

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

(Institute of National Importance) G.E. Road, Raipur – 492010 (CG) Phone: (0771) 22 54 200 Fax: (0771) 22 54 600 Email: director.nitrr@rediffmail.com Website: www.nitrr.ac.in

	National Institute of Technology Raipur											
			Computer	Appli	catio	n						
Course o	of Study and Sch	eme of Examination						MCA 5th	Semester		Branc	h:CA
			Periods per Week			Examinati		ion Scheme		Total		
S. No.	Subject Code	Subject Name		L T	P	TA	MSE/MTR		ESE/ESVE		Marks	Credits
					P		Theory	Prac.	Theory	Prac.		
1	CA405101CA	Distributed Computing	3	1	0	20	30	-	50	-	100	4
2	CA4052**CA	Elective-III	2	1	0	20	30	-	50	-	100	3
3	CA4052**CA	Elective-IV	2	1	0	20	30	-	50	-	100	3
4	CA4053##CA	Open Elective-II	2	1	0	20	30	-	50	-	100	3
5	CA405401CA	Computer Lab-501	0	0	4	40	-	20	-	40	100	2
6	CA405501CA	Minor Project-502	0	0	8	40	-	20	-	40	100	4
												19

**, ## are number to be filled from list of electives (Program and Open) prepared and maintained by the department

P	rogram Elective-III	Program Elective-IV		Open Elective-II		
Subject Code	Subject Name	Subject Code	Subject Name	Subject Code	Subject Name	
CA405201CA	1. Quantum Computing	CA405202CA	1. Parallel Processing	CA405301CA	1. Digital Image Processing	
CA405203CA	2. Cloud Computing	CA405204CA	2. Swarm Intelligence & Evolutionary Algorithms	CA405302CA	2. Pattern Recognition	
CA405205CA	3. Enterprise Resource Planning	CA405206CA	3. Mobile Computing			
CA405207CA	4. Cyber Law	CA405208CA	4. Biometrics			
CA405209CA	5. Decision Support System	CA405210CA	5. Information Retrieval			
		CA405211CA	6. Software Defined Network			
		CA405212CA	7. Software Testing			
		CA405213CA	8. Software Architecture and Management			



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	S	emester V		
1.	Department proposing the course	Computer Applications		
2.	Course Title	Distributed Computing		
3.	L-T-P Structure	3-1-0		
4.	Credits / # of period	04/42		
5.	Course number(Code)			
6.	Status (Core/Elective)	Core		
7.	Pre-requisites(course no./title)	Operating Systems and Computer Network		
8.	Frequency of offer			
9.	Course Objectives: 1. Learn the basics of distribut 2. Learn about IPC and Messa 3. Understand RPC and Sched	ed computing and network communication. ge passing in distributed computing. uling algorithm.		
10	4. Understand the concept of I	Distributed Shared Memory and Naming.		
	 Unit-1 Introduction to distributed comobjectives, characterization & classi Hardware & software issues, System distributed system. Coordination, symutual exclusion, election algoridistributed consensus. Unit-2 Models of distributed computing underlying protocols, IDL, marshareplication/ reliability, groups for multicast, atomic broadcast. Interplata representation and Marshallin Distributed Objects and Remote Imand notifications. 	 Aputing: Evolution of Distributed Computing, Motivation, fication of distributed systems, Distributed system architecture, a Models, Distributed computing environment, Design issues in ynchronization & consistency: Logical clocks, Physical clocks, thms, atomic broadcast, sequential consistency transaction Models of distributed computing: Client server, exceptions, lling etc. Group models and peer to peer: Groups for service parallelism and performance, client/ server vs. peer-to-peer, process Communication: API for Internet protocols. External ag. Client-Server communication between distributed objects, Events 		
	Unit-3			
	Remote communication and Distributed system management: Introduction to RPC: Model Transparency, Implementation, Stub generation messages and Communication protocols for RPCs Distributed system management: Task assignment approach, Load Balancing approach, Load Sharing Approach, Deadlocks in Distributed systems, Deadlocks in Message communication.			
	Unit-4			
	Distributed Shared Memory and DSM, Design issues in DSM syst systems, Naming: Overview, Featu mechanisms, Issues in designing hu	Naming: Distributed Shared Memory: Concepts, Hardware tems, Implementation issues, Heterogeneous and other DSM ures, Basic concepts, System oriented names, Object locating man oriented names, Name caches, Naming and security.		



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11.	Text B	Text Books:			
	1. 2.	Distributed Computing, Sunita Mahajan and Seema Shah, Oxford University Press Distributed Operating System – P.K.Sinha, PHI, 2008.			
12.	Reference Books :				
	1.	Distributed Systems: Concepts and Design, G. Coulouris, J. Dollimore, and T. Kindberg, Pearson Education			
	2.	Distributed Computing, Fundamentals, Simulations and Advanced topics, 2 nd Edition, Hagit Attiya and Jennifer Welch, Wiley India			



Semester	-V
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1.	Department proposing the course	Computer Applications.			
2.	Course Title	Quantum Computing			
3.	L-T-P Structure	2-1-0			
4.	Credits / # of period	03/32			
5.	Course number(Code)				
6.	Status (Core/Elective)	Elective			
7.	Pre-requisites(course no./title)	Calculus, linear algebra, probability, and familiarity with complex numbers are required. Prior exposure to quantum mechanics is helpful.			
8.	Frequency of offer				
9.	Course Objectives:				
	 The students will learn the fundamentals of quantum information science. Selected number of more advanced topics including few quantum versions of classical algorithms will be covered. 				
10.	Course Syllabus:				
	Unit-1				
	Quantum building blocks, Single qubit systems, Quantum Mechanics of Photon Polarization, Single qubit measurement, a quantum key distribution protocol, the state space of single qubit system. Multiple qubit systems, tensor products, state space of n-qubit system, Entangled States, Quantum Key Distribution Using Entangled States.				
	Unit-2				
	Measurement of Multiple-Qubit States, Dirac's Bra/Ket Notation, Projection Operators for Measurement, Hermitian Operator Formalism for Measurement, EPR Paradox and Bell's Theorem, Quantum State Transformations, The No-Cloning Principle, Some Simple Quantum Gates, The Pauli Transformations, The Hadamard Transformation, Multiple-Qubit Transformations from Single-Qubit Transformations, The Controlled-NOT and Other Singly Controlled Gates. Applications of Simple Gates. Realizing Unitary Transformations as Quantum Circuits.				
	Unit-3				
	Quantum Versions of Classical Computations, From Reversible Classical Computations to Quantum Computations, Reversible Implementations of Classical Circuits. A Language for Quantum Implementations., Example Programs for Arithmetic Operations. Introduction to Quantum Algorithms, Computing with Superpositions, Notions of Complexity, Deutsch's Problem, Quantum Subroutines, Few Simple Quantum Algorithms.				
	Unit-4				
	Shor's Factoring Algorithm, The Efficiency of Shor's Algorithm, The Discrete Logarithm Problem, Hidden Subgroup Problems, Framework for Quantum Error Correcting Codes, Fault Tolerance and Robust Quantum Computing.				



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11.	Text Books:		
	 Rieffel & Polak, Quantum Computing-A Gentle Introduction-The MIT Press (2011). David J Griffiths, Introduction to Quantum Mechanics, Cambridge India (2016). 		
12.	 Reference Books : 1. N. D. Mermin, Quantum Computer Science: An Introduction, Cambridge Univ. Press (2007) 		



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Semester-V

1.	Department proposing the course	Computer Applications			
2.	Course Title	Cloud Computing			
3.	L-T-P Structure	2-1-0			
4.	Credits / # of period	03/32			
5.	Course number(Code)				
6.	Status (Core/Elective)	Elective			
7.	Pre-requisites(course no./title)				
8.	Frequency of offer				
9.	Course Objectives:				
	 This course will help the students to get familiar with cloud computing fundamentals. The objective of the course is to study various platforms for cloud computing. To motivate students to do programming and experiment with the various cloud computing environments. To explore the applications based on cloud computing. 				
10.	Course Syllabus:				
	Unit-1				
	Introduction: Cloud computing at a glance: vision of cloud computing, defining a cloud, Historical development, Building cloud computing Environments, Types of cloud, Cloud Service Models: Software as a Service (SaaS), Infrastructure as a Service (IaaS), Platform as a Service (PaaS).				
	Unit-2				
	Virtualization: Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples.				
	Unit-3				
	Cloud Computing Architecture: Cloud Reference Model, Economics of the Cloud, Open Challenges, Cloud Application Platform, Cloud Programming and Management High-Throughput Computing: Task Programming: Task Computing, Task-based Application Models.				
	Unit 4				
	Cloud Application and Development: Cloud Application Development Platforms: Amazon web services, Google App Engine, Microsoft Azure, Scientific Applications, Business and consumer applications, Advanced Topics in Cloud Computing: Energy efficiency in clouds, Market-based management of clouds, Introduction to green computing.				



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11.	Text Books:			
	1. 2.	Mastering Cloud Computing Foundations and Applications Programming: Rajkumar Buyya, Christian Vecchiola, S.ThamaraiSelvi - Morgan Kaufmann (2013). Barrie Sosinsky, "Cloud Computing Bible" John Wiley & Sons, 2011.		
12.	Reference Books :			
	1. 2.	Kai Hwang, Geoffrey C. Fox and Jack J. Dongarra, "Distributed and cloud computing from Parallel Processing to the Internet of Things", Morgan Kaufmann, Elsevier, 2013. Tim Mather, Subra Kumaraswamy, and Shahed Latif, Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance, O'Reilly 2009.		



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Semester-V

1.	Department proposing the course	Computer Applications			
2.	Course Title	Enterprise Resource Planning			
3.	L-T-P Structure	2-1-0			
4.	Credits / # of period	03/32			
5.	Course number(Code)				
6.	Status (Core/Elective)	Elective			
7.	Pre-requisites(course no./title)				
8.	Frequency of offer				
9.	Course Objectives:				
	 To provide a contemporary and forward-looking on the theory and practice of ERP Technology. To focus on a strong emphasis upon practice of theory in Applications and Practical oriented approach. To train the students to develop the basic understanding of how ERP enriches the business organizations in achieving a multidimensional growth. To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills. 				
10.	Course Syllabus: Unit-1 Concentual foundation of Rusiness Process recognized in the second state of the se				
	BPR; Process improvement and Process redesign, Process identification and mapping; Role/Activity diagrams, Process Visioning, and benchmarking.				
	Unit-2				
	Enterprise Resource Planning : Evolution of ERP- MRP and MRP II, structure of ERP- two tier architecture, three tier architecture, Electronic data processing, management information system, Executive information system, ERP as an integrator of information needs at various Levels.				
	Unit-3				
	Typical Business Processes: Core processes, Product control, Sales order processing, Purchases, Administrative processes, Human resource, Finance support processes, Marketing, Strategic planning, Research and development, Problems in traditional view.				
	Unit-4				
	ERP models / functionality: Sales order processing, Production scheduling, forecasting, distribution, finance, features of each of the models, description of data flow across each module, Overview of supporting databases, ERP implementation issues.				



11.	Text Books:				
	1.	Enterprise Resource Planning-A managerial perspective, Veena Bansal, pearson education, 2013.			
	2.	Enterprise wide Resource Planning-theory and practice, Rahul V. Altekar, PHI			
12.	12. Reference Books :				
	1.	ALEXIS LEON: Enterprise Resource Planning, TMH.			
	2.	V. RAJARAMAN: Analysis and Design of Information Systems, PHI.			
	2	MONK' & DRADY: Concepts in EDD Vilses rule Thomson			
	5.	MOINE & DEAD I. Concepts III EEF, VIKas pub, I Hollisoli.			



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	Semester-V				
1.	Department proposing the course	Computer Applications			
2.	Course Title	Cyber Law			
3.	L-T-P Structure	2-1-0			
4.	Credits / # of period	03/32			
5.	Course number(Code)				
6.	Status (Core/Elective)	Elective			
7.	Pre-requisites(course no./title)				
8.	Frequency of offer				
9.	Course Objectives:				
	 Enable learner to understand, explore, and acquire a critical understanding Cyber Law. Develop competencies for dealing with frauds and deceptions and other cyber crimes that are taking place via the Internet. Make learner conversant with the social and intellectual property issues emerging from Cyberspace. Develop the understanding of relationship between commerce and cyberspace. 				
10.	Course Syllabus:				
	Unit 1 Fundamentals of Cyber Law: Jurisprudence of Cyber Law, Object and Scope of the IT Act 2000, Introduction to Indian Cyber Law, Unicitral Model Law, ISP Guideline. Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, Copy Right, Trademark law, Law related to Semiconductor layout & design. Unit 2 E -Commerce:				
	Security Threats to E -Commerce, Virtual Organization, Business Transactions on Web, Governance and EDI, Concepts in Electronics payment systems, E-Cash, Credit/De Cards, E-Agreement, Legal recognition of electronic and digital records, E-Commer Issues of privacy, Wireless Computing-Security challenges in Mobile devices. Digital Signatures -Technical issues, legal issues, Electronic Records, Digital Contrac Requirements of Digital Signature System.				
	Unit 3 Investigation and Ethics:				
Cyber Crime, Cyber jurisdiction, Cyber crime and evidence act, Treatment of difficult countries of cyber crime, Ethical issues in data and software privacy, Plagia Pornography, Tampering computer documents, Data privacy and protection, Domain I System, Software piracy, Issues in ethical hacking.					



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	Unit 4		
	Internet security threats:		
	Hacking, Cracking, Sneaking, Viruses, Trojan horse, Malicious Code & logic bombs. Introduction to biometric security and its challenges, Finger prints. Cyber crime forensic: CASE STUDY in Cyber Crime.		
11.	Text Books:		
	1 Cuber Law in India" Faroog Ahmad Pioneer books		
	2. K. K. Singh, Akansha Singh "Information Security and Cyber law" Umesh		
	Publication, Delhi		
	3."Cyber law and Information Security"-Faiyaz Ahamad, DreamTech press		
10			
12.	Reference Books :		
	1. "Cyber Law in India" -Farooq Ahmad-Pioneer books.		
	2. K. K. Singh, Akansha Singh "Information Security and Cyber law", Umesh		
	Publication, Delhi		



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1.	Department proposing the course	Computer Applications	
2.	Course Title	Decision Support System	
3.	L-T-P Structure	2-1-0	
4.	Credits / # of period	03/32	
5.	Course number(Code)		
6.	Status (Core/Elective)	Elective	
7.	Pre-requisites(course no./title)		
8.	Frequency of offer		
9.	Course Objectives:		
	 To provide knowledge of n business environment. 	nanagerial decision making and information systems used in a	
	2. To introduce decision support systems, demonstrate DSS development approaches, and show students how to utilize DSS capacities to support different types of decisions.		
	3. To introduces knowledge-based systems such as Expert System to the student.		
	4. To impart the concept of N the students.	Multi Criteria Decision Analysis (MCDA) and its method with	
10.	Course Syllabus:		
	Unit 1		
	Human Decision Making Process model of decision making, classific Kepner-Tregoe decision making me	: Human Information Processing, What is a decision, simon's cation of decision, how business people make decisions, The thod, types of information system.	
	Unit 2		
	Decision Support System (DSS) : Introduction, evolution of DSS, benefits of DSS, sub systems in DSS, types of DSS, architecture of DSS, models in DSS, Group decision support system(GDSS)		
	Unit 3		
	Knowledge-based systems : Conce Expert Systems, applications of Exp work, capabilities and limitations acquisition, representation, and rease	pts and definitions of Artificial Intelligence, basic concepts of pert Systems, structure of Expert Systems, how Expert Systems of Expert Systems, types of Expert Systems, knowledge oning.	
	Unit 4		
	Multi Criteria Decision Analy classification of MCDA methods, Se	ysis: Introduction, Decision problems, MCDA methods, election of MCDA methods.	

Semester V



11.	Text Books:		
	1. Decision Support and Data Warehouse Systems by Efrem G. Mallach, Tata McGraw-Hill.		
	2.	Decision Support Systems And Intelligent Systems by Efraim Turban, Prentice-Hal of India.	
12.	Reference Books :		
	1.	Decision Support Systems by V. S. Janakiraman, PHI.	
	2.	Multi-CriteriaDecision Analysis: Methods and Software by Alessio Ishizaka, Wiley.	



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Semester-V

1.	Department proposing the course	Computer Applications	
2.	Course Title	Parallel Processing	
3.	L-T-P Structure	2-1-0	
4.	Credits / # of period	03/32	
5.	Course number(Code)		
6.	Status (Core/Elective)	Elective	
7.	Pre-requisites(course no./title)	Algorithms, Data structures, Computer architecture.	
8.	Frequency of offer		
9.	Course Objectives:		
10	 Learn the Basic concept of parall Understand the Principles of Pip Learn the structure of array proceder Understand the multiprocessor at 	lel processing. elining and Vector Processing. essors and different algorithms. rchitecture, Parallel Memory Organizations.	
10.	Course Syllabus:		
	UNIT-1:		
	Introduction to parallel processing:Trends towards parallel processing; Parallelism in Uniprocessor systems, Parallel ComputerStructures: Pipeline computers, Array computers, Multiprocessor systems, Performance of ParallelComputers; Architectural classification schemes; Parallel processing applications.UNIT-2:		
	Principles of Pipelining and Vector Processing: Principles of Linear Pipelining, Classification of Pipelined processors, General pipelines & Reservation tables, Instruction and Arithmetic Pipelines, Vector Processing: characteristics Multiple Vector Task Dispatching, Pipelined Vector Processing methods.		
	UNIT-3:		
	Structure of Array Processors: SIMD Array Processors, SIMD Interconnection Networks, Performance Enhancement methods; Associative Array processing: Associative Memory Organization, Associative Processors. Algorithms on Array processors; Parallel Algorithms on Array Processors.		
	UNIT-4		
	Multiprocessor architecture: Multiprocessor Architecture, Inte Concurrency for multiprocessors, H interleaved memory; Multiprocessor 3	rconnection Networks for multiprocessors, Exploiting Parallel Memory Organizations: High order & Low order Scheduling strategies.	



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11.	Text Books:	
	1.Computer Architecture & parallel Processing- Kai Hwang & A. Briggs (McGraw Hill) 2.Advanced Computer Architecture: parallelism, Scalability, Programmability by: Kai Hwang(TMH)	
12.	Reference Books :	
	 Designing Efficient Algorithms for Parallel Computers – H.J. Quinns (McGraw- Hill) Computer Organization & Programming – By – Gear (TMH) Parallel Processing for Supercomputers & Artificial Intelligence –By – Hwang & Degroo 	



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Semester V

1.	Department proposing the course	Computer Applications	
2.	Course Title	Swarm Intelligence & Evolutionary Algorithms	
3.	L-T-P Structure	2-1-0	
4.	Credits / # of period	03/32	
5.	Course number(Code)		
6.	Status (Core/Elective)	Elective	
7.	Pre-requisites (course no./title)	Knowledge of complexity classes of P, NP, NP-Hard, NP- Complete, C language	
8.	Frequency of offer		
9.	Course Objectives :		
	 To understand the concepts of heuristics, metaheuristic techniques and approximation methods. To introduce the techniques of Swarm and Evolutionary Algorithms Explore and use of SI and EAs where there are no known polynomial time algorithms for COPs. 		
10.	Course Syllabus:		
	Unit-1		
	Introduction: Approximate Methods, Heuristics, Metaheuristic Techniques and Local Search.		
	Unit-2		
	Introduction to Evolutionary Algorithms: Genetic Algorithms: Genetic Algorithms: Elementary Concepts, Genetic algorithm, Subset-Coded Genetic Algorithm, Permutation-Coded Genetic Algorithm, Grouping-based Genetic Algorithm. Unit-3		
	Introduction to Swarm Intelligence Techniques: Basic concepts, examples of Swarm Intelligence Techniques such as Ant-Colony Optimization and Artificial Bee Colony Algorithm.		
	Unit-4		
	Warm-up to Swarm Intelligence and swarm intelligence techniques and e problem, TSP problem, job-schedulir	Evolutionary Algorithms: Introduction to implementation of evolutionary algorithm on some COPs such as 0/1 Knapsack ag problem, bin packing problem.	



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11.	 Text Books: 1. Genetic Algorithm in Search Optimization and Machine Learning, D. E. Goldberg, Pearson Education, 1989. 3. Ant-Colony Optimization, M. Dorigo and T Stutzle, PHI, 2004.
12.	 Reference Books : An Introduction to Genetic Algorithms, Melanie Mitchell, PHI, 1998. Essentials of Metaheuristics, Sean Luke, 2015, (http://cs.gmu.edu/~sean/book/metaheuristics/) Metaheuristics: From Design to Implementation, El-GhazaliTalbi, Wiley, 2009 D.Karaboga, B.Gorkemli, C.Ozturk, N.Karaboga: A Comprehensive survey: artificial Beecolony (ABC) algorithm and applications, Artificial Intelligence Review, vol 42, page 21-57, 2014 Springer



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Semester-V

1.	Department proposing the course	Computer Applications	
2.	Course Title	Mobile Computing	
3.	L-T-P Structure	2-1-0	
4.	Credits / # of period	03/32	
5.	Course number(Code)		
6.	Status (Core/Elective)	Elective	
7.	Pre-requisites(course no./title)		
8.	Frequency of offer		
9.	Course Objectives:		
	 To understand the basic conc To be familiar with the network To learn the basics of mobile To get knowledge about mobile 	epts of mobile computing. ork protocol stack. telecommunication system and Ad-Hoc networks. oile platforms and application issues.	
10.	Course Syllabus:		
	Unit-1		
 Current Wireless Systems: Overview of Paging Systems, Cordless Phones, Cellular Te Systems, Satellite Communication, Wireless LANs, Bluetooth, Medium access Telecommunication Systems, GSM Satellite Systems, Broadcast Systems Overview, Repetition of Data, Digital Audio Broadcasting, Digital Video Broadcasting. Unit-2 Wireless Standards: Wireless LAN, IEEE 802.11,Infrared Vs Radio Transmission, HIPERLAN, Bluetooth V ATM, Services, Reference Model, Radio Access Layer, Location Management, Addressing 			
	Encapsulation, Optimization Reverse Tunneling, IPv6, DHCP, Ad-hoc Networks. Unit 3		
Mobile Transport Layer & Wireless Application Protocol: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Transmission/T Selective Retransmission, Transaction oriented TCP, Datagram Protocol, Transpor Transaction Protocol, Session Protocol, Application Environment, Wireless Teleph		as Application Protocol: Nooping TCP, Mobile TCP, Transmission/Timeout Freezing n oriented TCP, Datagram Protocol, Transport Layer Security, ol, Application Environment, Wireless Telephony.	
	Unit 4		
	Application Issues: Dynamic DNS File System, Syncl Analysis of existing wireless netwo Signaling, GSM mobility management	hronization Protocol, Context aware applications, Security, ork, GSM Systems Overview, Security, Data Services N/W nt, Operations, Administration and maintenance.	



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11.	Text Books:	
	 J Schiller, 'Mobile Communication', Addison Wesley, 2000. John Wiley, 'Mobile Communication Design Fundamentals', 1993. 	
12.	Reference Books :	
	 Wireless Communication and Networks, Pearson Education, 2003. WAP-Wireless Application Protocol, Pearson Education, 2003 	



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attack. Privacy models.

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Semester V Department proposing the course **Computer Applications** Course Title **Biometrics L-T-P Structure** 2 - 1 - 003/32 Credits / # of period Course number(Code) Status (Core/Elective) Elective Pre-requisites(course no./title) Frequency of offer Course Objectives: Describe the principles of the three core biometric modalities (face, fingerprint and iris), 1. and know how to deploy them in authentication scenarios; 2. Organize and conduct biometric data collections, and apply biometric databases in system evaluation; 3. Calculate distributions of within- and between-class matching scores, and calculate various error estimates based on these distributions; 4. Identify the privacy and security concerns surrounding biometric systems, and know how to address them in such a way that balances both Course Syllabus: Unit-1 The Basics of Biometrics: Overview of field and applications. Development of biometric authentication. Basic terms, biometric data, biometric characteristics, biometric features, biometric templates and references. Expected properties of biometric identifiers. Basics in biometric errors estimation. Enrollment, verification and identification. Face Recognition: Face Processing Pipeline: acquisition, face detection, alignment, feature extraction, matching. Classic subspace methods. Hand-tuned feature descriptors. Deep learning architectures for face representation learning. Face matching techniques, Face recognition in video. Unit-2 **Fingerprint Recognition:** Fingerprint capture, sensor types, latent fingerprints. Fingerprint image preprocessing, segmentation, binary and skeletal images. Fingerprint singularities, detection of loops, deltas, whirls and cores, using singularities in fingerprints classification. Galton's details, base and complex minutiae, detection of minutiae. Fingerprint recognition, minutiae- and correlation-based methods. Fingerprints in forensics and biometrics, similarities and differences. Unit-3 **Iris Recognition:** Eye and iris morphogenesis, genetic penetrance. Principles of iris image capture, iris sensors. Iris image preprocessing, segmentation, formatting and filtering. Daugman's method, iris code, statistical properties of the iris code. Other iris coding methods, wavelet analysis. Multi-Biometric Fusion and Levels of fusion: sensor, feature, rank, decision. Score normalization and fusion rules. Quality-based fusion and failure prediction. Biometric System Security: Secure transfer of biometric data. Secure storage, use of smart cards, principles of match-off-card and match-on-card techniques. Biometrics in the cloud. Points of



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Unit - 4

Spoofing, Static and dynamic liveness features. What we want to detect (subversive actions) vs. what we can detect (suspicious actions). Liveness detection in biometrics. Selected liveness detection techniques, frequency analysis for paper printouts detection, pupil dynamics and blood pulse analyses for detection of sophisticated eye and finger spoofing trials.

Template Protection, Overview of principles from cryptography that help us secure fuzzy data. Template protection strategies: feature protection, key-binding, key-generating, hybrids. Overview of fuzzy vaults, fuzzy commitment, fuzzy extractors and revocable biotokens. Bio-cryptographic infrastructures for secure template management.

11. Text Books:

- 1. Jain, A.K., Flynn, P. and Ross, A. Handbook of Biometrics. 2008.
- 2. Li, S.Z. and Jain, A.K. Handbook of Face Recognition. Second Edition 2011.
- 3. Maltoni, D., Maio, D., Jain, A.K. and Prabhakar, S. Handbook of Fingerprint Recognition. Second Edition 2009.
 - 4. Burge, M.J. and Bowyer, K. Handbook of Iris Recognition. 2013.
 - 5. Marcel, S., Nixon, M.S. and Li, S.Z. Handbook of Biometric Anti-Spoofing. 2014.

12. **Reference Books :**

- 1. Ross, A., Nandakumar, K. and Jain, A.K. Handbook of Multibiometrics. 2006.
- 2. Li, S.Z. and Jain, A.K. Encyclopedia of Biometrics. First Edition 2009.



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Semester -V

1.	Department proposing the course	Computer Applications
2.	Course Title	Information Retrieval
3.	L-T-P Structure	2-1-0
4.	Credits / # of period	03/32
5.	Course number(Code)	
6.	Status (Core/Elective)	Elective
7.	Pre-requisites (course no./title)	Data Science, Programming Logic, Probability and statistics
8.	Frequency of offer	
9.	 Course Objectives: The student will learn the un system. Develop basic understanding information retrieval system Develop the skills of Evaluati The student will understand 	derlying technologies of modern information retrieval g of algorithms, design, and implementation of modern s. on methods used in Information Retrieval System. the applications of Information Retrieval Systems
	 10. Course Syllabus: Unit-1 Introduction to Information Retrieval: Basic building blocks of a modern search engine systelincluding web crawler, basic text analysis techniques, inverted index, query processing, search result interface. Preprocessing of text documents: Tokenization, Stop words, Stemming, Inverted index, Skip pointers, Phrase queries. Unit-2 Retrieval model, a.k.a., ranking algorithm, classical retrieval models: including Boolean, vector space, probabilistic and language models. Wild card queries, Permuterm index, Bigram index, Spelling correction, Edit distance, Jaccard coefficient, Soundex, learning-based ranking algorithms, i.e. learning-to-rank. Term Weighting and Vector Space Model. Eigen vectors, Sing value decomposition, Low-rank approximation, Problems with Lexical Semantics, PCA. Unit-3: Text Classification and Text Clustering algorithms. Retrieval evaluation: The classical evaluation confusion Metrics, Performance metrics : Precision, Recall, F1_Macro, F1_Micro, Accuracy, I Loss, ROC, AUC, etc. Unit-4. 	
	Relevance feedback to enhance r algorithm, link analysis techniques systems, including recommendation search. Content based image retrieva	etrieval performance, Link analysis, google's page rank for social network analysis, modern applications in search , personalization, and online advertising. XML Indexing and



राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर

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11.	Text Books:
	 Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, 2007. Search Engines: Information Retrieval in Practice. Bruce Croft, Donald Metzler, and Trevor Strohman, Pearson Education, 2009.
12.	Reference Books :
	 Information Retrieval: Implementing and Evaluating Search Engines. Stefan Buttcher, Charlie Clarke, Gordon Cormack, MIT Press, 2010 Modern Information Retrieval. Baeza-Yates Ricardo and Berthier Ribeiro-Neto. 2ndedition, Addison-Wesley, 2011



Semester -	V
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1.	Department proposing the course	Computer Applications
2.	Course Title	Software Defined Network
3.	L-T-P Structure	2-1-0
4.	Credits / # of period	03/32
5.	Course number(Code)	
6.	Status (Core/Elective)	Elective
7.	Pre-requisites(course no./title)	Computer Networks & TCP/IP Protocol Suits
8.	Frequency of offer	
9.	Course Objectives:	
	 Letting students the new Letting students know how S Engineering, Routing Optim data centers and cloud comp Letting the students know cu Software Defined Optical New Wireless Sensor Networks, S Vehicular Networks. Introducing the Students how should be used in enterprises its performance. 	SDN can be used in many currently research fields like Traffic ization, Resource Management, etc in complex networks like uting. rrent trends of SDN like Software Defined Internet of Things, etworks, Software Defined Edge Computing, Software Defined Software Defined Mobile Networks, Software Defined w vendor free, less expensive, centrally controlled networks in place of traditional network architecture without degrading
	 Unit-1 Introduction to SDN and Open fl (SDN): Introduction to SDN, Con- separating Control Plane and Data Pl Flow protocol. Unit-2 Network Virtualization and Minit in and Type 2), Applications and Adv Network Virtualization Framework (Unit-3 Dealing with Control and Data Plaswitches. Controlling the behavior of Control Plane: Comparative study ONOS, Floodlight etc. 	how: History and Evolution of Software Defined Networking nparison of Traditional Network and SDN, Advantages of ane, IETF Forces, Active Networking. Detailed study of Open net: Network Virtualization: Introduction, Hypervisor (Type 1 antages & Disadvantages of Network Virtualization, Existing VMWare and others), and Exploring Mini net.



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Unit-4

SDN in implementation: Introduction to North, Southbound, East/West Bound interface, controlling the behavior of Data plane using Control plane. Network Service Chaining. Exploring SDN for Network Security, Traffic Engineering, Routing Optimization, and Resource Management in the complex networks like Data Center Networks.

11.	Text Books:	
	1.	SDN: Software Defined Networks, An Authoritative Review of Network Programmability
	2.	Software Defined Networks: A Comprehensive Approach, by Paul Goransson and Chuck
		Black, Morgan Kaufmann
12	Doforo	ncos •
12.	Kelerences :	
	1.	SDN and Open Flow for Beginners by Vivek Tiwari, Sold by: Amazon Digital Services,
		Inc., ASIN.
	2.	Network Innovation through Open Flow and SDN: Principles and Design, Edited by Fei
		Hu, CRC Press.
	3.	Open Networking Foundation (ONF) Documents, https://www.opennetworking.org,
	4.	Mininet <u>http://mininet.org/</u> and https://github.com/mininet/mininet/wiki/Introduction-to-
		Mininet
	5.	Open Flow standards, <u>http://www.openflow.org</u> .



Semester V	V
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1.	Department proposing the course	Computer Applications
2.	Course Title	Software Testing
3.	L-T-P Structure	2-1-0
4.	Credits / # of period	03/32
5.	Course number(Code)	
6.	Status (Core/Elective)	Elective
7.	Pre-requisites(course no./title)	
8.	Frequency of offer	
9.	Course Objectives:	
	 Identify the reasons for bugs a remove bugs. Implement various test proce Apply the software testing tec Provides practical knowledge of some of the trade-offs betw 	and analyze the principles in software testing to prevent and sses for quality improvement. chniques in commercial environments. of a variety of ways to test software and an understanding yeen testing techniques.
10.	Course Syllabus:	
	Unit-1	
	Testing Methodology: Introduction and Model for Software Testing. E Software Failure Case Studies, methodology, Verification and Valio	on, Goals of Software Testing, Software Testing Definitions, ffective Software Testing Vs Exhaustive Software Testing, Software Testing Life Cycle (STLC), Software Testing dation.
	Unit-2	
	Testing Techniques: Dynamic Te Static Testing. Validation Activities. testing types, regression testing tec	esting: Black Box testing, White box Testing Techniques, Regression Testing, Progressive vs. Regressive, regression chniques.
	Unit-3	
	Managing the Test Process: Te Monitoring and Controlling the Tes the test suite and its benefits, tes effectiveness.	est Management, Software Metrics, Testing Metrics for sting Process, Efficient Test Suite Management: minimizing t suite minimization problem, techniques and measuring
	Unit- 4	
	Test Automation: Automation and T Software, Software Quality Manager characteristics, ISO 9000:2000, softw	Testing Tools, Study of testing tools, Testing Object Oriented nent, McCall's quality factors and Criteria, ISO 9126 quality are quality management.



11.	I. Text Books:	
	 Software Testing Principles and Practices Naresh Chauhan Ox Effective Methods for Software Testing, third edition b 	ford Higher Education. y Willam E. Perry, Wiley
	Publication.	
	3. Software Testing and quality assurance theory and pr	actice by KshirasagarNaik,
	Priyadarshi Tripathy, Wiley Publication.	
12.	Reference Books:	
	3. Software Testing Concepts and Tools by Nageswara Rao Pust	uluri, dreamtech press.
	4. Foundation of Software Testing 2 e , by Aditya P. Mathur, Per	arson publication.
	5. Software Testing Tools by Dr. K.V.K.K. Prasad, dreamtech pr	ress.
	6. Software Testing Principles, techniques and tools by M publication.	I.G. Limaye, McGraw Hill



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Semester -V

1.	Department proposing the course	Computer Applications	
2.	Course Title	Software Architecture and Management	
3.	L-T-P Structure	2-1-0	
4.	Credits / # of period	03/32	
5.	Course number(Code)		
6.	Status (Core/Elective)	Elective	
7.	Pre-requisites(course no./title)	Software Engineering	
8.	Frequency of offer		
9.	Course Objectives:		
	1 To know the issues related to	the design of complex software	
	2. To learn the project managen	nent concepts and the use of tools.	
	3. To inculcate understanding a	bout activities involved in various project management	
	phases.		
	4. To elucidate various process	models and describe issues related with quality assurance.	
10.	Course Syllabus:		
	Unit-1		
	Software components - COTS and infrastructure - Software variability management-Software architecture design methods - Architecture evaluation and assessment methods - architectural styles.		
	Unit-2		
	Design Patterns - Evolution patterns - Software artifact evolution processes - Case studies - Java Beans. Product, Process and Project – Definition – Product Life Cycle – Project Life Cycle Models.		
	Unit-3		
	Format Process Models And Their Us and CMM Models and their relevance Metrics – Configuration Management	se -Definition and Format model for a process – The ISO 9001 te to Project Management –Emerging Models - People CMM- t – Software Quality Assurance – Risk Analysis.	
	Unit-4		
	Engineering and People Issues Development, Testing, Maintenance, in Each Phase – Special Consider Distribution Issues.	in Project Management-Phases (Requirements, Design, Deployment) –Engineering Activities and Management Issues ations in Project Management for India and Geographical	



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11.	Text Books:		
	 Len Bass, Paul Clements, and Rick Kazman, "Software Architecture in Practice", 2nd Edition, Addison-Wesley Longman, Inc., Reading, MA, 2003. Richard N.Taylor, Nenad Medvidovic, and Eric M.Dashofy, "Software Architecture: Foundations, Theory and Practice", Wiley India Edition, 2012. 		
12.	 Reference Books: 1. Mary Shaw, and David Garlan ," Software Architecture in Practice: Perspectives on an Emerging Discipline", PHI Learning Private Limited, 2010. 2. Ramesh and Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001. 		



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1.	Department proposing the course	Computer Applications
2.	Course Title	Digital Image Processing
3.	L-T-P Structure	2-1-0
4.	Credits / # of period	03/32
5.	Course number(Code)	
6.	Status (Core/Elective)	Elective
7.	Pre-requisites(course no./title)	
8.	Frequency of offer	
9.	 Course Objectives: To become familiar with digitality. To get exposed to simple imationality. To learn the techniques of imtion. To become familiar with images. 	tal image fundamentals. ge enhancement techniques in Spatial and Frequency domain. age compression and segmentation ge transformation and recognition methods.
10.	Unit-1 INTRODUCTION & FUNDAME resolution, Image enhancement in spe Equalization, Histogram Specificatio Image Sampling and Quantization.	ENTALS : Image formation model, Spatial & Gray level ecial domain: Piecewise Transformation Functions, Histogram n, Image Averaging, Image Filtering, Canny Edge Detector,
	Unit-2 Image Enhancement in Spatial De Enhancement using Arithmetic and L Image Enhancement in the Freque Smoothing& Sharpening, Convolut Boundary Detection, Thresholding, R	Demain: Gray Level Transformations, Histogram Processing, ogic Operations, Spatial Filtering. Tency Domain: Introduction to FT and Frequency Domain, ion, Line Detection, Edge Detection, Edge Linking and egion Based Segmentation.
	Unit-3	
	IMAGE COMPRESSION: Image O Free Compression, Compression Tec etc. Image Compression Standard Watermarking.	Compression Models, Elements of Information Theory, Error chniques: Run length coding, Huffman coding, LZW coding ls, DCT, JPEG, MPEG Video Compression Standards,
	Unit-4	
	MORPHOLOGICAL IMAGE P Algorithms, Connected Components Restoration & Reconstruction. Color 2 IMAGE RECOGNITION: Repr Recognition based on decision theore	PROCESSING: Erosion, Dilation, Basic Morphological, Thinning, Skeletons, Image Registration, Basics of Image Image Processing: Color Fundamentals, Color Models. esentation, Boundary descriptors, Regional descriptors, tic & structural methods, Classification.

Semester -V



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11. Text Books:

- 1. Digital Image Processing by Rafael .C .Gonzalez and Richard. E.
- 2. Digital Image Processing by William K. Pratt 3rd Edition John Wiley and Sons Inc.

12. **Reference Books :**

- 1. A. K Jain, Fundamentals of image processing, prentice hall, Eagle cliffs, New Jersey, 1989
- 2. Chanda & Majumdar, Digital image processing and analysis, PHI, 2003
- 3. P. Suetens, Fundamentals of image processing, Cambridge University Press, 2002.
- 4. R. C. Gonzalez, R. E. Woods, S. L. Eddins, Digital Image Processing Using MATLAB(R), Course Technology, 1 edition, 2004



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1.	Department proposing the course	Computer Applications
2.	Course Title	Pattern Recognition
3.	L-T-P Structure	2-1-0
4.	Credits / # of period	03/32
5.	Course number(Code)	
6.	Status (Core/Elective)	Elective
7.	Pre-requisites(course no./title)	
8.	Frequency of offer	
9.	 Course Objectives: Understand the concept of a precognition and machine intel Understand the basic methods Understand and apply both su and characterize patterns in record behavior 	battern and the basic approach to the development of pattern lligence algorithms s of feature extraction, feature evaluation, and data mining upervised and unsupervised classification methods to detect eal-world data cognition algorithms that can be used to study algorithm
10.	Course Syllabus: Unit-1	
	Introduction: Definitions, data sets for Pattern Different Paradigms of Pattern Recognition Representations of Patterns and Classes, Metric and non-metric proximity measures Feature extraction.	
	Unit-2	
	Bias and Variance, Advance Classif Bagging Algorithms, Random Forest,	fication Techniques Support Vector Machine, Boosting and Associative Classifiers.
	Unit-3	
	Introduction to Neural Networks , AN Deep Learning , Training Deep Netwo	NN classification techniques, Regularization, Introduction to orks
	Unit-4	
	Recent advances in Pattern Recognit Pattern Recognition, Neuro fuzzy class	tion, SVMs, Kernel SVM, Combining classifiers, Statistical ssification.

Semester -V



11.	Text Books:	
	1.C.M. Bishop, "Pattern Recognition and Machine learning", Springer.2.Pattern Classification, Duda, Hart & Stork John Wiley.	
	3.Pattern Recognition and Image Analysis" by Arl Gose, Johnson baugh, Jost, PHI.	
12.	Reference Books :	
	1. "Pattern Recognition: Technique and Applications" by Rajjan Shinghal, Oxford.	
	2."Pattern Recognition Principles" by J.T. Tou and R.C. Gonzalez, Addison Wesley.	
	3.Duda & Hart P.E, Pattern Classification and Scene Analysis, John Wiley and Sons, NY.	
	4.Fu K.S., Syntactic Pattern Recognition And Applications, Prentice Hall, Englewood cliffs, N.J.	



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Computer Lab 501 (Cloud Computing)

- 1 Create a word document of your class time-table and store on cloud with doc and pdf format.
- 2 Prepare a powerpoint presentation on the cloud on a topic of your choice.
- 3 Create your resume and store it on the cloud.
- 4 Case study on different cloud environments (e.g., Google, Zoho, OpenStack etc.).
- 5 Online cloud based editor (e.g., Overleaf).
- 6 Case study on Github (Program sharing platform).
- 7 Develop a program of your choice and share it for collaboration work through Github.
- 8 Online IDE and Code Editors to Develop Web Applications (e.g., JSFiddle, CodeSandbox, CodeAnywhere, etc.).
- 9 Installing and using identity management features of OpenStack.
- 10 Install OpenStack and use it as infrastructure as a service and use technology ownCloud.
- 11 Case study on Microsoft Azure.
- 12 Develop a Microsoft Azure Application.
- 13 Develop Cloud-Based Attendance System (Users have the option to log in to mark attendance, and the database also stores important information. The database works via an Azure cloud which bridges the application and the cloud server via the internet).
- 14 Develop ownCloud and Incorporate the security features.
- 15 Mini project: using different features of cloud computing.



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Computer Lab – 501 (DIP Lab Assignments)

- 1. Image processing toolbox.
- 2. Basics of image enhancement, gray-level Transformation functions, histogram equalization and specification,
- 3. Filtering images in spatial and frequency domain: smoothing and sharpening, Convolution, Arithmetic operations on image.
- 4. Implement Frequency transformations, Edge detection, boundary linking, thresholding.
- 5. Implement image compression algorithms: Run length coding, Huffman coding, and various image compression standards.
- 6. Perform morphological operations on image:Erosion, Dilation, Connected Components, Thinning, Skeletons.
- 7. Image recognition using boundary descriptors, regional descriptors, texture and color descriptors and classification techniques.

Reference Books:

- 3. R. C. Gonzalez, R. E. Woods, S. L. Eddins , Digital Image Processing Using MATLAB(R) , Course Technology, 1 edition, 2004
- 4. Digital Image Processing by Rafael .C .Gonzalez and Richard. E.