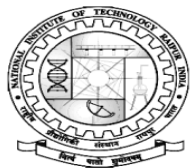




राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
(Institute of National Importance)
G.E. Road, Raipur – 492010 (CG)

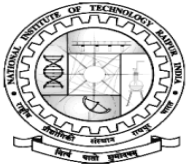
Phone: (0771) 22 54 200
Fax: (0771) 22 54 600
Email: director.nitr@rediffmail.com
Website: www.nitr.ac.in

National Institute of Technology Raipur												
Computer Application												
Course of Study and Scheme of Examination							MCA 3rd 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	CA403101CA	Object Oriented Concepts & Java	3	1	0	20	30	-	50	-	100	4
2	CA403102CA	Data Science	3	1	0	20	30	-	50	-	100	4
3	CA403103CA	Analysis and Design of Algorithms	3	1	0	20	30	-	50	-	100	4
4	CA403104CA	Computer Network	3	1	0	20	30	-	50	-	100	4
5	CA403105CA	Compiler Design	3	1	0	20	30	-	50	-	100	4
6	CA403401CA	Computer Lab-301	0	0	4	40	-	20	-	40	100	2
7	CA403402CA	Computer Lab-302	0	0	4	40	-	20	-	40	100	2
												24

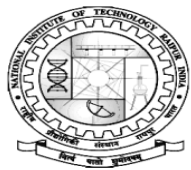


Semester III

1.	Department proposing the course	MCA
2.	Course Title	Object Oriented concepts & Java
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)	Knowledge of C programming
8.	Frequency of offer	
9.	Course Objectives: 1. To make students aware of object oriented concepts. 2. To impart students about OOPs concepts using Java. 3. To develop understanding of Exception Handling, Multithreading, I/O Stream, Socket, and Event Handling Programs in Java.	
10.	Course Syllabus: Unit-1 Introduction to OOPs: Object Model, OOD and OOA, Abstraction, Encapsulation, Inheritance, Polymorphism, Modularity, Hierarchy, State, Behavior and Relationship Among Objects. Objects Oriented Design, Identifying Classes and Object, Object Diagrams, Differences between other Programming Paradigms and OOP. Unit-2 Overview of Java: Features of Java, Byte-Code & JVM, Data-Types, Variables & Arrays, Control-Statements, Introduction to Java Class & Object, main () Function, Garbage Collection & finalize () method, this, Inheritance, Method Overriding, Dynamic method dispatching, super, final, package, Class path, Interface, Abstract Class, String Class, Collections in java. Unit-3 Exception handling: Exception-type, Uncaught Exception, Using try catch, throw, throws, finally, Throwable class and object, Exception Classes, Create own Exception Subclass. Multithreading: Creating Multiple Threads, isAlive(), join(), Thread priorities, Synchronization, Deadlock, wait(), notify(), notify All() methods, Inter-Thread Communication, suspend, resume & stop the threads. Unit-4 Stream and Socket: I/O Classes & Interfaces, File, Stream Classes (Byte and Character Stream) , Network Basics, Networking Classes and Interfaces, InetAddress, TCP/IP Client/Server Socket, URL, URL Connection, Datagram. Event Handling: Introduction to Applet, AWT classes and Swing, Window Fundamentals Delegation Event Model, Event Handling with Mouse and Keyboard.	



11.	Text Books: 1. Java: The complete reference, Herbert Schildt, McGrawhill 2. Understanding OOP with Java, T. Budd, Pearson Education
12.	Reference Books : 1. Murach's Beginning Java 2, Doug Lowe, Joel Murach and Andrea Steelman, SPD. 2. Core Java Volume-I Fundamentals, Eight Edition, Horstmann & Cornell, Pearson Education. 3. Java Programming, D. S. Malik, Cengage Learning. 4. Simply JAVA: An Introduction to JAVA programming By James R. Levenick, Firewall Media publication New, Delhi 5. The Java™ Tutorials – Oracle Docs https://docs.oracle.com/javase/tutorial/



Semester- III

1.	Department proposing the course	Department of Computer Applications
2.	Course Title	Data Science
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)	Basic Mathematics
8.	Frequency of offer	
9.	Course Objectives: <ol style="list-style-type: none">1. To develop understanding of data collection, the nature of data, and the analysis processes to infer the knowledge.2. To impart knowledge of statistical analysis techniques used in data science to choose optimal result.3. To elaborate knowledge of general linear models and cluster analysis methods for classification of data.4. To build implementation skills for preprocessing and analysis of data using various software tools.	
10.	Course Syllabus: Unit 1 Introduction to Data Science and Python: Introduction of Python, Python Packages for Data Science: pip install, numpy, scipy, pandas, matplotlib, nltk, Scikit-learn, Theano, TensorFlow, Keras, PyTorch etc. Unit 2 Model Designing: Data Preparation and Preprocessing, Training Set, Test Set; Normalization, Model Selection. Model Evaluation: Accuracy, AUC, ROC etc. Distance Computation, Non-linear Decision Boundaries (unequal covariance matrices). Unit 3 Supervised Learning: Linear Methods for Regression, Linear Methods for Classification, Kernel Smoothing Methods, Model Assessment and Selection, Model Inference and Averaging. Decision Trees, Evaluation and Validation, Gradient Descent, Bayesian Learning, <u>Advanced Discriminant Analysis</u> , Nearest Neighbor Classifier, Artificial Neural Network, Single Layer Perceptron, Multi-layer Perceptron.	



	<p>Unit 4</p> <p>Unsupervised Learning Algorithms: Types of Clustering Algorithms, Unsupervised Learning using K-means and Fuzzy C Means. Clustering Evaluation.</p> <p>Feature Engineering: Feature Extraction, Feature Selection, Dimensionality Reduction using PCA and LDA. Data Visualization, Visualization Tools.</p>
11.	<p>Text Books:</p> <ol style="list-style-type: none">1. “The Elements of Statistical Learning” Trevor Hastie, Robert Tibshirani Jerome Friedman. Springer Series in Statistics2. Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython Wes McKinney, O’Reilly Media (2017)3. Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems AurélienGéron, O’Reilly Media (2017)
12.	<p>Reference Books :</p> <ol style="list-style-type: none">1. Data Science from Scratch: First Principles with Python, Joel Grus, O’Reilly Media (2015)2. Doing Data Science: Straight Talk from the Frontline, Cathy O’Neil, Rachel Schutt, O’Reilly Media (2013)3. Learning the Pandas Library: Python Tools for Data Munging, Analysis, and Visualization, Matt Harrison, Create Space Independent Publishing Platform (2016)4. Mining of Massive Datasets, Jure Leskovec, AnandRajaraman, and Jeffrey David Ullman, 2nd ed., Cambridge University Press (2014)

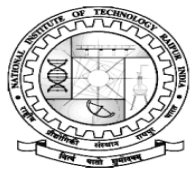


Semester III

1.	Department proposing the course	MCA
2.	Course Title	Analysis and Design of Algorithms
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)	Data structures
8.	Frequency of offer	
9.	Course Objectives: 1. To develop understanding of inherent complexities of a problem and to learn different strategies for problem solving. 2. Design algorithms, implementation of the algorithms by choosing appropriate data structures 3. To equip students in analyzing the complexity of an algorithm by giving mathematical proofs where necessary.	
10.	Course Syllabus: Unit-1 Analysis of Algorithms: asymptotic notation; best, worst and average case analysis of algorithms; Solving recurrence relations such as substitution method and Master's theorem Unit-2 Work out on complexity analysis: Heap data structure, priority queue application, Best, worst and average case analysis of a few sorting algorithms like heap sort, insertion sort. Unit-3 Strategies for problem solving: (a) Divide and Conquer strategy: Strassen's algorithm for matrix multiplication, Time complexity analysis for Merge Sort and Quick Sort Algorithms. (b) Greedy strategy: Minimum Spanning Tree problem; Shortest Path, Job Scheduling, Huffman's code etc along with proofs of correctness and complexity analysis. (d) Dynamic Programming strategy: Understanding of optimality principle. Applications to problems such as 0/1 Knapsack, Longest Common Subsequence Problem, Shortest Path, Optimal Binary Search Tree, Matrix Chain Multiplication. Unit-4 Sorting in linear time and Theory of NP-Completeness: counting, radix and bucket sort algorithms, Complexity classes of P, NP, NP-Hard, NP-Complete, Polynomial reductions, The statement of Cook's theorem.	



11.	Text Books: Introduction to Algorithms-T.Cormen, C.E.Leiserson, R.L.Rivest,PHI, 1998. Fundamental of Computer Algorithm -Horowitz & Sahini,Galgotia
12.	Reference Books: Algorithms- R.Johnsonbaugh and M.Schaefer, Pearson, 2004 Fundamentals of Algorithmics - G.Brassard and P.Bratley, PH, 1995

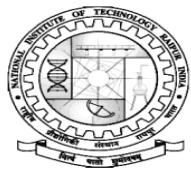


Semester III

1.	Department proposing the course	Computer Applications
2.	Course Title	Computer Network
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)	Basic understanding of handling computer systems
8.	Frequency of offer	
9.	Course Objectives:	<ol style="list-style-type: none">1. To provide insight about fundamental concepts and reference models (OSI and TCP/IP) and its functionalists.2. To gain comprehensive knowledge about the principles, protocols, and significance of Layers in OSI and TCP/IP.3. To develop a basic understanding of the various Cryptographic techniques.4. To inculcate understanding in Wireless Ad Hoc and Sensor Networks, and Security in Computer Network.
10.	Course Syllabus:	<p>Unit-1</p> <p>Basic Concept of Network: Advantages and applications, Types of networks (LAN, MAN and WAN), Different network topologies like star, ring, hybrid, tree. Network Protocol Architecture: OSI Reference model, Layers of the OSI model. Physical, Data-link, Network, Transport, Session, Presentation and Application layer.</p> <p>Unit-2</p> <p>Physical Layer: Signals, Transmission Impairments, data transmission techniques. Data Link Layer: Error Detection and Correction, Parity, CRC, Hamming Code, Flow Control and Error Control, ARQ, Sliding window, Multiple Access Protocols.</p> <p>Unit-3</p> <p>Network Layer: Packet Switching, IP addressing methods, Subnetting, Routing: Distance Vector Routing, Link State Routing. Transport Layer: Transport Services: UDP, TCP, Congestion Control, QOS, Application Layer: Domain Name Space (DNS), Electronic Mail, WWW.</p>



	<p>Unit-4</p> <p>Introduction to Cryptography: Basics of Symmetric Key, Asymmetric Key Cryptography, Cryptography Techniques. Fundamentals of Wireless Communication Technology –MANETs and WSNs: concepts, architectures, applications.</p>
11.	<p>Text Books:</p> <ol style="list-style-type: none">1. A. S. Tanenbaum “Computer Network: Second Ed. Prentice Hall, India (tan).2. B. A. Frouzan, “Data Communication”, Tata Mc Graw Hill.3. Atul Kahate, “Cryptography and Network Security”, Tata Mc Graw Hill.
12.	<p>Reference Books:</p> <ol style="list-style-type: none">1. “Data and Computer Communication” by William Stallings2. “Ad Hoc and Sensor Networks: Theory and Applications” by Carlos de Morais Cordeiro and Dharma Prakash Agrawal.3. “Cryptography and Network Security” by Behrouz A Forouzan and Debdeep Mukhopadhyay.4. C. Siva Ram Murthy, and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols “, Prentice Hall Professional Technical Reference, 2008.



Semester III

1.	Department proposing the course	MCA
2.	Course Title	Compiler Design
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)	Theory of Computation
8.	Frequency of offer	
9.	Course Objectives: <ol style="list-style-type: none">1. To elaborate the phases of compiler and lexical analysis operation.2. To compute different parser techniques and syntax directed definitions.3. To make familiar with intermediate code generation and run time system of a compiler.4. To impart with the code generation and instruction selection procedure.	
10.	Course Syllabus: UNIT – 1 Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Bootstrapping, Back Patching. Lexical analysis: Parsers and symbol table, token, lexeme and patterns. Error reporting. Regular grammar, Transition diagrams. UNIT– 2 Syntax analysis: CFGs, ambiguity, associativity, precedence, top down parsing, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (LR, SLR, CLR, LALR,). Syntax directed definitions: inherited and synthesized attributes, dependency graph, evaluation order, bottom up and top down evaluation of attributes, L- and S-attributed definitions. UNIT – 3 Run time system: storage organization, activation tree, activation record, stack allocation of activation records, parameter passing mechanisms. Intermediate code generation: Postfix notation, Three address code, intermediate representations, translation of declarations, assignments, control flow, Boolean expressions and procedure calls, storage allocation. UNIT – 4 Code generation and instruction selection: issues, basic blocks and flow graphs, optimization of basic blocks, Loop optimization, register allocation, code generation, dag representation of programs, code generation from DAGs, peep hole optimization, code generator, Target machine, Introduction to cross compiler.	



11.	Text Books: 1. Compiler-Principles, Techniques and Tools by Alfred V.Aho, Ravi Sethi and J. D. Ullman, Addison Wesley. 2. Principles of Compiler Design, Alfred V.Aho and J.D.Ullman, Narosa Publication.
12.	Reference Books : 1. Compiler Design in C by A.C. Holub, Prentice Hall of India. 2. Compiler Construction (Theory and Practice) by A.Barret William and R.M.Bates (Galgotia Publication). 3. Compiler Design, Kakde, Compiler Design, Galgotia Publication. 4. AW Appel, J Palsberg, Modern Compiler Implementation in Java, Cambridge University Press, 2002.



Computer Lab – 301 (Java Lab Assignment)

Implementation of programs based on theory discussed in the classes of OOPs and Java subject.

1. Programs based on overview of Java such as
 - (a) Program related to classes, objects and methods
 - (b) Program related to inheritance
 - (c) Program to illustrate the use of “this”, “super”, “final” and “static” keywords
 - (d) Program that demonstrate the use of abstract class and interface
 - (e) Program related to String class
 - (f) Program to create user define package.

2. Programs based on Exception Handling and Multithreading such as
 - (a) Programs that show the use of try, catch, throw, throws and finally keywords in Exception handling.
 - (b) Programs to create a class of user defined exception.
 - (c) Program to demonstrate multithreading.
 - (d) Programs based on synchronization and inter-thread communication in threads.

3. Programs based on Stream, Socket and Event Handling such as
 - (a) Programs that use FileInputStream/FileOutputStream classes for file handling.
 - (b) Program to create client/server socket to establish bi-directional communication.
 - (c) Write a program to create URL connection to current find out status of a web site.
 - (d) Write a program to show all the Swing/AWT Components of the Java
 - (e) Program based on event handling with mouse and keyboard.



Computer Lab – 302 (Data Science Lab Assignments)

1. Data Scientist's ToolBox
2. Problem solving using R/Python, Working with data import and export, NumPy, Pandas, SciPy, Data Visualization Matplotlib, Plot generation Processing of data
3. Normalization, Simple Linear regression, Multiple linear regression, Polynomial regression, logistic regression
4. Classification. Model Evaluation, K-cross fold validation, Naïve bayes, Tree based classification, K-NN, SVM, Kernel in SVM,
5. Clustering. Clustering, Model Evaluation, Clustering, K-means, Hierarchical clustering
6. Database MapReduce : Scalability, Parallel Processing, Mapreduce, Comparison between DB & MR, NoSQL