राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर

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 Application											
Course of Study and Scheme of Examination						MCA 4th Semester				Branch: CA	
S. No.	Subject Code	Subject Name	Periods per Week			TA	Examination Scheme				Total Marks	Credits
			L	T	P		MSE/MTR		ESE/ESVE			
							Theory	Prac.	Theory	Prac.		
1	CA404101CA	AI & Machine Learning	3	1	0	20	30	–	50	–	100	4
2	MA404002MA	Computer Oriented Optimization	3	1	0	20	30	–	50	–	100	4
3	CA4042**CA	Elective-I	2	1	0	20	30	–	50	–	100	3
4	CA4042$$CA	Elective-II	2	1	0	20	30	–	50	–	100	3
5	CA4043##CA	Open Elective-I	2	1	0	20	30	–	50	–	100	3
6	CA404401CA	Computer Lab-401	0	0	4	40	–	20	–	40	100	2
7	CA404502CA	Computer Lab-402	0	0	4	40	–	20	–	40	100	2
8	CA404403HS	Language Lab-403- GD/PI	0	0	4	40	–	20	–	40	100	2
											23

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

Program Elective-I		Program Elective-II		Open Elective-I	
Subject Code	Subject Name	Subject Code	Subject Name	Subject Code	Subject Name
CA404201CA	1. Soft Computing	CA404206CA	1. Web Technology- Advance Java	CA404301CA	1. Computer Graphics & Multimedia
CA404202CA	2. Crptography & Network Security	CA404207CA	2. Unix N/W Programming	CA404302CA	2. Advance Data Mining
CA404203CA	3. Advance Database	CA404208CA	3. Internet Technologies and Programming		
CA404204CA	4. Advance OS	CA404209CA	4. Internet of Things		
CA404205CA	5. Multimedia Techniques				

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Semester - IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	AI & Machine learning
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)	
8.	Frequency of offer	
9.	Course Objectives: 1. Understanding the concepts of Artificial Intelligence. 2. Apply the Artificial Intelligence methods for solving different problems. 3. To learn methodology and tools to apply machine learning algorithms to real data and evaluate their performance. 4. To better understand the concepts of AI and Machine learning.	
10.	Course Syllabus: **Unit-1** Introduction to AI: Control strategies, Search strategies, Problem solving by search: state space, Problem reduction; Constraint Satisfaction problems, Game Playing, Problem solving methods - Problem graphs, Matching, Indexing and Search techniques. **Unit-2** Automated Reasoning: Proposition and first order logic, inference and deduction, resolution refutation, answer extraction, knowledge representation, logic programming and constrained logic programming, non-monotonic reasoning and Statistical reasoning. **Unit-3** Planning: state-space, plan space and partial order planning, planning algorithms; Reasoning under uncertainty: probabilistic reasoning, Probability theory, Bayes Theorem and Bayesian networks, Certainty Factor, **Unit-4** Machine Learning: inductive learning, decision trees, logical approaches, computational learning theory, neural networks, reinforcement, supervised and unsupervised learning; Intelligent agents, Expert System, Natural language understanding, Applications.	

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11.	**Text Books:**
	1. Elaine Rich and Kevin Knight: Artificial Intelligence – Tata McGraw Hill.
	2. Artificial Intelligence: A Modern Approach, Stuart Rusell, Peter Norving, Pearson Education 2nd Edition.
	3. Artificial Intelligence and Soft Computing: Behavioral and Cognitive Modeling of the Human Brain by AmitKonar, CRC Press, 2000.
12.	**Reference Books :**
	1. Nils J. Nilsson, Artificial Intelligence: A New Sythesis, Morgan-Kaufmann.
	2. Artificial Intelligence, Winston, Patrick, Henry, Pearson Education.
	3. Artificial Intelligence by Gopal Krishna, Janakiraman.
	4. Dan W.Patterson, Introduction to Artificial Intelligence and Expert Systems – Prentice Hal of India.

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Semester – IV

1.	Department proposing the course	Department of Mathematics
2.	Course Title	Computer Oriented Optimization
3.	L-T-P Structure	3-1-0
4.	Credits / # of period	4/40
5.	Course number(Code)	CMA42
6.	Status (Core/Elective)	Core
7.	Pre-requisites (course no./title)	Undergraduates Mathematics
8.	Frequency of offer	Regular
9.	**Course Objectives:** To enable the students to apply the knowledge of Optimization Techniques in various fields: 1. Introduce the methods to solve the optimization problems including LPP and their applications. 2. Introduce the methods to solve the sequencing problems, dynamic programming, and multi-objective programming. 3. Introduce the methods to solve transportation, assignment and replacement problems. 4. Introduce the PERT and CPM networks for scheduling, monitoring and controlling the project work.	
10.	**Course Syllabus:** **Unit - 1: - Introduction to Optimization** Introduction to constrained and unconstrained optimization, Mathematical formulation of L.P.P., Graphical method for solving LPP with two variables, Simplex method, Application of simplex method for maximization & minimization of LPP, Artificial variable technique for finding the initial basic feasible solution, Two Phase method, The Big-M method, Degeneracy in simplex method, Duality theory in LP, Dual simplex method. **Unit - 2: - Sequencing and Dynamic Programming** Sequencing problem, Johnson's algorithm for processing N-jobs through two-machine problem, N-jobs through 3 machines problem, 2-jobs through N-machine by graphical method, Bellman's principle of optimality of dynamic programming, Characteristics of dynamic programming, Dynamic programming algorithm, Introduction to multi-objective optimization. **Unit - 3: - Transportation, Assignment & Replacement Problems** **Transportation:** North-West Corner Rule, Lowest Cost Entry method, Vogel's Approximation method, MODI Method. **Assignment problems:** Hungarian method. **Replacement:** Replacement of equipment/ Asset that Deteriorates Gradually, Replacement of equipment that fails suddenly, Recruitment & Promotion problem, Equipment renewal problem.	

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	Unit - 4: - Network Analysis Introduction, Network & basic components, Logical sequencing, Rules of Network Construction, CPM/PERT Techniques, Critical path method (CPM), Determination of critical path (Labeling method), The Project Evaluation & Review Technique (PERT), Probability Considerations in PERT, Distinction between PERT & CPM, Project cost, Time-cost optimization algorithm.
11.	**Text Books:-** **1.** Operation Research,Panneerselvam, Prentice Hall of India. **2.** Operation Research: An Introduction, Hamdy, A. Taha, Prentice Hall of India.
12.	**Reference Books: -** 1. Gillett B. E., Introduction to Operation Research- A Computer Oriented Algorithmic Approach, McGraw Hill 2. KantiSwarup, Gupta P. K., Man Mohan, Operations Research, Sultan Chand & Sons. 3. Vohra N. D., Quantitative Techniques in Management, T.M.H., 1990. 4. Zoints. S., Linear & Integer Programming, Prentice Hall, 1975. 5. R. K. Gupta, Operational Research, Krishna PrakashanMandir, Meerut.

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Semester IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Soft 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 : 1. To enable problem solving using soft computing techniques. 2. To introduce the techniques of soft computing, neural network principles and algorithms for given problems. 3. Implementation of fuzzy algorithms for real time applications. 4. To explain the evolutionary algorithm of soft computing.	
10.	Course Syllabus: **Unit-1** Historical development, Introduction of soft computing, soft computing vs. hard computing; tools, applications and techniques. **Unit-2** Introduction of neural network, model of artificial neuron, Architectures, Learning methods, Taxonomy of NN system, Single layer NN system, Back- propagation, Associative memory and Applications. **Unit-3** Introduction to fuzzy logic and fuzzy sets, fuzzy relations, fuzzy arithmetic, Fuzzification, Fuzzy inference, Fuzzy rule based system, Defuzzification and Applications. **Unit-4** Introduction of Genetic Algorithm, Encoding, Operators of GA, Basic GA algorithm, Fuzzy associative memory, Integration of neural networks, fuzzy logic and genetic algorithms, Evolutionary Algorithm & Hybrid System, Hybrid systems like neuro-fuzzy systems and Applications.	

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11.	**Text Books:** 1. Neural Networks, Fuzzy Logic and Genetic Algorithms by Rajsekaran and Pai, PHI Publication. 2. Artificial Intelligence and Soft Computing: Behavioral and Cognitive Modeling of the Human Brain by Amit Konar, CRC Press, 2000.
12.	**Reference Books :** 1. A Comprehensive Foundation to Neural Networks, Simon Haykins, Prentice Hall. 2. Fuzzy Sets and Fuzzy Logic: Theory and Applications, G. J. Klir, and B. Yuan, PHI learning, 2011. 3. D. E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning, Addison Wesley, 1989.

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Semester - IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Cryptography & Network Security
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)	Elementary Number Theory, Computer networks.
8.	Frequency of offer	Regular
9.	Course Objectives: 1. To understand basic objectives of cryptography and types of ciphers. 2. To understand the public key cryptosystem and various hard problems. 3. To study and analyze standards and certification in key exchange and signatures. 4. Explores the network and system security.	
10.	Course Syllabus: **Unit-1** **Introduction:** Security attacks, cryptographic attacks, services and mechanism, techniques. **Traditional symmetric key ciphers:** substitution ciphers, transposition ciphers, stream and block ciphers. **Number theory and finite fields:** Euclidean algorithm, Modular arithmetic, Groups, Rings and Fields, Finite fields, Prime numbers, Fermat's and Euler's theorems, Discrete Logarithms. **Unit-2** **Introduction to modern symmetric key ciphers:** modern block ciphers, modern stream ciphers. DES, AES, use of modern block and stream ciphers. Asymmetric key cryptography, RSA cryptosystem, Rabin cryptosystem, El Gamal cryptosystem, Elliptic curve cryptosystem, message integrity and authentication. Cryptographic hash functions. **Unit-3** **Digital signatures:** attacks on digital signatures, digital signature schemes, variation and applications. **Entity authentication:** passwords, challenge-response, zero-knowledge, biometrics. **Key management:** symmetric key distribution, Kerberos, symmetric key agreement, Public key distribution. **Unit-4** **Network Security:** security at the application layer - email, PGP and S/MIME. **Security at the transport layer:** SSL architecture, SSL message formats, transport layer security. Security at the network layer: IPSec, Internet Key Exchange (IKE), ISAKMP. **System security:** description of the system. Users, trust and trusted systems, buffer overflow and malicious software, malicious programs: viruses and worms, Intrusion Detection System (IDS), Firewalls.	

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11.	**Text Books:** 1. Behrouz A Forouzan and Debdeep M, Cryptography and Network Security Second Edition, Tata McGraw Hill Education Private Limited. 2. William Stallings, Cryptography and Network Security: Principles and Practice, Prentice Hall of India.
12.	**Reference Books :** 1. Doug Stinson, Cryptography Theory and Practice, CRC Press. 2. A. Das and C. E. Veni Madhavan, Public-Key Cryptography: Theory and Practice, Pearson Education Asia. 3. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, Handbook of Applied Cryptography, CRC Press. 4. Neal Koblitz, A course in number theory and cryptography, Springer. 5. Johannes A. Buchmann, Introduction to Cryptography, Undergraduate Text in Mathematics, Springer.

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Semester IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Advance Database
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)	DBMS
8.	Frequency of offer	
9.	Course Objectives: 1. To understand the basic concepts and terminology related to Advance DBMS 2. To design and implement Distributed Databases. 3. Advanced DBMS techniques to construct tables and write effective queries, forms, and reports	
10.	Course Syllabus: **Unit-1** Indexing, Query processing and optimization, concurrency control. Distributed database: Features of Distributed versus Centralized Databases, Principles of Distributed Databases fragmentation transparency, distributed query processing and optimization, distributed transaction modal and concurrency control, distributed deadlock and commit protocol. **Unit-2** Object oriented and object relational databases: specialization, generalization, aggregation and association, object, object identity, architecture of object oriented and object relational databases **Unit-3** Web databases and enhanced data models: accessing databases through web, web server, XML database and Active Database concepts. GIS Database, No SQL. **Unit-4** Introduction to image and multimedia database, Text Database: Unstructured Data, Tokenization, Pre-processing (Stop-words removal, Lemmatization, Stemming etc.), Storage and Retrieval, Bag-of-word model.	

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11.	**Text Books:**
	1. R. Ramakrishnan, J. Gehrke, Database Management Systems, 3/e McGraw Hill, 2004
	2. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 7/e, McGraw Hill, 2019
	3. Feldman, Ronen, and James Sanger. The text mining handbook: advanced approaches in analyzing unstructured data. Cambridge university press, 2007.
12.	**ReferenceBooks:**
	1. R. Elmasri, S. Navathe, Benjamin Cumming, Fundamentals of Database system
	2. Narang, Object Oriented Database, Prentice – Hall of India, New Delhi.
	3. W. Kim "Modern Database System", 1995, Acin Press, Addision – Wesley.
	4. Bengfort, Benjamin, Rebecca Bilbro, and Tony Ojeda. Applied Text Analysis with Python: Enabling Language-aware Data Products with Machine Learning. " O'Reilly Media, Inc.", 2018.

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Semester- IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Advance OS
3.	L-T-P Structure	2-1-0
4.	Credits / # of period	03/40
5.	Course number(Code)	ECA43
6.	Status (Core/Elective)	Elective
7.	Pre-requisites(course no./title)	
8.	Frequency of offer	
9.	Course Objectives : 1. To provide knowledge about advanced concepts in OS 2. To inculcate ability to develop OS for distributed systems 3. To inculcate ability to develop modules for mobile devices	
10.	Course Syllabus: **Unit 1** **Multiprocessor Operating Systems:** System architectures, Structures of OS, OS design issues, Process synchronization, Process scheduling and allocation, Memory management. **Unit 2** **Distributed Operating Systems:** System Architectures, Design issues, Communication models, Clock synchronization, Mutual exclusion, Election algorithms, Distributed deadlock detection. **Distributed scheduling**: Distributed shared memory, Distributed File system, Multimedia file systems, File placement, Caching. **Unit 3** **Database Operating Systems:** Requirements of Database OS, Transaction process model, Synchronization primitives, Concurrency control algorithms. **Unit 4** **Mobile Operating Systems:** ARM and Intel architectures, Power management, Mobile OS architectures, Underlying OS, Kernel structure and native level programming, Runtime issues, Approaches to power management.	

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11.	**Text Books:**
	1. M Singhal and NG Shivaratri, Advanced Concepts in Operating Systems, Tata McGraw Hill Inc, 2001
12.	**Reference Books :**
	1. A S Tanenbaum, Distributed Operating Systems, Pearson Education Asia, 2001
	2. Source Wikipedia, Mobile Operating Systems, General Books LLC, 2010

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Semester IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Multimedia Techniques
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(CO) : 1. Understand the concepts of multimedia systems and multimedia database design 2. Develop the concept of digital image and video processing. 3. Develop and impart the digital audio signal processing. 4. To Introduce the concepts of multimedia securities and issues.	
10.	Course Syllabus: **Unit-1** An introduction of multimedia systems, multimedia databases, multimedia database design for text, image, audio, video. Query Languages for Retrieving Multimedia Data. An introduction of digital signal processing, **Unit-2** Basics of Digital image and video processing. Data and File format standards- RTF, TIFF, RIFF, MIDI, JPEG, AVI, JPEG, TWAIN Architecture. Basics of compression techniques. Basic idea to extract frames from a video, video motion analysis, tagging of objects present in a video. **Unit-3** Digital audio, sounds and signals, harmonics, Non-periodic signals, noise, auto-correlation, DCT, DFT, Filtering and convolution, Differentiation and integration, LTI Systems, Modulation and sampling. Characteristics of speech, speech understanding, audio analysis, speech analysis and classification. **Unit-4** Multimedia security, issues with multimedia security, Watermarking, Steganography, and Forensics outlines essential principles, technical information, and expert insights on multimedia.	

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11.	**Text Books:** 1. Handbook of Image and Video Processing, Bovik 2. Think DSP, Digital Signal Processing in Python, by Allen B. Downey 3. Multimedia Security by Frank Y. Shih Publisher: CRC Press, ISBN: 9781439873328
12.	**Reference Books :** 1. Ze-Nian Li & Mark S. Drew. (2004). *Fundamentals of Multimedia.* Upper Saddle River, NJ: Pearson Education. 2. Advanced Image and Video Processing Using MATLAB, Shengrong Gong, Chunping Liu, Yi Ji, BaojiangZhong, Yonggang Li, Husheng Dong, Modeling and Optimization in Science and Technologies 12, Springer International Publishing, 2019, ISBN-978-3-319-77221-9;978-3-319-77223-3. 3. Practical image and video processing using MATLAB, Oge Marques, Wiley-IEEE Press

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Semester- IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Web Technology - Advance Java
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: 1. To provide students with prerequisites of Web Development. 2. To empower students with Java Web Technologies. 3. To impart basics of Network Programming using Java. 4. To introduce latest trends of Java Technologies.	
10.	Course Syllabus: **Unit-1:** **Introduction to Web**: Client-Server Architecture, World Wide Web, Client Side Web Technologies: HTML5, CSS3, JavaScript (JS). eXtensible Markup Language (XML), Java Script Object Notation (JSON) and, AJAX (Asynchronous JavaScript and XML). **Unit-2:** **Servlets and JSP**: Servlet Overview and Architecture, Interface Servlet and the Servlet Life Cycle, Working with Servlets. Java Server Pages (JSP): Introduction, Implicit Objects, Directives, Custom Tag Libraries.Java Database Connectivity (JDBC). **Unit-3:** **Network Programming**: Remote Method Invocation (RMI): Defining and implementing the Remote Interface. Enterprise Java Bean:Creating a JavaBean, Types of beans. **Unit-4:** **Miscellaneous**: Single Page Application, Object-Relational Mapping (ORM), Introduction to MVC Framework: SpringMVC.	

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11.	**Text Books:** 1. Web Technologies: A Computer Science Perspective, by Jeffrey C. Jackson, Prentice Hall 2. JDBC, Servlets and JSP Black Book by Santosh Kumar K.
12.	**Reference Books :** 1) Web Technology: A Developers Perspective by N.P.Gopalan & J.Akilandeswani, PHI Publication. 2) Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java, JSP, XML and Ajax, Black Book by Kogent Learning Solutions Inc. 3) Internet and Web Technologies by Raj Kamal, Tata McGraw-Hill Education. 4) Java Script:The definite Guide By Flangam ,O‟Reilly. 5) Advanced Java 2 Platform HOW TO PROGRAM by H. M.Deitel, P. J. Deitel, S. E. Santry. 6) https://docs.oracle.com/javase/tutorial/ 7) http://edutechwiki.unige.ch/en/Web_technology_and_web_design_tutorials

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Semester-IV

1.	Department proposing the course	Computer Applications
2.	Course Title	Unix N/W Programming
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 network and Unix
8.	Frequency of offer	Regular
9.	Course Objectives : 1. To develop the necessary skill of networks commands and network management protocols and basics of TCP/IP. 2. To develop the understanding of socket programming. 3. To develop the knowledge of massage passing and Remote Procedure Call. 4. To develop the client server programming skill.	
10.	Course Syllabus: **Unit – 1** **An overview of Networking:** Basics commands used for networking(DHCP, CLIENT,IPCONFIG, ROUTE, PING, TCP, etc.), Communication protocols, Internet protocols, system network architecture, TCP, IP headers, IPv4, IPv6 address structures, IP addressing and subnet masking, OSI and TCP/IP model and Basic shell scripting for Networking. **Unit –2** **Unix Socket Programming:** Introduction to sockets, Socket address structures, value result arguments, Byte and manipulation functions, Elementary system calls–sockets, connect, bind, listen, accept, fork and exec functions, concurrent servers, close function and related functions. I/O asynchronous and multiplexing models, select, poll functions, signal, fcntl functions, socket implementation, UNIX domain protocols, port number, client and server socket. **UNIT-3** **Inter process and Message communication:** MPI (Message passing Interface), RPC (Remote procedure call), Basic chat server programs, IPC (Interprocess communication), Thread concepts used in sockets programming. **UNIT-4** **Client Server Programming:** Clientside programming: Implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Serverside programming: Steps for creating server, Accepting connection from browsers, Creating an HTTP server, Adding multithreading to an HTTP server.	

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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

11.	**Text Book:** 1. Unix network programming, W.Richard Stevens (Volume-1&Volume-2). 2. Internetworking with TCP/IP and Client-Server Programming and Applications, Douglas E. Comer, David L. Stevens, Publisher: Addison-Wesley, Year: 2000.
12.	**Reference Books :** 1. Unix Network Programming Sockets and Networking Api, Vol. 1, 3rd by Bill, Fenner, M.Andrew. 2. Java Network Programming, 4th Edition by Elliotte Rusty Harold. 3. UNIX Network Programming: Interprocess Communications, Author(s): W. Richard Stevens, Publisher: Prentice Hall, Year: 1998.

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Semester- IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Internet Technologies and Programming
3.	L-T-P Structure	3-1-0
4.	Credits / # of period	03/32
5.	Course number(Code)	
6.	Status (Core/Elective)	
7.	Pre-requisites(course no./title)	
8.	Frequency of offer	
9.	Course Objective: 1. To provide students with knowledge of underlying technologies of Internet. 2. To teach students basics of web designing using HTML and CSS. 3. To share knowledge of client side web programming using JavaScript. 4. To introduce light weight data transport technologies: XML and JSON. 5. To provide details of partially loaded web pages using AJAX. 6. To introduce PHP as server side language for web development.	
10.	Course Syllabus: **Unit-1** Internet Concept: Fundamental of World Wide Web (WWW), History of WWW, Domain Name System (DNS), DHCP, and SMTP and other services, Internet service provider (ISP), Concept of IP Addresses (IPv4 & IPv6), Web Browser and Web Servers. **Unit-2** Designing a basic web page using HTML and CSS: - HTML Tags, Text Formatting and Style, List, Adding Graphics to Html Document, Tables and Layout, Linking Documents, Frame, Forms, Project in HTML, Introduction to CSS, Class and DIV, External Style Sheet. **Unit-3** Programming and data transporting in Web: Introduction to JavaScript (JS), JS object model and hierarchy, Handling event. Introduction to XML, XML Schema. Introduction to Java Script Object Notation (JSON), JSON Syntax Rules, JSON Data, JSON Objects. Introduction to AJAX (Asynchronous JavaScript and XML). **Unit-4** MVC using PHP: Introduction to MVC architecture. Basic constructs of PHP, PHP forms, Database connectivity with PHP, PHP Sessions, PHP Cookies.	

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11.	**Text Books:** 1. Internet Programming by Puntambekar, technical Publications. 2. Web Technologies by Roy, OXFORD higher education. 3. PHP & MySQL Novice to Ninja by Kevin Yank.
12.	**Reference Books :** 1. The Joy of PHP Programming: A Beginner's Guide by Alan Forbes 2. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java, Jsp, XML and Ajax, Black Book, Kogent Learning Solutions Inc. 3. Web Technology: A Developer's Perspective by Gopalan, PHI.

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Semester IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Internet of Things
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(CO) : 1. To learn the basic issues, policy and challenges in the Internet. 2. To understand basic components and working of IoT. 3. To get an idea of some of the application areas where Internet of Things can be applied. 4. To understand the cloud and internet environment. 5. To understand the various modes of communications with Internet.	
10.	Course Syllabus: **Unit-1** **Internet of Things Introduction and Architecture**: Introduction to IoT and its Challenges & Issues, Components in internet of things, IoT Architectures, IoT reference architecture IoT reference model, Domain model, information model, functional model, communication model, IoT Security. **Unit-2** **IoT Protocols**: Protocol Standardization Efforts: M2M and WSN Protocols, SCADA and RFID Protocols, Unified Data Standards, Protocols: IEEE 802.15.4, BACNet Protocol, Modbus, Zigbee Architecture, Network layer: LowPAN, CoAP, MQTT. **Unit-3** **Building IoT:** Introduction to Arduino and Raspberry-Pi, IoT Systems, Logical Design using Python, IoT Physical Devices & Endpoints, IoT Device, Building blocks: Raspberry Pi-Board, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Platforms **Unit-4** **Web of Things (WOT)**: Web of Things versus Internet of Thing, Architecture Standardization for WoT-Platform, Middleware for WoT, WoT Portals and Business Intelligence, Cloud of Things: /SOA and Cloud Computing, Cloud Standards, Cloud of Things Architecture, Open Source.	

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11.	**Text Books:**
	1. Honbo Zhou, "The Internet of Things in the Cloud:A Middleware Perspective" — CRC Press-2012.
	2. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", John Wiley &Sons, 2013.
	3. CunoPfister, "Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud", Maker Media, 2011.
12.	**Reference Books :**
	1. Luigi Atzori, Antonio Lera, GiacomoMorabito, "The Internet of Things: A Survey", Journal on Networks, Elsevier Publications, October, 2010.
	2. Dieter Uckelmann, Mark Harrison, "Architecting the Internet of Things", Springer 2011.
	3. ArshdeepBahga, Vijay Madisetti, "Internet of Things (A Hands-On-Approach)", VPT, 2014.
	4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

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Semester- IV

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Computer Graphics & Multimedia
3.	L-T-P Structure	2-1-0
4.	Credits / # of period	03/32
5.	Course number(Code)	
6.	Status (Core/Elective)	
7.	Pre-requisites(course no./title)	
8.	Frequency of offer	
9.	Course Objectives(CO) : 1. To introduce the concepts and techniques used in Computer Graphics. 2. To understand graphics programming 3. To formulate a working definition of interactive multimedia; 4. To demonstrate the use of animation, digitized sound, video control, and scanned images;	
10.	Course Syllabus: **Unit-1** Computer Graphics and Output Primitives: Concepts and applications, Display devices,Introduction to Graphics software packages: OpenGL, Input and Interaction in OpenGL. Line drawing algorithm. Circle generating algorithm, Midpoint algorithms, Antialiasing, Polygon filling algorithms. **Unit-2** 2-D-Transformations, Composite Transformation, Matrix Representation of all Homogeneous Coordinates. 2D-projections– parallel and perspective projection, Viewing pipeline Window-to-view port transformation. Clipping Operations: Line and Polygon Clipping. **Unit-3** 3-D Transformation: 3D object representations. Curved lines and Surfaces: Interpolating and approximation curves, Bezier curves B-Spline curves. 3-D Transformation. Visible Surface detection Algorithm, depth comparison, A-Buffer, Back face removal, Scan-line method, Depth Sorting Method Area subdivision method. Illumination models and Shading, Polygon rendering, Ray tracing, Radiosity Model. **Unit-4** Overview of Multimedia its Elements, Sound/Audio and MIDI. Video and Animation: Morphing, Tweening, Methods of Controlling Animation, Animation Software Packages. Data Compression: storage space, coding requirements. Source, entropy and hybrid coding some basic compression technique: runlength code, Huffman code. JPEG: Image preparation, Lossy sequential DCT – based mode, expanded lossy DCT based mode, Lossless mode, Hierarchical mode. MPEG, Huffman Encoding, LZW compression.	

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11.	**Text Books:**
	1. Computer Graphics by Donand Hearn & M. Pauline Baker PHI. 2. Multimedia Computing Communication & Applications " By Ralf Steimnety&KerlaNeshtudt." Prince Hall.
12.	**Reference Books :**
	1. Ze-Nian Li and Mark S.Drew, "Fundamentals of Multimedia", First Edition, Pearson Education, 2007. 2. Prabhat K Andleigh, KiranThakrar, "Multimedia Systems Design", First Edition, PHI, 2007. 3. Ralf Steinmetz and Klara, "Multimedia Computing, Communications and Applications", Pearson Education, 2004. 4. "B.J. Korites", Python Graphics: A Reference for Creating 2D and 3D Images. 5. "Steve Heath", Multimedia and Communications Technology, 2nd Edition, Focal Press 6. "Multimedia Systems Concepts Standards and Practice" http://users.ece.utexas.edu/~ryerraballi/MSB/Contents.html

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Semester IV

1.	Department proposing the course	Computer Applications
2.	Course Title	Advance Data Mining
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: 1. Learning in-depth about data mining techniques. 2. Understanding time series mining 3. Identifying applications of data mining: anomaly detection 4. Understanding the patterns of complex data using Machine learning algorithms	
10.	Course Syllabus: **Unit-1** Text Data Mining, Text Classification, Vector Space Model, Flat and Hierarchical Clustering, Text Summarization **Unit-2** Time Series Mining: Machine Learning for Time Series Data, Multivariate Time Series (MVTS) Mining, Importance of MVTS data, Sources of MVTS data, Mining MVTS data, Sign Language Data, Agro-meteorological Data **Unit-3** Association rules and Link analysis: Market Basket Analysis, Apriori Algorithm, FP-Growth Algorithm,Outlier Detection : Different approaches of outlier detections Practical significance of outlier detection, Outlier detection with high dimensional data. **Unit-4** Mining Complex data : Mining with web data, graph data, Earth Science Data, Spatial and Temporal data	

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11.	**Text Books:**
	1. Data Mining Concepts and Techniques. Jiawei Han, Micheline Kamber, Jian Pei
	2. Introduction to Data Mining. Tan, Kumar Seinbach, Pearson
	3. Data Mining. Concepts, Models, Method and Algorithm. Mehmed Kantardzic, Wiley
12.	**Reference Books:**
	1. Forecasting Methods and Applications. Spyros Makridakis, Steven C. Wheelwright, Rob J. Hyndman. Wiley

Computer Lab – 401 (AI & Machine Learning Lab Assignments)

1. Write a prolog program to find the rules for parent, child, male, female, son, daughter, brother, sister, uncle, aunt, ancestor given the facts about father and wife only.
2. Write a program to find the length of a given list.
3. Write a program to find the last element of a given list.
4. Write a program to delete the first occurrence and also all occurrences of a particular element in a given list.
5. Write a program to find union and intersection of two given sets represented as lists.
6. Write a program to read a list at a time and write a list at a time using the well defined read & write functions.
7. Write a program given the knowledge base, If x is on the top of y, y supports x. If x is above y and they are touching each other, x is on top of y. A cup is above a book. The cup is touching that book. Convert the following into wff's, clausal form; Is it possible to deduce that `The book supports the cup'.
8. Write a program given the knowledge base, If Town x is connected to Town y by highway z and bikes are allowed on z, you can get to y from x by bike. If Town x is connected to y by z then y is also connected to x by z. If you can get to town q from p and also to town r from town q, you can get to town r from town p. Town A is connected to Town B by Road 1. Town B is connected to Town C by Road 2. Town A is connected to Town C by Road 3. Town D is connected to Town E by Road 4. Town D is connected to Town B by Road 5. Bikes are allowed on roads 3, 4, 5. Bikes are only either allowed on Road 1 or on Road 2 every day. Convert the following into wff's, clausal form and deduce that `One can get to town B from town D'.
9. Solve the classical Water Jug problem of AI.
10. Solve the classical Monkey Banana problem of AI.
11. Solve the classical Crypt arithmetic problems such as DONALD + GERALD = ROBERT of AI.
12. Solve the classical Missionary Cannibals problem of AI.
13. Solve the classical Travelling Salesman Problem of AI.
14. Solve the classical Blocks World Problem of AI.
15. Write a program to search any goal given an input graph using AO* algorithm.
16. Search: Uninformed search, A* search, adversarial search, local search.
17. Planning: Markov Decision Problems, Value Iteration and Policy Iteration.
18. Probabilistic reasoning: Bayes nets, conditional independence, exact and approximate inference.
19. Supervised learning: Linear methods for classification and regression, regularization, cross-validation, decision trees, neural networks, ensemble methods.
20. Unsupervised learning: k-means clustering.

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List of Equipments/Machine required:

- (i) PC with Windows XP
- (ii) Visual Prolog Compiler

Recommended Books:

- (i)   Ivan Bratko: Logic & prolog programming.
- (ii) Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, 3rd edition, Pearson, 2010.
- (iii) The Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani, and Jerome Friedman, 2nd edition, Springer, 2009.

Computer Lab – 402 (Web Technology Lab Assignments)

1. Design a static web site containing at least 5 pages using HTML and CSS.
2. Perform form-validation using javascript.
3. Create n (user defined number) number of text-inputs using javascript.
4. Create an XML document to store Books' record and access them using an HTML page.
5. Create a registration page and show the form-data on submission in another web page (using servlet/jsp).
6. Create a web page that stores student record into database (oracle/MySQL). Also create a show-student-information page that shows those records.
7. Create user registration page and login page. Also create a userhome page that should be redirected after successful login.
8. Use session to track the user across the websites.
9. Store some cookie variables on users' computer and retrieve them in next Http request.
10. Create a small single page application (SPA) using AngularJS.

Text Books:

1. Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java, Jsp, XML and Ajax, Black Book, Kogent Learning Solutions Inc.
2. JDBC, Servlets and JSP Black Book by Santosh Kumar K. Kogent Solutions Inc.

References:

1. Web Technology: A Developer's Perspective by Gopalan, PHI.
2. AngularJS by Green and Seshadri. O Really.

Computer Lab – 402 (Internet of Things Lab Assignments)

1) Create a program that blinks the LED on the development board.

2) Pick one from the available sensors and create code that will display the sensed data on the PC. Find the corresponding data sheet of the sensor and study it. While attaching the sensor take care to follow the instructions found in the data sheet.

3) Attach the radio unit to the board. The radio uses SPI bus. Identify and connect the appropriate pins. Obtain the libraries required for the radio module.

4) Combine the code of the sensor and the radio communication. Send the data retrieved from the sensor to the gateway.

5) Create any circuitry project using Arduino.

6) Explain working of Raspberry Pi.

7) How do you connect and display your Raspberry Pi on a Monitor Or TV?

8) Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.

9) Use the Rapbery Pi as the gateway for the experiment number 4.

10) Create a small project using sensors, ardunio, raspberry pi using the wireless communication method.

Reference Books:

1. "Arduino for Beginners: Step-By-Step Guide to Arduino (Arduino Hardware & Software) arduino" Book by Simon Knight.

2. "Building Wireless Sensor Networks Using Arduino" Book by Matthijs Kooijman.

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Computer Lab – 402 (Computer Graphics Lab Assignments)

1. Implement line drawing algorithm between two given end points $A(x1, y1)$ and $B(x2, y2)$ using following algorithms and compare the results.
    a. DDA algorithm
    b. Bresenham's Algorithm
2. Draw a circle for given center $O(x, y)$ and radius r using following algorithms:
    a. Mid-point circle drawing algorithm
    b. Bresenham's Algorithm
    c. Parametric Circle
3. ImplementMid-pointEllipsedrawingalgorithmfor given center $O(x, y)$, minor and major radius as r_a and r_b.
4. Implement following polygon filling algorithms :
    a. Boundary fill (4-connected / 8-connected)
    b. Flood fill
5. Implement Flood fill algorithm using recursion/ non recursion. OR Write a program to Fill a solid colored area./ Write a program to Fill a Multicolor Boundary area.
6. Implement following 2D transformations on a given triangle ΔABC with vertices $A(x1, y1)$, $B(x2, y2)$, and$C(x3, y3)$:
    a. Translation
    b. Rotation (origin and pivot)
    c. Scaling
    d. Shearing (x-axis, y-axis)
7. Perform reflection of polygon with respect to
    a. X-axes
    b. Y-axes
    c. With respect to origin
    d. With respect to line Y=X
    e. With respect to line Y=mX+C
8. Implement algorithm to rotate a circle (alternatively inside and outside) around the circumference of another circle.
9. Draw a car using in build graphics function and translate it from bottom left corner to right bottom corner of screen.
10. Prepare a game using graphics basic object and various transformations.
    OR
    Create a Paint Brush Like Application that include facility to draw all the basic object.
    OR
    Develop any useful tool (like watch) using graphics basic object and various transformations
11. Write a program to draw a cube using in build library function and perform 3D transformations
12. Implement window clipping algorithm using Cohen Sutherland and Sutherland Hodgeman polygon clipping algorithm.
13. Implementation of text compression using dynamic Huffman coding/ static Huffman coding
14. Draw Bazier curve using Local Control Point (60,20),(80,100),(150,90),(180,50)

Language Lab – 403 (GD/PI)

1.	Department proposing the course	Humanities and Social Science
2.	Course Title	Group Discussion/Personality Development Lab
3.	L-T-P Structure	0-0-4
4.	Credits / # of period	02/02
5.	Course number(Code)	
6.	Status (Core/Elective)	Essential Program Requirement
7.	Pre-requisites (course no./title)	None
8.	Frequency of offer	Second Year (Fourth Semester)
9.	Course Objectives: 1. To enable language proficiency skills 2. To develop logical and argumentative skills 3. To use English in professional comunication	
10.	Course Syllabus: **UNIT I** Extempore ,Job Talk, Mock Interview **UNIT -II** Group Discussion and Debate **UNIT-III** Leadership Skills **UNIT-IV** A Project on Communication Model	
11.	**Suggested readings:** 1. Group Discussion and Interview Skills-P. Patnaik-CUP 2. Campus Group Discussion with Smart Answer:Third Eye of HR Managers-Anant kr. Dass-Atlantic	