, journal metrics. Use of AI tools in writing research articles.	CO4	(07)
Unit 6	IPR: Meaning, nature and scope of Intellectual property (IP), Importance of IPR in engineering, patents, copyrights, trademarks.	CO4	(05)

List of Submission: Assignment questions on every unit shall be given to students.

Text Books

- 1.
2. Panneerselvam, R. Research Methodology, 2nd ed., PHI Learning Pvt. Ltd., New Delhi, 2013. (Units 1, 2 and 3)
3. Kumar, R. Research Methodology: A Step-by-Step Guide for Beginners, 4th ed., Pearson Education India, New Delhi, 2019. (Units 1 and 2)
4. Malhotra, N. K. Research Methodology: An Applied Orientation, 7th ed., Pearson Education India, New Delhi, 2020. (Units 3 and 4)
5. Pavithra, R. H. Research Methodology and Techniques of Data Analysis, Current Publications, New Delhi, 2023. (Unit 3)



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6	Bhandari, M. K. Intellectual Property Rights, 4th ed., Central Law Publications, Allahabad, 2024. (Unit 6)
Reference Books	
1.	B. L. Garg, R. Kavdia, S. Agrawal, and U. K. Agarwal, Research Methodology. Jaipur, India: RBSA Publishers, 2019. (Unit 1 and 2)
2.	D. Deb, R. Dey, and V. E. Balas, Engineering Research Methodology. Singapore: Springer, 2019. (Unit 2)
3.	J. P. Lal, S. Bishla, and D. Singh, Research Methodology and Data Analysis. New Delhi, India: Publishing House, 2023. (Unit 3 and 4)
4	D. Chawla and N. Sondhi, Research Methodology. New Delhi, India: Vikas Publishing House, 2011. (Unit 1, 3 and 4)
5	P. K. Praveena and R. P. Thevannoor, Research Report Writing. New Delhi, India: Bharti Publications, Sept. 24, 2021. (Unit 5)
6	M. Vidhya Sree, M. K. Singh, P. Bisht, and Z. Beevi, Research Methodology and IPR Strategies. New Delhi, India: Technical Publications, 2022. (Unit 6)
Useful Links	
1.	https://youtu.be/1vf8ZvADxfY "Research methodology" by Dr Devika Bhatnagar
2.	https://www.youtube.com/watch?v=IfWl1zzU "Research Methodology" by Prof. Edamana Prasad, Prof. Prathap Haridoss, IIT Madras.
3.	https://www.youtube.com/watch?v=E2gGF1rburw "Research Methodology in Natural Sciences" by Prof. Soumitro Banerjee, Department of Physical Sciences, IISER Kolkata.

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	PSO 1	PSO 2
CO 1	3	2	1	1	1	2	3	1	2	1	1	+1	2
CO 2	2	3	2	3	2	2	2	1	1	1	1	1	2
CO 3	2	3	2	3	3	2	3	2	2	2	2	1	1
CO 4	3	2	3	2	3	2	3	3	2	3	2	2	2

Guideline for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	20
Understand	5	5	10
Apply	5	5	10
Analyze	5	5	20
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60



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Government College of Engineering, Karad

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

IT3814: Program Elective-III Human Computer Interaction

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	MSE	20
Tutorials	-	ISE	20
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs. 30 Min

Prerequisite : Basic Programming Knowledge, Software Engineering & Operating System.

Course Outcomes (CO): Students will be able to

- CO1** understand importance of HCI study and principles of user-centred design (UCD) approach.
- CO2** develop understanding human factors in HCI design and models, paradigms and context of interactions.
- CO3** design effective user-interfaces following a structured and organized UCD process.
- CO4** evaluate usability of a user-interface design.

Course Contents

		CO	Hours
Unit 1	Introduction: HCI, Disciplines involved in HCI, Importance of HCI The psychology of everyday things, Principles of HCI, User-centred Design.	CO1	(04)
Unit 2	Understanding the Human: Input-output channels, Human memory, Thinking: Reasoning and Problem Solving, Human emotions, Individual differences, Psychology and Design.	CO2	(04)
Unit 3	Understanding the Interaction: Models of interaction, Ergonomics, Interaction styles, WIMP Interface, Interactivity, Context of interaction, User experience, Paradigms of Interactions.	CO2	(05)
Unit 4	HCI – Design Process: Interaction design, The software design process, User focus, Scenarios, Navigation Design, Screen Design, Prototyping techniques, Wire-Framing, Understanding the UI Layer and Its Execution Framework, Model-View-Controller (MVC) Framework.	CO3	(05)
Unit 5	Design Rules, Guidelines & Evaluation: Principles that support usability, Design standards, Design Guidelines, Golden rules and heuristics, Using toolkits, User interface management system (UIMS), Goals of evaluation, Evaluation Criteria, Evaluation through expert analysis, Evaluation through User participation, Choosing an Evaluation Method.	CO4	(05)
Unit 6	HCI Models and Theories: Goal and task hierarchy model, Linguistic model, Physical and device models, Cognitive architectures, Hierarchical task analysis (HTA), Uses of task analysis, Diagrammatic dialog design notations, (Self Study: Finding things on web Future of HCI)	CO2, CO3	(05)

Text Books

1. Gerard Jounghyun Kim (20 March 2015), Human-Computer Interaction: Fundamentals and Practice. CRC Press. ISBN 978-1-4822-3390-2. (Unit-1,2,3,4,5,6)
2. Alan Dix (2008), Human Computer Interaction. Pearson Education. ISBN 978-81-317-1703-5. (Unit-1,2,3,4,5,6)

Reference Books

1. Ben Shneiderman; Catherine Plaisant; Maxine Cohen; Steven Jacobs (29 August 2013), Designing the User Interface: Strategies for Effective Human-Computer Interaction, Pearson Education Limited. ISBN 978-1-292 03701-1.
2. Donald A. Norman (2013), The Design of Everyday Things Basic Books, ISBN 978-0-465-072996.
3. Jeff Johnson (17 December 2013), Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Guidelines, Elsevier. ISBN 978-0-12-411556-9.
4. Alan Cooper; Robert Reimann; David Cronin; Christopher Noessel (13 August 2014), About Face: The Essentials of Interaction Design, Wiley. ISBN 978-1-118-76658-3.

Useful Links



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1.	https://onlinecourses.nptel.ac.in/noc25_cs38/preview : Human Computer Interaction (In English) By Prof. Rajiv Ratn Shah IIT Delhi.
2.	https://onlinecourses.nptel.ac.in/noc25_cs72/preview : User-centric Computing For Human Computer Interaction By Prof. Samit Bhattacharya IIT Guwahati
3.	https://nptel.ac.in/courses/106103237? : NOC: Design & Implementation of Human-Computer Interfaces, IIT Guwahati, Prof. Samit Bhattacharya.
4.	https://nptel.ac.in/courses/106106177? : NOC: Human Computer Interactions, IIT Hyderabad Prof. K. Ponnurangam.

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	PSO 1	PSO 2
CO 1	2	1	1	-	-	2	2	-	1	-	2	1	2
CO 2	2	3	1	1	1	1	2	-	1	-	1	1	-
CO 3	2	1	3	1	3	2	1	1	1	1	2	2	3
CO 4	2	3	2	3	1	1	2	-	1	-	1	1	2

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyze	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60



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Government College of Engineering, Karad

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

IT3824: Program Elective-III Big Data Analytics

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	MSE	20
Tutorials	00 Hrs/week	ISE	20
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs 30 Min

Prerequisite : Database Management Systems

Course Outcomes (CO): Students will be able to

CO1	Explain basic concepts and terminologies used in big data.
CO2	Illustrate data analytics life cycle and business challenges.
CO3	Discuss Hadoop technology used in the distributed environment.
CO4	Select appropriate big data tools for various case studies in distributed environment.

Course Contents

	Course Contents	CO	Hours
Unit 1	Introduction: Classification of Digital Data, Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges with Big Data, Overview of Big Data, Other Characteristics of Data, Importance of Big Data, Traditional Business Intelligence (BI) versus Big Data, A Typical Data Warehouse Environment, A Typical Hadoop Environment.	CO1	(05)
Unit 2	Big Data Analytics: Big data analytics, Drivers of Big data analytics, Big Data Stack, Typical analytical architecture, Virtualization and Big Data, Virtualization Approaches, Business Intelligence Vs Data science, Applications of Big data analytics. (Self-Study: Crowd sourcing analytics)	CO2	(05)
Unit 3	Hadoop Technology: Introduction, Distributed Computing Challenges, History of Hadoop, Hadoop Overview, Use Case of Hadoop, Hadoop Distributors, HDFS (Hadoop Distributed File System), Processing Data with Hadoop, Managing Resources and Applications with Hadoop YARN.	CO2	(05)
Unit 4	Big Data Tools: NoSQL - Introduction, advantages, Use of NoSQL in industry, HadoopVs SQL. MongoDB – Introduction, Data Types in MongoDB, MongoDB Query Language Cassandra - Features of Cassandra, CQL Data Types, CRUD Operations, Using a Counter. (Self Study: Alter Commands, Import and Export, Collections)	CO3	(05)
Unit 5	MAPREDUCE Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression	CO4	(04)
Unit 6	Data warehousing and analysis tools: Hive: Introduction, architecture of hive, data types, file format, HQL. Pig – Introduction – ETL Processing, Data Types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators. (Self Study: Amazon RedShift)	CO4	(04)

Text Books

- Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley India Pvt. Ltd., 2nd Edition, 2019 (Unit:1,2,3,4,5,6)

Reference Books

- Tom White, "Hadoop: The Definitive Guide", O'Reilly Publications, 4th Edition, 2015, ISBN-10: 9352130677, ISBN-13: 978-9352130672
- DT Editorial Services, "Big Data Black Book: Covers Hadoop 2, MapReduce, Hive, YARN, Pig, R and Data Visualization", 1st Edition, New Delhi: Dreamtech Press, 2016
- David Dietrich, Barry Heller, "Beibei Yang, Data Science and Big Data Analytics", EMC Education Services, Wiley, 2015, ISBN: 978-1118876138.

Useful Links

- <https://nptel.ac.in/courses/106104189> Big Data Computing Prof. R. Misra IIT, Patna
- https://onlinecourses.nptel.ac.in/noc20_cs92/preview Statistical Foundation for Big Data Analysis Prof. Arindam Banerjee, IIT Kharagpur
- <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-cs33/> Big Data Computing Prof. R. Misra IIT, Patna



Signature

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	PSO 1	PSO 2
CO 1	3	-	-	-	-	-	-	-	-	-	-	1	2
CO 2	2	3	2	-	-	-	-	-	-	-	-	1	2
CO 3	-	2	-	3	3	-	-	-	-	-	-	1	2
CO 4	-	-	3	2	2	-	-	-	-	-	-	1	2

1: Slight(Low)

2: Moderate(Medium)

3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60



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Government College of Engineering, Karad

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

IT3834 Program Elective III: Natural Language Processing

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	MSE	20
Tutorials	00 Hrs/week	ISE	20
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs 30 Min

Prerequisite : Machine Learning

Course Outcomes (CO): Students will be able to

CO1	Understand the fundamental concepts of NLP, challenges and issues in NLP.		
CO2	Illustrate various language modelling techniques and develop real world NLP applications.		
CO3	Integrate the NLP techniques for the information retrieval task.		
CO4	Demonstrate the use of NLP tools and techniques for text-based processing of natural languages.		
Course Contents		CO	Hours
Unit 1	Introduction and Preprocessing: Introduction to NLP, Language Modeling (N-grams), Text Preprocessing (Tokenization, Stemming, Lemmatization, POS Tagging, Stop words).	CO1	(04)
Unit 2	Morphological Analysis and Parsing: Morphological analysis, Structure of English Language, Context-Free Grammar (CFG), Parsing Algorithms (Top-down, Bottom-up), Probabilistic Parsing.	CO2	(06)
Unit 3	Semantics and Information Retrieval: Lexical Semantics, Word Sense Disambiguation, Information Retrieval, Vector Space Model, Evaluation Metrics.	CO2	(05)
Unit 4	Machine Learning in NLP: Text Classification, Sentiment Analysis, Hidden Markov Models (HMM), Neural Networks for NLP	CO3	(05)
Unit 5	NLP Tools and Techniques: Prominent NLP Libraries: Natural Language Tool Kit (NLTK), spaCy, TextBlob, Gensim. Word Sense Disambiguation: Lesk Algorithm Walker's algorithm, WordNets for Word Sense Disambiguation	CO4	(04)
Unit 6	Applications of NLP: Named Entity Recognition (NER), Machine Translation, Chatbots, and Transformers (BERT/GPT concepts).	CO4	(04)

Text Books

1. Manning Christopher D., and Hinrich Schütze, "Introduction to Natural Language Processing", Cambridge, MA: MIT Press, 2019 (Unit: 1, 2, 3)
2. Jurafsky, David, and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing", Computational Linguistics and Speech Recognition, 2025 (Unit 2, 4)
3. Jacob Eisenstein, "An Introduction to Information Retrieval", Cambridge University Press (Unit: 3)
4. Steven Bird, Ewan Klein, Edward Loper, "Natural Language Processing with Python – Analyzing Text with the Natural Language Toolkit", O'Reilly Publication, 2011 (Unit: 5, 6)

Reference Books

1. Natural Language Processing And Information Retrieval Principles And Applications by Muskan Garg, Sandeep Kumar, and Abdul Khader Jilani Saudagar. July 2025.
2. Information Retrieval: Advanced Topics and Techniques (ACM Books) by Omar Alonso. December 2024.
3. Natural Language Processing: A Textbook with Python Implementation (2nd Edition) by Raymond S. T. Lee 2025
4. Python Natural Language Processing Cookbook by Zhenya Antic September 2024
5. Natural Language Processing with Transformers and Python: Practical AI Solutions March 2025.
6. Natural Language Processing with Python: Build Real-World NLP Applications (published August 2025).

Useful Links

1. <https://nptel.ac.in/courses/106106211> Natural Language Processing Prof. Ramaseshan R Chennai
2. <https://nptel.ac.in/courses/106105158> Natural Language Processing, IIT Kharagpur Prof. Pawan Goyal
3. <https://nptel.ac.in/courses/106101007> Natural Language Processing Prof. Pushpak Bhattacharyya IIT Bombay



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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	PSO 1	PSO 2
CO 1	3	2	-	-	1	-	-	-	-	-	2	2	1
CO 2	3	2	3	1	3	-	-	1	1	-	2	3	2
CO 3	2	3	2	2	3	-	-	-	1	-	1	3	3
CO 4	1	2	2	3	3	-	-	2	2	1	2	3	2

1: Slight(Low)

2: Moderate(Medium)

3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60



Rajkulkarni

Government College of Engineering, Karad

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

IT3844: Program Elective III: Information Retrieval

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	MSE	20
Tutorials	00 Hrs/week	ISE	20
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs 30 Min

Prerequisite : DBMS, Data warehousing and Mining

Course Outcomes (CO): Students will be able to

CO1	Learn basic concept of information retrieval process.
CO2	Explore and apply indexing and searching techniques of information retrieval.
CO3	Understand the use of IR in distributed and multimedia IR, Web Search.
CO4	Describe, analyse, and apply web mining techniques to extract meaningful patterns from web data.

Course Contents

		CO	Hours
Unit 1	Introduction: Basic Concepts, Data Retrieval vs. 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 and Cluster Hypothesis (Self-study: Clustering Algorithms).	CO1	(06)
Unit 2	Indexing, Modeling and Searching Techniques: Indexing and Searching: Inverted file, Suffix trees & suffix arrays, Signature Files, Clustered files. Modeling Techniques: Basic concepts, Boolean Model, Vector Model, Probabilistic Model, Searching strategies: Boolean Search, Serial search, cluster based retrieval.	CO2	(05)
Unit 3	Text and Multimedia Languages: Introduction, Metadata, Text, Mark-up Languages, Multimedia, Trends and Research Issues.	CO1 CO2	(04)
Unit 4	Retrieval and Text Operations: Retrieval Evaluation: Precision and recall, alternative measures. Text Operations: Document Pre-processing, Document Clustering, Text Compression.	CO3	(04)
Unit 5	Distributed and Multimedia IR: Distributed IR: Collection Partitioning, Source Selection, Query Processing, web issues. Multimedia IR: Data Modeling, Query languages, Generic multimedia indexing.	CO3 CO4	(05)
Unit 6	Searching the Web: Importance, Challenges, Characterizing the Web, Search Engines, Browsing, Meta-searchers, (Self-study: Searching using Hyperlinks).	CO3 CO4	(04)

Text Books

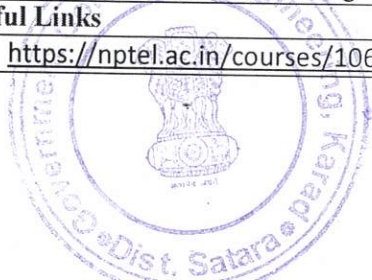
1. C.J. Rijsbergen, "Information Retrieval", Butterworth-Heinemann publisher, 2nd edition, 1979 ISBN-13: 978-0408709293. (Unit:1)
2. Yates, Neto, "Modern Information Retrieval", Pearson Education, 1st edition, 2010, ISBN 81-297-0274-6. (Unit: 2,3,4)
3. Bing Liu, "Web Data Mining: Exploring Hyperlinks,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

Reference Books

1. Stefan Butcher, 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/106101007> Natural Language Processing, Prof. Pushpak Bhattacharya, IIT Bombay.



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2.	https://onlinecourses.nptel.ac.in/e-learning/preview/noc26_cs13 Introduction to Information Retrieval, Prof. Dwaipayan Roy
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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	PSO 1	PSO 2
CO 1	2	2	-	-	-	-	-	-	-	-	-	1	2
CO 2	1	3	2	-	-	-	-	-	-	-	-	1	1
CO 3	2	2	2	1	1	-	-	-	-	-	-	1	2
CO 4	1	3	2	1	1	1	-	-	-	-	1	1	2

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	10
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	10
Create	-	-	-
TOTAL	20	20	60



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Government College of Engineering, Karad					
Final Year (Sem-VIII) B. Tech Information Technology					
IT3815: Industry Elective IV : AI Tools and Industry Trends					
Teaching Scheme			Examination Scheme		
Lectures	02 Hrs/week		MSE	20	
Tutorials	00 Hrs/week		ISE	20	
Total Credits	02		ESE	60	
			Duration of ESE	02 Hrs 30 Min	
Prerequisite : Artificial Intelligence, Machine Learning					
Course Outcomes (CO): Students will be able to					
CO1	Use modern AI tools, Large Language Models and multimodal AI fundamentals.				
CO2	Apply open-source AI models and RAG techniques using platforms such as Llama, Ollama and LM Studio.				
CO3	Integrate AI capabilities into software development and automation workflows using APIs, code assistants and workflow tools.				
CO4	Evaluate AI applications across industry sectors with respect to ethics, privacy, governance and responsible usage.				
Course Contents					
			CO	Hours	
Unit 1	Foundations of Modern AI Tools & LLMs: Introduction to AI tools: Generative AI, Predictive AI, Automation AI , Architecture of Large Language Models: Tokenization, Transformer, Self-Attention, Overview of leading LLMs: GPT, Llama, Claude, Gemini, Mistral, Prompt engineering fundamentals and task-specific prompting patterns			CO1	(04)
Unit 2	Open-Source LLMs & RAG Fundamentals: Installing and running open-source LLMs, Local inference using Ollama, LM Studio, Quantization for resource-efficient deployment, Embedding's and Vector Databases, Retrieval-Augmented Generation (RAG): need, workflow and applications			CO2	(06)
Unit 3	Multimodal AI Tools (Vision, Audio, Image Generation): Image generation using Stable Diffusion, Vision models, Audio AI, Multimodal LLM usage: GPT-4o / Gemini for text-image-audio integration, Applications: captioning, OCR ,document extraction.			CO1, CO2	(04)
Unit 4	AI Tools for Software Development & Automation: AI coding assistants: GitHub Copilot / CodeWhisperer / Cursor, Automated debugging and test generation using AI tools, API-based integration of AI models using Python + FastAPI, Workflow automation, Generating documentation and code refactoring using AI			CO3	(05)
Unit 5	Applied AI in Industry: AI in business automation: chatbots, CRM, customer support and marketing, AI in analytics, AI in education: personalized tutoring and auto-assessment, AI in healthcare: opportunities with ethical restrictions and safety boundaries, Generative AI for content production and knowledge management(Self study: AI roles in industry: AI Engineer, Prompt Engineer, ML Engineer, AI Product Developer)			CO4	(05)
Unit 6	Future Trends, Governance & Enterprise AI: RAG execution, AI Agents and autonomous workflows, On-device / Edge AI tools, AI governance, ethics, privacy, and risk overview of global AI regulations			CO2, CO3, CO4	(04)
Text Books					
1.	Jay Alammur, Maarten Grootendorst "Hands-On Large Language Models: Build and Deploy LLM Applications", 1st Edition, O'Reilly Media, 2024. (Unit 1,2, 3)				
2.	Huyen C., "AI Engineering: Building Applications with Foundation Models", 1st Edition, O'Reilly Media, 2024 (Unit 2,4,5,6)				



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Reference Books	
1.	Géron A., "Hands-On Machine Learning with Scikit-Learn, Keras and TensorFlow", 3rd Edition, O'Reilly Media, 2023.
2.	Jurafsky D. and Martin J., "Speech and Language Processing", 3rd Edition, Pearson / Online Release, 2023–2024.
3.	Foster D., "Generative Deep Learning", 2nd Edition, O'Reilly Media, 2024.
Useful Links	
1.	https://onlinecourses.nptel.ac.in/noc26_cs33/preview Deep Learning for Natural Language Processing By Prof. Pawan Goyal IIT Kharagpur
2.	https://onlinecourses.swayam2.ac.in/imb26_mg37/preview Generative AI and Large Language Models By Naveen Kumar Bhansali, Indian Institute of Management Bangalore (IIMB)

Guidelines for 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	PSO1	PSO2
CO 1	3	2	1	2	1	1	-	-	-	-	1	3	1
CO2	1	2	3	3	3	2	-	-	-	-	1	3	3
CO3	1	1	3	3	3	3	-	1	-	-	1	3	3
CO4	1	1	1	1	1	3	3	3	-	-	1	1	3

: Slight(Low)

2: Moderate(Medium)

3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ESE
Remember	5	10
Understand	5	10
Apply	5	20
Analyse	5	10
Evaluate	-	10
Create	-	-
TOTAL	20	60



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Government College of Engineering, Karad

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

IT3825: Program Elective-IV High Performance Computing

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	MSE	20
Tutorials	00 Hrs/week	ISE	20
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs 30 Min

Prerequisite : Operating Systems

Course Outcomes (CO): Students will be able to

CO1	Understand the fundamental concepts of parallel computing, including architectures, communication costs, interconnection networks, and processor mapping techniques.
CO2	Apply principles of parallel algorithm design using decomposition methods, task interaction characteristics, and load-balancing strategies.
CO3	Analyse shared-memory and message-passing parallel methods using OpenMP and MPI to perform basic communication operations such as broadcast, reduction, scatter, and gather.
CO4	Compare and assess heterogeneous parallel platforms—including GPUs and Many Integrated Cores.

Course Contents

	CO	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, Routing Mechanisms for Interconnection Networks.	CO1	(05)
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.	CO2	(05)
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.	CO2	(05)
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)	CO3	(05)
Unit 5 Graphics Processing Units: Introduction to Heterogeneous Parallel Computing, GPU architecture, Thread hierarchy, (Self Study: Memory Hierarchy)	CO3	(04)
Unit 6 Many Integrated Cores: Introduction to Many Integrated Cores, MIC, Xeon Phi architecture, Thread hierarchy, Memory Hierarchy, Memory Bandwidth and performance considerations.	CO4	(04)

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, Izzat El Hajj, "Programming Massively Parallel Processors: A Hands-on Approach", 4th Edition, Morgan Kaufmann, 2022. (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: Portable Shared Memory Parallel Programming", MIT Press, 2008.
3. William Gropp, Ewing Lusk, Anthony Skjellum, "Using MPI: Portable Parallel Programming with the Message Passing Interface", 3rd Edition, MIT Press, 2014

Useful Links



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1.	https://nptel.ac.in/courses/106/108/106108025/ Parallel Computer Architecture and Programming Prof. Srinivas Aluru IISc Bangalore
2.	https://nptel.ac.in/courses/106/105/106105247/ GPU Architectures and Programming Prof. P. K. Sinha, IIT Kharagpur
3.	https://nptel.ac.in/courses/106/105/106105225/ Introduction to Parallel Programming Prof. Sourav Chakraborty, IIT Kharagpur

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	PSO 1	PSO 2
CO 1	3	-	-	-	-	-	-	-	2	-	-	1	1
CO 2	2	3	-	-	-	-	-	-	2	-	-	1	1
CO 3	-	2	3	2	2	-	-	-	2	-	-	2	2
CO 4	-	-	2	3	3	-	-	-	2	-	-	2	2

1: Slight(Low)

2: Moderate(Medium)

3: Substantial(High)

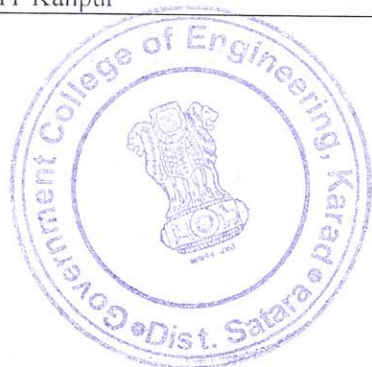
Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60



Rajkulkarni

Government College of Engineering, Karad			
Final Year (Sem-VIII) B. Tech Information Technology			
IT3835: Program Elective IV: Quantum Computing			
Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	MSE	20
Tutorials	00 Hrs/week	ISE	20
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs 30 Min
Prerequisite : Machine Learning			
Course Outcomes (CO): Students will be able to			
CO1	Understand the fundamental principles of quantum computation and quantum information.		
CO2	Analyze quantum algorithms and compare their performance with classical counterparts		
CO3	Evaluate quantum information concepts including entropy, distance measures, quantum noise models, and quantum operations.		
CO4	Propose and Design basic quantum error-correcting codes and fault-tolerant quantum computation strategies		
	Course Contents		CO
			Hours
Unit 1	Fundamentals of Quantum Computation: History of quantum computation and quantum information, Quantum bits, Quantum computation, Single qubit gates, Multiple qubit gates, Quantum circuits.		CO1
			(04)
Unit 2	Quantum Algorithms: Classical computations on a quantum computer, Quantum parallelism, Deutsch's algorithm, The Deutsch-Jozsa algorithm, The quantum search algorithm, Simon's Algorithm (Self-study: Optimality of the quantum search algorithm)		CO1
			(04)
Unit 3	Quantum Information: Prospects for practical quantum information processing, Distance measures for quantum information, Quantum error-correction, mEntropy and information, Quantum information theory. (Self study- Quantum counting)		CO2
			(05)
Unit 4	Quantum noise and quantum operations: Classical noise and Markov processes, Operator-sum representation, Axiomatic approach to quantum operations, Trace and partial trace, Geometric picture of single qubit quantum Operations.		CO3
			(05)
Unit 5	Quantum error-correction: Theory of quantum error-correction, Classical Error Correction, Discretization of the errors, Independent error models, The Shor code, Constructing quantum codes.		CO4
			(05)
Unit 6	Applications of Quantum Computing: DiVincenzo Criteria, NMR Quantum Computer, Electronic States of Ions as Qubits, Fault-Tolerant Quantum Computation.		CO4
			(05)
Text Books			
1.	Michael A. Nielsen and Isaac L. Chuang, "Quantum Computation and Quantum Information", 2010 (Unit 1,2,3,6)		
2.	P. Kaye, R. Laflamme, M. Mosca, "An Introduction to Quantum Computing", 2006 (Unit:4, 5)		
Reference Books			
1.	N. David Mermin, "Quantum Computer Science", Cambridge 2007.		
Useful Links			
1.	https://nptel.ac.in/courses/106106232 Introduction to Quantum Computing: Quantum Algorithms and Qiskit Prof. Prabha Mandayam IIT Bombay		
2.	https://onlinecourses.nptel.ac.in/noc26_cs06 Quantum Computing: Algorithms and Limitations Through the Query Model Prof. Rajat Mittal IIT Kanpur		



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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	PSO 1	PSO 2
CO 1	-	-	2	3	1	1	1	-	-	-	-	2	1
CO 2	-	1	2	2	3	1	-	-	-	-	-	1	2
CO 3	1	2	1	3	1	1	-	-	-	-	1	2	1
CO 4	1	-	3	2	1	1	-	1	-	1	1	2	2

1: Slight(Low)

2: Moderate(Medium)

3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60



Rajbukkani

Government College of Engineering, Karad

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

IT3845: Program Elective-IV: Computer Vision

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	MSE	20
Tutorials	00 Hrs/week	ISE	20
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs 30 Min

Prerequisite : Digital Systems

Course Outcomes (CO): Students will be able to

CO1	Understand image formation, image processing, and feature extraction techniques.
CO2	Apply image analysis methods including segmentation, feature detection, and geometric vision techniques.
CO3	Analyze deep learning and object recognition methods for image classification and detection.
CO4	Implement computer vision algorithms for real-world applications such as healthcare, autonomous systems, and surveillance.

Course Contents

		CO	Hours
Unit 1	Image Formation & processing Introduction to computer vision, geometric primitives and transformation, photometric image formations, Point operators, Linear and non linear filtering.(Self study: Geometric transformations)	CO1	(05)
Unit 2	Color& Local image features: Human color perception,Representing color, Computing the image gradient,representing the image gradient, finding corners and building neighborhoods,describing neighborhood with SIFT and HOG features.	CO1 CO2	(06)
Unit 3	Deep Learning: Supervised learning, unsupervised learning, Deep Neural networks, convolutional networks.Feature Detection, Description & Matching	CO3	(05)
Unit 4	Object Recognition: Instance recognition, image classification, object detection, semantic segmentation(Self study: video understanding)	CO3	(04)
Unit 5	Feature detection and matching : Points and patches, edges and contours , contour tracking, lines and vanishing points, segmentation.	CO2	(04)
Unit 6	Applications of Computer Vision Medical Imaging & Healthcare: cancer detection, CT/MRI segmentation Autonomous Vehicles: Scene understanding, lane detection, object tracking, SLAM Agriculture: Crop disease detection, drone-based imaging Retail & Surveillance: Person re-identification, face recognition, action recognition	CO4	(04)

Text Books

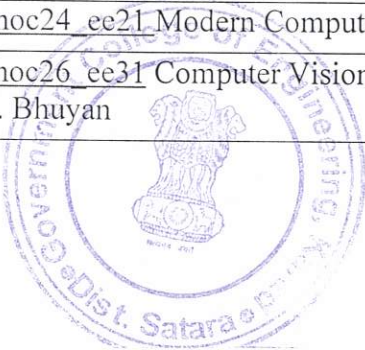
- Richard Szeliski, Computer Vision: Algorithms and Applications, Springer, 2nd Ed., 2021/2022/2025.(Ch 1,3,4,5)
- Forsyth & Ponce, Computer Vision: A Modern Approach, Pearson, 2nd Ed.(ch 2)

Reference Books

- Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press.
- Gonzalez & Woods, Digital Image Processing, Pearson, 4th Ed., 2024/2025.

Useful Links

- https://onlinecourses.nptel.ac.in/noc25_cs143 Computer Vision By Prof. Jayanta Mukhopadhyay
- https://onlinecourses.nptel.ac.in/noc24_ee21 Modern Computer Vision By Prof. A.N. Rajagopalan
- https://onlinecourses.nptel.ac.in/noc26_ee31 Computer Vision And Image Processing - Fundamentals And Applications By Prof. M. K. Bhuyan



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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	PSO 1	PSO 2
CO 1	3	2	1	1	3	-	-	-	-	-	1	3	2
CO 2	3	3	2	2	3	1	-	-	1	-	1	3	3
CO 3	3	3	3	2	3	1	1	-	1	-	2	3	3
CO 4	3	3	3	3	3	2	1	1	1	1	2	3	3

1: Slight(Low)

2: Moderate(Medium)

3: Substantial(High)

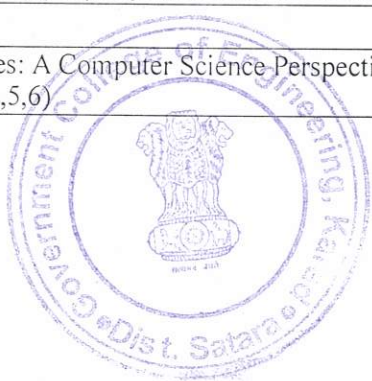
Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	-
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60



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Government College of Engineering, Karad			
Final Year (Sem – VIII) B. Tech. Information Technology			
IT3805: Web Technology (Multi-disciplinary Minor – 05)			
Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	MSE	20
Tutorials	00 Hrs/week	ISE	20
Total Credits	02	ESE	60
		Duration of ESE	02 Hrs 30 Min
Prerequisite : Data Structure, Python Programming			
Course Outcomes (CO): Students will be able to			
CO1	Understand the fundamentals of Internet protocols.		
CO2	Apply JavaScript, DOM, and jQuery concepts to develop interactive and dynamic client-side web applications.		
CO3	Develop dynamic web applications using Java Servlets, JSP, XML, and integrate MySQL database		
CO4	Build server-side web applications using PHP and ASP.NET, and demonstrate the working principles of Web Services including WSDL and SOAP.		
	Course Contents		
		CO	Hours
Unit 1	Web Essentials and Mark-up language- HTML The Internet, basic internet protocols, WWW, HTTP Request message, HTTP response message, web clients, web servers. HTML: history and versions. HTML elements, Introduction to Style Sheet, CSS features, CSS core syntax, Style sheets and HTML, Bootstrap.	CO1	(06)
Unit 2	Client Side Technologies: JavaScript and DOM Introduction to JavaScript, JavaScript in perspective, basic syntax, variables and data types, statements, operators, literals, functions, objects, arrays, built in objects, JavaScript debuggers. Introduction to Document Object Model, jQuery.	CO2	(05)
Unit 3	Java Servlets Servlet architecture overview, Servlets generating dynamic content, Servlet life cycle, parameter data, sessions, cookies, URL rewriting.	CO3	(04)
Unit 4	XML XML documents and vocabularies, XML declaration, XML Namespaces DTD, DM, DDL, MySQL database and Java Servlets, JSON: Introduction, working of JSON.	CO3	(03)
Unit 5	JSP and Web Services Introduction to Java Server Pages, JSP and Servlets, running JSP applications, Basic JSP, JavaBeans classes and JSP, Support for the Model-view-controller paradigm, JSP related technologies. Web Service concepts, WSDL. (Self Study: Communicating Object data: SOAP, Struts)	CO3, CO4	(05)
Unit 6	Server Side Scripting Languages Introduction to PHP, uses of PHP, general syntactic characteristics, Primitives, operations and expressions, output, control statements, arrays, functions, pattern matching, form handling, files, cookies, session tracking, using MySQL with PHP Introduction to ASP.NET.	CO4	(05)
Text Books			
1.	Jeffrey C.Jackson, "Web Technologies: A Computer Science Perspective", 2 nd Edition, Pearson Education, 2007, ISBN 978-0131856035. (Unit 1,2,3,4,5,6)		



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2.	Robert W. Sebesta, "Programming the World Wide Web", 4 th Edition, Pearson education, 2008. (Unit 1,2,3,4,6)
Reference Books	
1.	Parminder Kaur, Aseem Khanna, "Web Technologies", Lovely Professional University, Edition I
2.	C. Xavier, "Web Technology Design", New Age International (P) Ltd, Publishers, Edition 2005
3.	Chris Bates, "Web Programming Building Internet Applications", 3 rd Edition, Wiley India, 2006.
4.	H.M. Deitel, P.J. Deitel and A.B. Goldberg, "Internet & World Wide Web How To Program", 3 rd Edition, Pearson Education, 2006, ISBN 978-0131752429.
Useful Links	
1.	https://www.coursera.org/learn/introduction-html-css-javascript , Introduction to HTML, CSS, & JavaScript, Michelle Saltoun
2.	https://onlinecourses.swayam2.ac.in/e-learning/preview/nou24_cs09 , Web Technology, Dr. Ashutosh Kumar Bhatt
3.	https://content.techgig.com/upskilling-at-techgig/free-online-web-development-courses-2026/articleshow/124064830.cms , Web Development, Aaniket Pandey
4.	https://www.geeksforgeeks.org/web-tech/web-technology/ Web Technology

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	PSO 1	PSO 2
CO 1	3	2	-	-	-	-	-	-	-	1	1	2	1
CO 2	-	-	2	-	3	-	-	-	1	-	-	3	2
CO 3	-	3	-	2	-	1	-	-	-	-	1	2	3
CO 4	-	-	3	1	-	1	-	1	1	1	2	3	3

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

Guideline for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	-	-	-
Understand	5	5	10
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	20
Create	-	-	-
TOTAL	20	20	60



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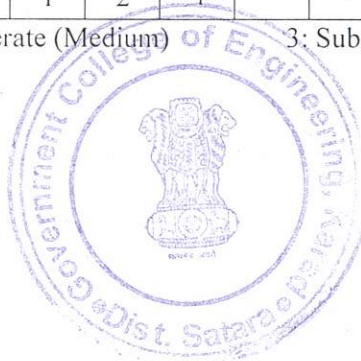
Government College of Engineering, Karad													
Final Year (Sem – VIII) B. Tech. Information Technology													
IT3807: Cloud Computing Lab													
Laboratory Scheme:							Examination Scheme:						
Practical	02 Hrs/week						ISE	25					
Total Credits	01						ESE	-					
Prerequisite : Programming in C, C++, Java, Python													
Course Outcomes (CO): Students will be able to													
CO1	Install, configure, and manage virtualization and cloud infrastructure components using suitable tools and platforms.												
CO2	Deploy and demonstrate basic cloud based applications.												
CO3	Analyze and compare major cloud service providers.												
CO4	Design and implement secure authentication and data storage mechanisms.												
Course Contents													CO
Implementation of following concepts													
Experiment 1	Installation and Configuration of virtualization.												CO1
Experiment 2	Implementation of Xen Server or Docker.												CO1
Experiment 3	Installation of Google App Engine and create simple application using any programming language.												CO2
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.												CO2 CO4
Experiment 5	Setup private cloud using OwnCloud on Ubuntu.												CO2
Experiment 6	Implementation of Load Balancing Two Web Servers using HAProxy.												CO2
Experiment 7	Design and Develop custom Application using Salesforce Cloud.												CO4
Experiment 8	Implement “Software as a Service” (SaaS) model using Google Cloud Platform (GCP). / Deploying a simple cloud application using Render (PaaS).												CO1 CO2
Experiment 9	Case study on Amazon EC2/Microsoft Azure/Google Cloud Platform.												CO3
Experiment 10	Implement Infrastructure as a Service using OpenStack.												CO3
Experiment 11	Deployment of application on kubernetes cluster using Minikube.												CO2
Experiment 12	Mini project: Creating a cloud like social site for institute or any other applications useful to institute using Cloud. (Mandatory)												CO3 CO4
List of Submission:													
Minimum number of Experiments : 10													

Mapping of COs and POs

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

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

Assessment Pattern:



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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	15
Task II	05	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	05
ISE	25	25	25	25	25	25	25	25	25	25	25	25	25

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
IT3808: Cryptography and Cyber security Lab				
Laboratory Scheme:			Examination Scheme:	
Practical	02 Hrs/week		ISE	25
Total Credits	01		ESE	25
Prerequisite: Basic Programming Skills, Computer Networks Fundamentals.				
Course Outcomes(CO): Students will be able to				
CO1	apply classical cryptographic techniques and transposition methods for encryption and decryption.			
CO2	implement modern cryptographic algorithms and secure key exchange mechanisms.			
CO3	analyze hashing, digital signatures, and authentication techniques for secure communication.			
CO4	demonstrate cybersecurity tools and techniques for intrusion detection, vulnerability assessment, malware analysis, and system security testing.			
Course Contents				CO
Implementation of following concepts				
Experiment 1	Perform encryption, decryption using the following substitution techniques (i) Ceaser cipher, (ii) Playfair cipher iii) Hill Cipher iv) Vigenere cipher			CO1
Experiment 2	Perform encryption and decryption using following transposition techniques i) Rail fence ii) row & Column Transformation			CO1
Experiment 3	Implement SDES algorithm.			CO2
Experiment 4	Implement RSA Algorithm.			CO2
Experiment 5	Implement the Diffie-Hellman Key Exchange algorithm for a given problem.			CO2
Experiment 6	Calculate the message digest of a text using the SHA-1 algorithm.			CO3
Experiment 7	Implement the SIGNATURE SCHEME – Digital Signature Standard.			CO3
Experiment 8	Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.			CO4
Experiment 9	Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool			CO4
Experiment 10	Defeating Malware i) Building Trojans ii) Rootkit Hunter			CO4
Experiment 11	Study and demonstrate system hacking and write a report. a) How to crack a password? b) How to use Ophcrack / Crowbar / John the Ripper / Aircrack-ng to Crack Passwords.			CO4
Experiment 12	Case study on any security attack and designing a solution how it could be prevented.			CO4
List of Submission:				
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 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	3	2	1	-	3	-	1	-	-	-	1	3	2
CO 2	3	3	2	2	3	1	1	-	-	-	1	3	3
CO 3	3	3	2	2	3	1	2	-	1	-	1	3	3



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CO 4	3	3	2	3	3	2	2	1	1	-	2	3	3
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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	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
ISE	25	25	25	25	25	25	25	25	25	25	25



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Government College of Engineering, Karad				
Final Year (Sem-VIII) B. Tech Information Technology				
IT3819: Industry Elective IV - AI Tools and Industry Trends Lab				
Laboratory Scheme:			Examination Scheme:	
Practical	02 Hrs/week		ISE	25
Total Credits	01		ESE	-
Prerequisite : Artificial Intelligence, Machine Learning				
Course Outcomes (CO): Students will be able to				
CO1	Apply tokenization, attention and multimodal AI tools to understand transformer-based systems.			
CO2	Deploy and optimize open-source LLMs using quantization, embedding and RAG.			
CO3	Develop AI-enabled applications using micro services, code assistants and workflow automation.			
CO4	Evaluate AI systems for hallucination, bias, privacy risks and ethical compliance.			
Course Contents				CO
Implementation of following concepts				
Experiment 1	Image generation using Stable Diffusion or DALL·E.			CO1, CO2
Experiment 2	Understanding tokenization and attention using transformer visualizer tools.			CO1
Experiment 3	Running open-source LLMs locally using Ollama (Llama / Mistral).			CO2
Experiment 4	Deploying quantized models (Q4 / Q8) in LM Studio and comparing inference speed.			CO2
Experiment 5	Building a Retrieval-Augmented chatbot using embeddings and a vector database (FAISS / ChromaDB).			CO2
Experiment 6	Document and image understanding using vision models such as CLIP / BLIP (captioning, OCR).			CO1, CO2
Experiment 7	Speech-to-text using Whisper and multimodal Q&A using GPT-4o / Gemini.			CO1, CO2
Experiment 8	Using AI code assistants (GitHub Copilot / CodeWhisperer / Cursor) for debugging and auto-test generation.			CO3
Experiment 9	Creating an AI microservice using FastAPI for text summarization or code review.			CO3
Experiment 10	Workflow automation using AI on platforms like Zapier / Make.com / n8n.			CO3, CO4
Experiment 11	AI governance and ethics experiment - identifying bias, privacy risks and hallucinations in model outputs.			CO4
Experiment 12	Mini Project: Designing and presenting a prototype of any application (Mandatory).			CO2, CO3, CO4
List of Submission:				
• Minimum number of Experiments : 10				

Guidelines 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	PSO 1	PSO 2
CO 1	3	2	1	2	1	1	-	-	-	-	1	3	1
CO 2	1	2	3	3	3	2	-	-	-	2	1	3	3
CO 3	1	1	3	3	3	2	-	1	-	3	1	3	3
CO 4	1	1	1	1	1	3	3	1	-	1	1	1	3

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

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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	15
Task II	5	5	5	5	5	5	5	5	5	5	5	5	5
Task III	5	5	5	5	5	5	5	5	5	5	5	5	5
ISE	25	25	25	25	25	25	25	25	25	25	25	25	25



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Government College of Engineering, Karad				
Final Year (Sem-VIII) B. Tech Information Technology				
IT3829: Program Elective-IV High Performance Computing Lab				
Laboratory Scheme:			Examination Scheme:	
Practical	02 Hrs/week		ISE	25
Total Credits	01		ESE	-
Prerequisite : Data Structure, Mathematics				
Course Outcomes (CO): Students will be able to				
CO1	Apply Linux system commands and basic parallel programming tools to configure and operate OpenMP, MPI, and CUDA development environments.			
CO2	Develop and analyze shared-memory parallel programs using OpenMP constructs such as loops, clauses, sections, and synchronization mechanisms.			
CO3	Design and implement message-passing parallel programs using MPI directives, collective communication, synchronization, and non-blocking operations.			
CO4	Implement and evaluate GPU-based parallel solutions using CUDA, including basic kernel execution, matrix multiplication, and tiled matrix-matrix multiplication.			
Course Contents				CO
Implementation of following concepts				
Experiment 1	To study the system commands of linux related to parallel programming.			CO1
Experiment 2	Installation and study of basics of OpenMP API (Open Multi-Processor API).			CO1
Experiment 3	To implement sharing of work among threads using Loop Construct in OpenMP.			CO1
Experiment 4	To implement sharing of work among threads in an OpenMP program using "Sections Construct" and Single Construct.			CO1
Experiment 5	Installation and study of basics of MPI (Message Passing Interface).			CO3
Experiment 6	To implement the directives for communication between MPI processes.			CO3
Experiment 7	To implement MPI collective operations using Synchronization.			CO3
Experiment 8	Execution of a simple CUDA C Program.			CO3
Experiment 9	To implement Matrix Multiplication in CUDA C.			CO4
Experiment 10	To implement tiled Matrix-Matrix Multiplication in CUDA C.			CO4
Experiment 11	Vector Addition Using CUDA			CO4
Experiment 12	Image Processing Using CUDA			CO4
List of Submission:				
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 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	-	-	-	2	-	3	-	-	-	-	-	2	1
CO 2	-	-	-	-	2	-	-	3	-	-	-	2	1
CO 3	-	-	-	3	-	-	-	-	3	-	-	2	1
CO 4	-	-	-	-	3	-	-	-	-	3	-	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	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
ISE	25	25	25	25	25	25	25	25	25	25	25

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
IT3839: Program Elective IV Quantum Computing Lab				
Laboratory Scheme:			Examination Scheme:	
Practical	02 Hrs/week		ISE	25
Total Credits	01		ESE	--
Prerequisite : Computer fundamentals				
Course Outcomes (CO): Students will be able to				
CO1	Understand Foundations of Quantum Computation			
CO2	Apply and Implement Quantum Algorithms			
CO3	Analyze Quantum Information, Noise and Operations			
CO4	Evaluate Quantum Error Correction & Applications			
Course Contents				CO
Implementation of following concepts				
Experiment 1	Introduction to Quantum Computing Tools			CO1
Experiment 2	Qubits, Superposition & Measurement			CO2
Experiment 3	Single-Qubit Quantum Gates			CO2
Experiment 4	Multi-Qubit Gates and Entanglement			CO3
Experiment 5	Quantum Circuits and Quantum Parallelism			CO1
Experiment 6	Implementation of Deutsch's Algorithm			CO1
Experiment 7	Deutsch–Jozsa Algorithm			CO3
Experiment 8	Grover's Quantum Search Algorithm			CO3
Experiment 9	Quantum Noise and Quantum Channels			CO4
Experiment 10	Density Matrix and Partial Trace			CO4
Experiment 11	Quantum Error Correction – Shor Code			CO4
Experiment 12	Simulation of Fault-Tolerant Quantum Computation			CO4
List of Submission:				
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 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2
CO 1	-	-	-	-	-	3	-	-	-	2	-	1	1
CO 2	-	-	-	3	-	-	-	-	2	-	-	1	1
CO 3	-	-	-	-	3	-	-	-	-	-	2	2	2
CO 4	-	-	-	-	-	3	-	2	-	-	-	2	2

1: Slight (Low)

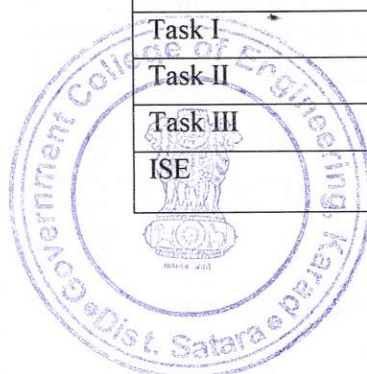
2: Moderate (Medium)

3: Substantial (High)

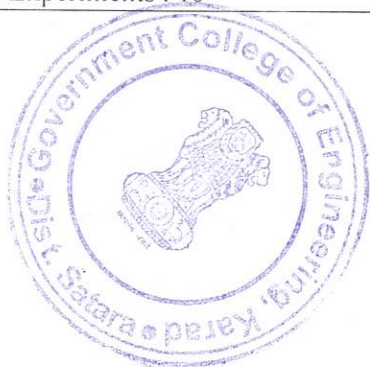
Assessment Pattern:

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	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
ISE	25	25	25	25	25	25	25	25	25	25	25

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Government College of Engineering, Karad			
Final Year (Sem – VIII) B. Tech. Information Technology			
IT3849: Program Elective IV- Computer Vision Lab			
Laboratory Scheme:		Examination Scheme:	
Practical	02 Hrs/week	ISE	25
Total Credits	01	ESE	-
Prerequisite :			
Course Outcomes (CO): Students will be able to			
CO1	Understand fundamentals of image processing.		
CO2	Implement image pre-processing and enhancement techniques.		
CO3	Detect, describe, and match image features.		
CO4	Design and implement computer vision solutions for real-world applications.		
Course Contents			CO
Implementation of following concepts			
Experiment 1	To perform basic image handling and processing operations on the image. (Image reading, displaying and basic manipulations)		CO1
Experiment 2	To perform point operations and histogram processing including image negative , contrast stretching and histogram equalization.		CO1
Experiment 3	Implement spatial domain filtering techniques such as image smoothing and sharpening.		CO1
Experiment 4	To perform geometric Transformations including image scaling and translation on images.		CO1
Experiment 5	To perform edge detection & thresholding.		CO2
Experiment 6	Implementation of region based segmentation techniques.		CO2
Experiment 7	To perform color model conversion and enhancement.		CO2
Experiment 8	To perform color based segmentation.		CO3
Experiment 9	To extract shape based features and perform basic pattern classification.		CO3
Experiment 10	To perform feature extraction using deep models.		CO4
Experiment 11	Estimate motion using optical flow and block matching and perform object recognition using classical deep learning approaches.		CO4
Experiment 12	Perform object recognition using BoVW with SVM/k-NN and deep features from pre-trained CNN models.		CO4
List of Submission:			
Minimum number of Experiments : 10			



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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	PSO 1	PSO 2
CO 1	3	2	1	-	2	-	-	-	-	-	1	3	2
CO 2	3	3	2	2	3	-	-	-	1	-	1	3	3
CO 3	3	3	2	2	3	1	-	-	1	-	1	3	3
CO 4	3	3	3	3	3	2	1	1	1	1	2	3	3

1: Slight (Low)

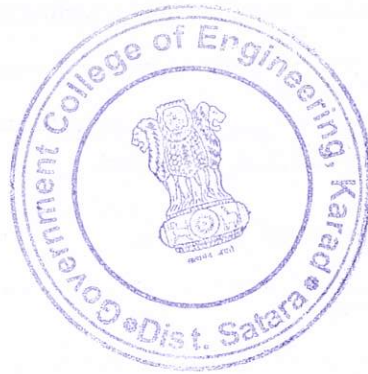
2: Moderate (Medium)

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	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
ISE	25	25	25	25	25	25	25	25	25	25	25

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Government College of Engineering, Karad				
Final Year (Sem – VIII) B. Tech. Information Technology				
IT3810: Major Project				
Laboratory Scheme:			Examination Scheme:	
Practical	08 Hrs/week		ISE	50
Total Credits	04		ESE	50
Prerequisite : Basic technical knowledge, Tools and S/W				
Course Outcomes (CO): Students will be able to				
1.	Identify a real-life IT problem and understand its requirements by studying related information.			
2.	Create a suitable system design and choose the right tools and technologies for building the solution.			
3.	Develop, test, and check the solution to ensure it works correctly and meets the required goals.			
4.	Prepare clear documentation and present the project results			
Course Contents				
I Guidelines for Project Topic Selection:				
<ul style="list-style-type: none"> • Select a topic relevant to the Information Technology, Computer Science and Engineering. • For selection of topic refer Scopus Index Journals preferably from reputed publishers like IEEE, ACM, Springer, Elsevier, etc. • 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 organization/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 research oriented. 				
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 internal marks.				
Research paper publication / participation in project activities / any special achievement is mandatory for each group.				
II Assessment Guidelines:				
There shall be two reviews conducted for project work assessment; following are expectations for each review.				
Project REVIEW-I				
Project Review–I is an essential component of the project work. At this stage, the student is required to complete a portion of the project that includes the problem statement, literature review, SRS, model, and design. By the end of this review, the project should be developed at least up to the design stage. As part of the progress, the student must give a presentation highlighting the technological advancements related to the chosen project topic. The evaluation will primarily focus on the work completed, quality of content, presentation skills and ability to answer questions.				
Project REVIEW-II				
Project Review–II requires the student to complete the remaining components of the project, which include the selection of appropriate technologies and tools, necessary installations, UML implementations, testing, results, and performance analysis. This also involves discussing improvements using parameter-wise data tables, comparing the work with existing or known algorithms/systems, and validating the results and conclusions. The student must prepare and submit the final project report in the prescribed standard format. The report should				

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be duly certified by the project guide and the Head of the Department to confirm the satisfactory completion of the project work.

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	PSO 1	PSO 2
CO 1	3	3	1	1	1	2	1	2	2	1	2	3	2
CO 2	3	2	3	2	3	2	1	2	2	2	1	3	3
CO 3	3	3	3	3	3	2	1	2	2	2	1	3	3
CO 4	1	1	1	1	1	1	2	2	2	2	2	2	2

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



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Government College of Engineering, Karad
Final Year (Sem – VIII) B. Tech. Information Technology

IT3811: MOOCI

Teaching Scheme		Examination Scheme	
Lectures	-	MSE	-
Tutorials	-	ISE	-
Total Credits	03	ESE	100
		Duration of ESE	

Guidelines

- Students must enroll **only in approved MOOC** available on **SWAYAM/NPTEL** platforms.
- The department will provide a **list of eligible and recommended courses** for **7th semester**.
- **Prior approval from the BoS Chairman/ HOD** is mandatory before course enrollment.
- The **final list of enrolled MOOC** will be approved and recorded by the department **before course commencement**.
- Each MOOC must have a **duration of 8–12 weeks**.
- Students may select any **one specialization area** from the following:
 - i. Digital Forensics/Ethical Hacking
 - ii. Soft Computing
 - iii. Blockchain Technology
 - iv. Computer Vision
 - v. Big Data Analytics/Computing
 - vi. Augmented Reality and Virtual Reality
 - vii. Quantum computing

• **Students must:**

Attend/view all lecture videos regularly.

Complete and submit all assignments and quizzes on time

Appear for and pass the **final proctored examination** conducted by the MOOC platform.

• **Upon completion**

Submit the **MOOC completion certificate** to the Departmental MOOC Coordinator.

The Coordinator will **verify authenticity** and maintain semester-wise records.

Verified certificates will be **forwarded to the Controller of Examinations (COE), GCE Karad.**



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Government College of Engineering, Karad			
Final Year (Sem – VIII) B. Tech. Information Technology			
IT3812: MOOC II			
Teaching Scheme*		Examination Scheme	
Lectures	-	MSE	-
Tutorials	-	ISE	-
Total Credits	03	ESE	100
		Duration of ESE	

Guidelines

- Students must enroll only in approved MOOC available on SWAYAM/NPTEL platforms.
- The department will provide a list of eligible and recommended courses for **7th semester**.
- Prior approval from the BoS Chairman/ HOD is mandatory before course enrollment.
- The final list of enrolled MOOC will be approved and recorded by the department before course commencement.
- Each MOOC must have a duration of 8–12 weeks.
- Students may select any one specialization area from the following:
 - i. Data Mining
 - ii. Machine Learning
 - iii. Deep Learning [LLM, Agentic AI, Generative AI, Explainable AI, Prompt Engineering, Transformer]
 - iv. Data Science/Analytics
 - v. Natural Language Processing
 - vi. Cyber Security
 - vii. Quantum computing

• **Students must:**

Attend/view all lecture videos regularly.

Complete and submit all assignments and quizzes on time

Appear for and pass the final proctored examination conducted by the MOOC platform.

• **Upon completion**

Submit the MOOC completion certificate to the Departmental MOOC Coordinator.

The Coordinator will verify authenticity and maintain semester-wise records.

Verified certificates will be **forwarded to the Controller of Examinations (COE), GCE Karad.**



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Government College of Engineering, Karad
Final Year (Sem – VIII) B. Tech. Information Technology

IT3813: Internship

Teaching Scheme		Examination Scheme	
Lectures	-	MSE	-
Tutorials	-	ISE	250
Total Credits	12	ESE	250

Course Outcomes (CO): Students will be able to

CO1	Apply theoretical and technical knowledge to solve practical problems encountered in industry or research environments.
CO2	Analyze professional challenges and implement appropriate engineering solutions.
CO3	Develop effective teamwork, communication, and project management skills through hands-on experience.
CO4	Demonstrate professional ethics, discipline, and adaptability in real-world engineering contexts.

Guidelines for Semester VII (Mode-2 Internship)

The internship under **Mode-2** is applicable to students opting for a six-month internship during **Semester VII** of the B. Tech program. This provision facilitates early industry or research engagement immediately after the completion of the VI semester. Students must choose either Mode-1 or Mode-2 at the beginning of the semester.

The internship shall be of six months (one full semester) duration. Students can undertake their internship at:

- Recognized industries or Organizations relevant to their specialization.
- Research institutions or government organizations such as DRDO, ISRO, BARC, CDAC, or reputed universities.
- Start-ups and innovation centers working in areas like IoT, FPGA design, machine learning, and automation.
- Authorized training centers or industrial partners having a Memorandum of Understanding (MoU) with the institute.

All internships shall be undertaken with prior approval as per the Institution's Internship Policy. The internship is mandatory and shall be treated as a head of passing for the award of the B.Tech degree. It aims to provide experiential learning, professional exposure, and practical application of theoretical knowledge to real-world scenarios.

Mode of Internship

a) Research Internship

- Location: Reputed research Organizations, R&D laboratories, Centers of Excellence, or Incubation Centers.
- Objective: To gain exposure to research methodologies, advanced tools, and analytical techniques.
- Expected Outcome: Development of analytical reasoning, experimental proficiency, and technical writing skills for higher research or academic progression.

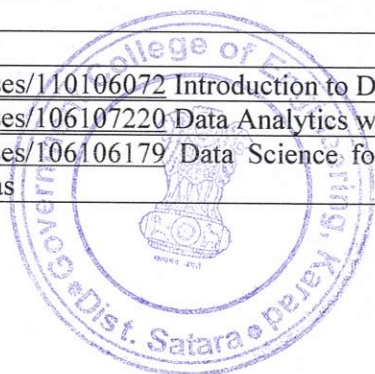
b) Industry Internship

- Location: Recognized industries, MSMEs, start-ups, or technology-driven companies.
- Objective: To gain hands-on experience in industrial environments and apply engineering knowledge to solve professional challenges.
- Expected Outcome: Strengthened professional competencies, teamwork, adaptability, and real-world problem-solving abilities.



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Government College of Engineering, Karad					
Final Year (Sem-VIII) B. Tech Information Technology					
IT3805: Multi-Disciplinary Minor –VI: Data Analytics					
Teaching Scheme			Examination Scheme		
Lectures	02 Hrs/week		MSE	20	
Tutorials	00 Hrs/week		ISE	20	
Total Credits	02		ESE	60	
			Duration of ESE	02 Hrs 30 Min	
Prerequisite : Machine Learning					
Course Outcomes (CO): Students will be able to					
CO1	Understand data analytics concepts, lifecycle, and applications.				
CO2	Explore basic statistical and data analytical techniques.				
CO3	Visualize data and Use popular data analytics tools.				
CO4	Analyze engineering case studies using data analytics.				
	Course Contents			CO	Hours
Unit 1	Introduction to Data Analytics: Overview of Data Analytics and Data Science, Types of Analytics: Descriptive, Diagnostic, Predictive, Prescriptive, Data Analytics lifecycle, Engineering applications of data analytics, (Self Study: Roles and responsibilities of a Data Analyst).			CO1	(05)
Unit 2	Data Acquisition and Pre-processing: Data types: Structured, Semi-structured, Unstructured, Data sources: Sensors, IoT, Logs, Databases, Web data, Data cleaning techniques, Handling missing values and outliers, Data transformation and feature scaling.			CO1 CO2	(05)
Unit 3	Exploratory Data Analysis and Statistics: Exploratory Data Analysis (EDA), Descriptive statistics, Probability distributions, Correlation and covariance, Engineering data interpretation.			CO2	(04)
Unit 4	Data Visualization and Reporting: Principles of effective visualization, Charts and plots: Bar, Line, Scatter, Histogram, Box plot, Multivariate visualization, Dashboards and reports, Visualization tools: Python, Matplotlib, (Self Study: Tableau/Power BI).			CO3	(05)
Unit 5	Analytical Models and Techniques: Linear regression and multiple regression, Classification basics: Logistic regression, KNN, Clustering concepts: K-Means, Model evaluation metrics.			CO3 CO4	(05)
Unit 6	Tools, Engineering Applications: Data analytics tools: Python, R, SQL, Engineering case studies: manufacturing, energy, communication, healthcare, Predictive maintenance and quality analytics, Ethics, privacy, and security in data analytics.			CO4	(04)
Text Books					
1.	Anil Maheshwari, "Data Analytics Made Accessible", McGraw Hill Education. (Unit: 1,2,3)				
2.	Wes McKinney, "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython", O'Reilly Media, 3rd Edition. (Unit: 4,6)				
3.	Peter Bruce, Andrew Bruce, "Practical Statistics for Data Scientists", O'Reilly Media, 2nd Edition. (Unit: 2,3,5)				
Reference Books					
1.	Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, "An Introduction to Statistical Learning", Springer				
2.	Han, Kamber, Pei, "Data Mining: Concepts and Techniques", Morgan Kaufmann				
3.	David Dietrich, Barry Hiller, "Data Science & Big Data Analytics", EMC education services, Wiley publications, 2012.				
Useful Links					
1.	https://nptel.ac.in/courses/110106072 Introduction to Data Analytics, Dr. Balaraman Ravindran IIT, Madras				
2.	https://nptel.ac.in/courses/106107220 Data Analytics with Python, Prof. A. Ramesh IIT, Roorkee				
3.	https://nptel.ac.in/courses/106106179 Data Science for Engineers Prof. Ragunathan Rengasamy, Prof. Shankar Narasimhan IIT, Madras				



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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	PSO 1	PSO 2
CO 1	2	2	2	1	1	-	-	-	-	-	-	1	1
CO 2	2	3	2	1	1	-	-	-	-	-	-	1	1
CO 3	2	2	1	1	2	-	-	-	-	-	-	1	2
CO 4	1	3	2	1	1	1	-	-	-	-	-	1	2

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

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	5	10
Understand	-	-	10
Apply	5	5	10
Analyse	5	5	20
Evaluate	5	5	10
Create	-	-	-
TOTAL	20	20	60



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Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
...

Year	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
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