SCHEME AND DETAILED SYLLABUS

FOR

(8th SEMESTER)

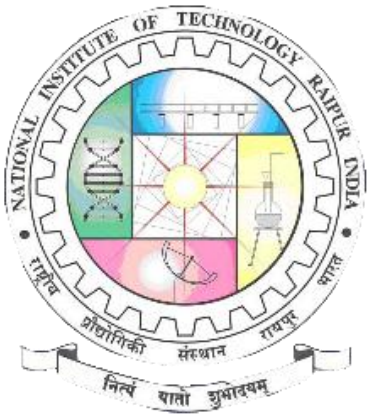
OF

B.TECH FOUR YEAR DEGREE COURSE

IN

INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY



National Institute of Technology Raipur

Chhattisgarh – 492010

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

Phone: (0771) 225 42 00
Fax: (0771) 225 46 00
Email: director.nitrr@rediffmail.com
Website: www.nitrr.ac.in

DEPARTMENT OF INFORMATION TECHNOLOGY

Scheme (Fourth Year)

National Institute of Technology Raipur													
Course of Study and Scheme of Examination							B. Tech. 8th Semester				Branch: IT	
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	Program Elective (IT1082XXIT)	Program Elective - V (Reference Table 7)	3	0	0	20	30		50		100	3
2	Program Elective (IT1082XXIT)	ProgramElective - VI (Reference Table 7)	3	0	0	20	30		50		100	3
3	Open Elective (IT1083XXIT)	Open Elective - IV (Reference Table 8)	3	0	0	20	30		50		100	3
4	Open Elective (IT1083XXIT)	Open Elective - V (Reference Table 8)	3	0	0	20	30		50		100	3
												12

Reference Table:7 (Program Elective - V & VI)		
S. No.	Subject Code	Subject Name
1	IT108201IT	Blockchain
2	IT108202IT	Medical Imaging
3	IT108203IT	Information Retrieval
4	IT108250IT	Cellular Mobile Computing
5	IT108251IT	High Performance Computing
6	IT108252IT	Software Defined Network

Reference Table:8 (Open Elective - IV & V)		
S. No.	Subject Code	Subject Name
1	IT108301IT	Big Data Processing
2	IT108302IT	Cloud Computing
3	IT108303IT	Pattern Recognition
4	IT108350IT	Deep Learning
5	IT108351IT	Bioinformatics
6	IT108352IT	Decision Support System

DEPARTMENT OF INFORMATION TECHNOLOGY

Scheme (Fourth Year)

Eight Semester for Students Undergoing Major Internship

National Institute of Technology Raipur												
Course of Study and Scheme of Examination							**B. Tech. 8th Semester**				**Branch: IT**	
S. No.	**Subject Code**	**Subject Name**	**Periods per Week**			**TA**	**Examination Scheme**				**Total Marks**	**Credits**
							MSE/MTR		**ESE/ESVE**			
			L	**T**	**P**		**Theory**	**Prac.**	**Theory**	**Prac.**		
1	Open Elective (IT1083XXIT)	Open Elective - IV (Reference Table 8)	3	0	0	**20**	**30**		**50**		**100**	3
2	Open Elective (IT1083XXIT)	Open Elective - V (Reference Table 8)	3	0	0	**20**	**30**		**50**		**100**	3
3	Major Internship IT108703IT	Major Internship									**100**	6 =(4^+2^^)
											Total Credits	**12**

^*Mid-semester evaluation report and field evaluation report to be submitted by industry*
^^*Report submission and presentation in the department*

Blockchain

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Program Elective	IT108201IT

[Pre-requisites: Cryptography]

Course Objective:

1. To introduce the concept and the basics of blockchain technologies.
2. To provide knowledge on various applications of blockchain technologies.
3. To enable awareness on the different generations and types of blockchains.

Course Content

UNIT 1: Introduction to Blockchain

The consensus problem – Asynchronous Byzantine Agreement – AAP protocol and its analysis – Nakamoto Consensus on permission-less, nameless, peer-to-peer network – Abstract models for blockchain – Garay model – RLA Model – Proof of work as random oracle – formal treatment of consistency, liveness and fairness – protocol for Stake based chains – Hybrid models.

UNIT 2: Cryptocurrency

Cryptographic basics for cryptocurrency - Overview of hashing, signature schemes, encryption schemes and elliptic curve cryptography Bitcoin – Wallet – Blocks – Merkle Tree – Hardness of mining – transaction verifiability-anonymity – forks – double spending – mathematical analysis of properties of Bitcoin.

UNIT 3: Ethereum

Ethereum – Ethereum Virtual Machine – wallets for Ethereum – Solidarity – Smart Contracts – Attacks on smart contracts.

UNIT 4: Blockchain-Hyperledger

Blockchainhyperledger – Fabric architecture, implementation, networking, fabric transactions, demonstration, smart contracts.Other applications of Blockchain, e-governance, use cases, trends on blockchains, scalability issues, blockchain on clouds.

Course Materials

Required Text: Text books

1. Kevin Werbach, The Blockchain and the new architecture of trust, MIT Press, 2018.
2. Joseph J. Bambara and Paul R. Allen, Blockchain – A practical guide to developing business, law, and technology solutions, Tata McGraw-Hill Education, 2018.
3. Joseph J. Bambara and Paul R. Allen, Blockchain, IoT, and AI: Using the power of three to develop business, technical, and legal solutions, TataMcGraw-Hill Education 2019.
4. Melanie Swan, Blockchain – Blueprint for a new economy, OReilly publishers, 2015

Medical Imaging

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Program Elective	IT108202IT

[Pre-requisites: Digital Image Processing]

Course Objectives

1. To understand need for Quality assurance and Quality assurance tests for radiography, methods of recording sectional images.
2. To understand the mathematical concept needed in image processing.
3. To have a clear understanding of concept and components of medical imaging techniques.
4. To have an exposure on Quality assurance tests for X-rays, MRI.

Course Content

Unit 1: Introduction to Digital Image

Signal input, image matrix, digital image quality, digital image processing, picture archiving and communication system (PACS).

Unit 2: X-RAY Computed Tomography

Principles of sectional imaging, scanner configuration, detectors, data acquisition system, image formation principles, conversion of x-ray data in to scan image. 2D image reconstruction techniques: back projection, iterative and analytical methods. Viewing system, image quality and artifacts.

Unit 3: Ultra Sound in Medicine

Introduction, production of ultrasound, acoustic impedance, ultrasonic transducers and types, transmitter and detector principles, probe design, principles of image formation. Display system: principles of A-mode, B-mode and M-mode display. Principles of scan conversion (real time imaging), image processing, Doppler Ultra sound and Color flow mapping. Application of diagnostic ultra sound.

Unit 4: Magnetic Resonance Imaging

Introduction, principles of MRI, MRI instrumentation, magnets, gradient system, RF coils- receiver system. Relaxation processes, pulse sequence, image acquisition and reconstruction techniques, Functional MRI - Application of MRI.
Radio nuclides for imaging, radionuclide production: cyclotron production, reactor production, generator production. Rectilinear scanners, Linear scanners, SPECT, PET, Gamma Camera, Comparison of other tomographic techniques.

Course Materials

Required Text: Text books

1. K. Kirk Shung, Michael Smith & Benjamin M.W. Tsui, “Principle of Medical imaging” Academic Press.
2. Joseph J. Carr&John M. Brown, “Introduction to Biomedical Equipment Technology” Pearson Education, Asia.
3. R. S. Khandpur, “Handbook of Bio-Medical Instrumentation”, Tata McGraw-Hill Education.
4. John G. Webster, “Bioinstrumentation”, Wiley & Sons

Optional Materials: Reference Books

1. Dowsett, Kenny & Johnston, “The Physics of Diagnostic Imaging”, Chapman & Hall Medical, Madras/London.
2. Brown, Smallwood, Barber, Lawford& Hose, “Medical Physics and Biomedical Engineering”, Institute of Physics Publishing, Bristol.
3. Massey &Meredith, “Fundamental Physics of Radiology”, John Wright & Sons.
4. S. Webb, “The Physics of Medical Imaging”, Adam Hilger, Bristol.
5. Sybil M. Stockley, “A Manual of Radiographic Equipments”, Churchill Livingstones.
6. Thomas S. Curry , J.E. Dowdey & R. E. Murry , “ Christensen’s Physics of Diagnostic Radiology”, Lea &febiger, U.S.

Information Retrieval

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Program Elective	IT108203IT

[Pre-requisites: Computational Mathematics]

Course Objectives

1. Understand the basic concepts of the information retrieval.
2. Understand data pre-processing, indexing, retrieval methods and concepts.
3. Understand how to evaluate the effectiveness and efficiency of different information retrieval.

Course Content

Unit 1: Introduction:

History of IR, Components of IR, Issues, Open source Search engine Frameworks. The impact of the web on IR, role of artificial intelligence (AI) in IR, IR Versus Web Search, Components of a Search engine.

Unit 2: Information Retrieval:

Boolean and vector-space retrieval models, Term weighting, TF-IDF weighting- cosine similarity, Preprocessing, Inverted indices - efficient processing with sparse vectors , Language Model based IR - Probabilistic IR–Latent Semantic Indexing, Relevance feedback and query expansion.

Unit 3: Web Search Engine:

Introduction and Crawling,Web search overview, web structure, the user, paid placement, search engine optimization/ spam. Web size measurement, search engine optimization/spam, Web Search Architectures, crawling, meta-crawlers-Focused Crawling, web indexes, Near-duplicate detection, Index Compression, XMLretrieval.

Unit 4: Web Search - Link Analysis and Specialized Search:

Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Searching and Ranking, Relevance Scoring and ranking for Web, Similarity, Hadoop & Map Reduce - Evaluation, Personalized search , Collaborative filtering and content-based recommendation of documents and products, handling “invisible” Web Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval.

Course Materials

Required Text: Text books

1. C. Manning, P. Raghavan, and H. Schütze, Introduction to Information Retrieval , Cambridge University Press, 2008.
2. Ricardo Baeza -Yates and Berthier Ribeiro – Neto, Modern Information Retrieval: The Concepts and Technology behind Search, 2nd Edition, ACM Press Books 2011.
3. W. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009.
4. Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.

Optional Materials: Reference Books

1. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010.
2. David A. Grossman and OphirFrieder “Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series”, 2nd Edition, Springer, 2004.

Cellular Mobile Computing

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Program Elective	IT108250IT

[Pre-requisites: Computer Networks]

Course Objectives

1. To understand the concept of basic cellular system.
2. To know the types of channel coding techniques, data transmission modes and services of GSM, CDMA.
3. To have an insight into the various propagation models used in mobile communication.
4. To study the recent trends adopted in cellular systems and wireless standards.

Course Content

Unit 1: Introduction to Wireless Network System

Evolution of mobile communications, Mobile Radio System around the world, Types of Wireless communication System, Comparison of Common wireless system, Trend in Cellular radio and personal communication. Second generation Cellular Networks, Adhoc Networks, Sensor Networks, Third Generation (3G) Wireless Networks,.

Unit 2: The Cellular Network Concept- System Design

Cellular system, Hexagonal geometry cell and concept of frequency reuse, Channel , Soft handoff, hard handoff ,Handoff Strategies, Channel assignment strategies, Large scale path loss:-Free Space Propagation loss equation, Pathloss of NLOS and LOS systems, , Outdoor propagation model, Indoor propagation models

Unit 3: Wireless LAN

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security, IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

Unit 4: Mobile computing

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations, Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

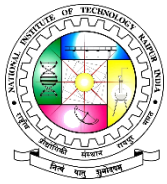
Course Materials

Required Text: Text books

1. Jochen Schiller, Mobile Communications, Addison Wesley.
2. Asha Mehrotra, GSM System Engineering, Artech House Publishers.
3. M. V. D. Heijden, M. Taylor, Understanding WAP, Artech House Publishers.

High Performance Computing Design

[8thSemester, Fourth Year]



Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Program Elective	IT108251IT

[Pre-requisites: Computational Mathematics, Computer Organization, Computer Networks, Micro Processor]

Course Objectives

1. To introduce the fundamentals of high-performance computing with the graphics processing units and many integrated cores using their architectures and corresponding programming environments.
2. To provide systematic and comprehensive treatment of the hardware and the software high performance techniques involved in current day computing.
3. To introduce the fundamental and advanced parallel algorithms

Course Content

Unit 1: Introduction to HPC Systems

Introduction to HPC Systems, Multi-core CPUs, Types of Parallel Computers: Shared Memory Multiprocessor System, Message-Passing Multicomputer, Distributed Shared Memory, MIMD and SIMD Classifications, Cluster Computing, Cache Coherency, Interconnection networks for Parallel Computers.

Unit 2: Principles of Parallel Algorithm Design

Decomposition techniques, Characteristic of Tasks and Interactions, Mapping Techniques for Load Balancing, Parallel Algorithm Model, Basic Communication Operations, and Analytical modeling of program performance: speedup, efficiency, scalability, cost optimality, isoefficiency.

Unit 3: Parallel Programming Model

Programming Using the Message-Passing Paradigm: Principles of Message-Passing Programming, MPI: The Message Passing Interface, Shared Memory Programming: OpenMP, Combing MPI and OpenMP, GPUs as Parallel Computers, Architecture of a Modern GPU, CUDA Program Structure, Data Parallelism

Unit 4: Parallel Algorithm

Sorting, graphs, dense matrix algorithms, sparse matrix algorithms, MapReduce Programming Model, Parallel data processing using Map-Reduce Programming, Parallel Programming with Apache Spark

Course Materials

Required Text: Text books

1. Hesham El-Rewini , “Advanced Computer Architecture and Parallel Processing” Wiley, 2016.
2. AnanthGrama et al. “Introduction to Parallel Computing”, Addison-Wesley, 2003.
3. Michael Quinn“Parallel Programming in C with MPI and OpenMP”, McGraw Hill in 2004.
4. David B. Kirk, Wen-mei, W. Hwu , “Programming Massively Parallel Processors: A Hands-on Approach” Morgan Kaufmann, 2010.

Optional Materials: Reference Books

1. P. Pacheco, An Introduction to Parallel Programming, Morgan Kaufmann, 2011.
2. Kai Hwang, “Advanced Computer Architecture: Parallelism, Scalability, Programmability” Tata McGraw-Hill, New Delhi.
3. Nicholas Wilt, “The CUDA Handbook_ A Comprehensive Guide to GPU Programming”, Addison-Wesley Professional (2013).
4. Donald Miner and Adam Shook “MapReduce Design Patterns: Building Effective Algorithms andAnalytics for Hadoop and Other Systems”, O'Reilly Media, 2012.

Software Defined Network

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Program Elective	IT108252IT

[Pre-requisites: Computer Network, Wireless Network]

Course Objectives

1. This course introduces about software defined networking,
2. Explain the key benefits of SDN by the separation of data and control planes.
3. Understand the SDN data plane devices and Open flow Protocols/
4. Understand and describe the architectures, applications, and standards for the data, control, and application planes of a SDN

Course Content

Unit 1: Introduction to SDN

History of Software Defined Networking (SDN) – Separation of Control Plane and Data Plane, IETF Forces, Active Networking, Control and Data Plane Separation: Concepts, Advantages and Disadvantages, OpenFlow protocol.

Unit 2:Control Plane and Data Plane

Overview, Existing SDN Controllers including Floodlight and Open Daylight projects, Switching and Firewall Implementation using SDN Concepts.

Unit 3:Network Virtualization

Concepts, Applications, Existing Network, Virtualization Framework (VMWare and others), Mininet based examples.

Unit 4: Programming SDN

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

Use Cases of SDNs: 5G communications,IOT, Internet Exchange Points, BackboneNetworks, Home Networks, Traffic Engineering.

Course Materials

Required Text: Text books

1. SDN: Software Defined Networks, An Authoritative Review of NetworkProgrammability Technologies, By Thomas D. Nadeau, Ken Gray Publisher:O'Reilly Media, August 2013,
2. Software Defined Networks: A Comprehensive Approach, by PaulGoransson and Chuck Black, Morgan Kaufmann, June 2014,

Optional Materials: Reference Books

1. SDN and OpenFlow for Beginners by Vivek Tiwari, Sold by: Amazon Digital Services,
2. Network Innovation through OpenFlow and SDN: Principles and Design, Edited by Fei Hu, CRC Press, ISBN-10: 1466572094, 2014.
3. Open Networking Foundation (ONF) Documents,
4. OpenFlow standards, http://www.openflow.org, 2015.

Big Data Processing

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108301IT

[Pre-requisites: Artificial Intelligence, Programming Language]

Course Objectives

1. To study the basic technologies that forms the foundations of Big Data.
2. To understand the specialized aspects of big data including big data application, and big data analytics.
3. To study different types of case studies on the current research and applications of the Hadoop, Apache Spark, Map Reduce Programming, and machine learning tools.

Course Content

Unit 1: Introduction to Big Data

Big Data & Why is it Important, Characteristics of big data, Source of Big Data, Challenges of Big Data, Hadoop, Core components of the Hadoop ecosystem, NoSQL database, HIVE, Pig, Oozie, Storing Data in Hadoop
Hadoop Distributed File System (HDFS), HDFS Architecture, HBASE, HBase Architecture, HBase Schema Design, Programming for HBase, Combining HDFS and HBase for Effective Data Storage.

Unit 2: Map reduce Programming Model

MapReduce Execution Pipeline, Runtime Coordination and Task Management in MapReduce, Building and Executing MapReduce Programs,Designing MapReduce Implementations, Building Iterative MapReduce Applications, To MapReduce or Not to MapReduce?,Using MapReduce as a Framework for Parallel Processing.

Unit 3: Apache Spark

How Spark Works?, Spark Model of Parallel Computing, RDD, Types of RDDs, Spark Job Scheduling, DataFrame API , Data Representation in DataFrames.

Unit 4: Machine Learning in Apache Spark

Spark MLlib and ML:Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering,Clustering, Classification, feature Extraction algorithms and its implementation in Apache Spark, Spark SQL, Spark Screaming.

Course Materials

Required Text: Text books

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al., “Understanding Big data”, McGraw Hill, 2012.
3. Holden Karau et al., “Learning Spark: Lightning-Fast Big Data Analysis”, O'Reilly Media, 2015.

Optional Materials: Reference Books

1. Tom White “ Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012
2. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press, 2013.
3. Anand Rajaraman and Jefrey David Ulman, “Mining of Massive Datasets”, Cambridge University Press,2012.
4. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015

Cloud Computing

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108302IT

[Pre-requisites: Operating System,DBMS]

Course Objectives

1. To introduce the fundamentals and essentials of Cloud Computing.
2. To understand the deployment of web services from cloud architecture.
3. To provide students a sound foundation of the Cloud computing so that they can start using and adopting Cloud Computing services and tools in their real-life scenarios.
4. To expose the students to frontier areas of Cloud Computing and information systems

Course Content

Unit 1: Introduction To Various Computing Paradigm And Cloud Computing

History of Centralized and Distributed Computing –overview of Distributed Computing, Cluster computing, Utility Computing, Grid Computing, etc. Cloud Computing overview, applications, Intranet and the Cloud, First movers in the Cloud. Cloud Computing – benefits, characteristics, challenges, security concerns, regulatory issues.

Unit 2: Cloud Computing Models and Virtualization

Cloud Computing –service delivery models, deployment models. Cloud resources– Network and API,virtual and physical computational resources, Data storage. Virtualization concepts – types of Virtualization, introduction to various Hypervisors, High Availability (HA)/Disaster Recovery (DR) using Virtualization, moving VMs.

Unit 3: Cloud Service Delivery Models

Infrastructure as a Service (IaaS) –Resource Virtualization: Server, Storage, Network, Case studies. Platform as a Service (PaaS) – Cloud platform & Management: Computation, Storage, Case studies. Software as a Service (SaaS) – Web services, Web 2.0, Web OS, Case studies. Anything as a service (XaaS).

Unit 4: Cloud Access, Security and Its Standards

Cloud Access: authentication, authorization and accounting. Cloud Provenance and meta-data. Cloud Reliability and fault-tolerance, Cloud Security, privacy, policy and compliance. Cloud federation, interoperability and standards, Cloud Computing Tools & Providers: Introduction and working of various Cloud Computing tools: Cloudsim, Aneka, KVM, OpenNebula, Eucalyptus, OpenStack, etc. Amazon AWS, Microsoft Azure, Google App Engine, Salesforce.com, etc.

Course Materials

Required Text: Text books

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, “Cloud Computing – APractical Approach”, Tata McGraw-Hill 2010.
2. Barrie Sosinsky, “ Cloud Computing Bible”, John Wiley & Sons, 2010.
3. RajkumarBuyya, James Broberg, Andrzej Goscinski, “Cloud Computing – Principles and Paradigms”, Wiley indiaPvt. Ltd, 2010

Optional Materials: Reference Books

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, “Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance”, O'Reilly 2009.

Pattern Recognition

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108303IT

[Pre-requisites: Statistical Methods and Probability]

Course Objectives

1. To understand the basic concepts for probability and optimization for pattern recognition.
2. To understand various dimensionality reduction techniques.
3. To understand various Supervised Learning techniques.
4. To understand various Unsupervised Learning techniques.

Course Content

Unit-1: Basics of Linear Algebra, Probability and Optimization

Vectors, Inner product, Outer product, Inverse of a matrix, Eigen analysis, Singular value decomposition, Probability distributions - Discrete distributions and Continuous distributions, Independence of events, Conditional probability distribution and Joint probability distribution, Bayes theorem, Unconstrained optimization, Constrained optimization - Lagrangian multiplier method.

Unit 2: Methods for Function Approximation and Dimensionality Reduction Techniques

Methods for Function Approximation: Linear models for regression, Parameter estimation methods - Maximum likelihood method and Maximum a posteriori method, Regularization, Ridge regression, Lasso, Bias-Variance decomposition, Bayesian linear regression. Dimensionality Reduction Techniques: Principal component analysis, Fisher discriminant analysis, Multiple discriminant analysis.

Unit 3: Probabilistic Models for Classification

Bayesian decision theory, Bayes classifier, Minimum error-rate classification, Normal (Gaussian) density - Discriminant functions, Decision surfaces, Maximum-Likelihood estimation, Maximum a posteriori estimation; Gaussian mixture models, Expectation-Maximization method for parameter estimation, Naive Bayes classifier, Non-parametric techniques for density estimation, Parzen-window method, K-nearest neighbors method, Hidden Markov models (HMMs) for sequential pattern classification, Discrete HMMs and Continuous density HMMs.

Unit 4: Discriminative Learning, Non-Metric based Classification, Ensemble Methods for Classification, and Clustering

Discriminative Learning based Models for Classification: Logistic regression, Perceptron, Multilayer feedforward neural network - Gradient descent method, Error backpropagation method; Support vector machine. Non-Metric Methods for Classification: Decision trees, CART, Ensemble Methods for Classification: Bagging, Boosting, Gradient boosting. Pattern Clustering: Criterion functions for clustering, Techniques for clustering - K-means clustering, Hierarchical clustering, Density based clustering and Spectral clustering; Cluster validation.

Course Materials

Required Text: Text books

1. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006
2. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001

Optional Materials: Reference Books

1. S. Theodoridis and K. Koutroumbas, Pattern Recognition, Academic Press, 2009
2. E. Alpaydin, Introduction to Machine Learning, Prentice-Hall of India, 2010.
3. G. James, D. Witten, T. Hastie and R. Tibshirani, Introduction to Statistical Learning, Springer, 2013.

Deep Learning

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108350IT

[Pre-requisites: Computational Mathematics, Data Mining, Artificial Intelligence, Neural Network and Fuzzy Logic]

Course Objectives:

1. To introduce fundamental problems in deep learning.
2. To understand complexity of Deep Learning algorithms and their limitations.
3. To be capable of confidently applying common Deep Learning algorithms in practice and implementing their own.
4. To provide understanding of theoretical foundations, techniques, mathematical concepts, common architectures, and algorithms used in deep learning and the way to apply them to solve problems.

Course Content

Unit 1: Introduction to basic Terminologies

Introduction to basic Terminologies: Types of errors, bias-variance trade-off, overfitting-underfitting, Vector Calculus and optimization, variants of gradient descent, momentum. Issues and Challenges in Deep Learning,Relation and Differences among Deep learning, Neural Networks, Machine Learning, Artificial Intelligence.

Unit 2: Deep Learning Architectures

Introduction to Deep Learning Architectures, Convolutional Neural Networks Architecture, CNN representations: invertibility, stability, invariance, covariance/invariance: capsules and related models. Applications of CNN. Deep Unsupervised Learning: Autoencoders (standard, denoising, contractive, etc.), VariationalAutoencoders, Adversarial Generative Networks, Maximum Entropy Distributions.

Unit 3**:** Recurrent Neural Networks

Recurrent Neural Networks (RNNs), Long-Short Term Memory (LSTM) architectures,Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs, Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

Unit 4:Implications of Deep Learning

Python Programming in Deep Learning, Case studies on Deep Learning in Healthcare, Weather Forecasting, Business Intelligence, Biometrics.

Course Materials

Required Text: Text books

1. Deep Learning, Ian Goodfellow and YoshuaBengio and Aaron Courville, MIT Press, 2016.
2. Neural Networks and Deep Learning: A Textbook, Charu C. Aggarwal, Springer 2018.
3. Deep Learning with Python, Francois Chollet, Manning 2017.

Optional Materials: Reference Books

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007

Bio- Informatics

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108351IT

[Pre-requisites: Computational Mathematics, Data Mining, Artificial Intelligence, Data Science & Machine Learning]

Course Objectives

1. To study data mining for Biological data
2. To study bioinformatics software
3. To study different databases and search techniques for biological data
4. To Learn Different Gene Analysistools and machine learning models for gene identification

Course Content

Unit 1: Introduction to Bio-Informatics

Definition and History of Bioinformatics, Internet and Bioinformatics, Data generation: Generation of large scale molecular biology data through Genomesequencing, Protein sequencing, Gel electrophoresis, NMR Spectroscopy, X-Ray Diffraction,and microarray, Introduction to data types and Source. Biological Databases;Nucleic acid databases (NCBI, DDBJ, and EMBL), Protein databases (Primary, Composite, and Secondary), Specialized Genome databases: (SGD, TIGR, and ACeDB), Structure databases (CATH, SCOP, and PDBsum), Applications of Bioinformatics.

Unit 2: Bio-Computing

Introduction to String Matching Algorithms, Database Search Techniques, Sequence Comparison and Alignment Techniques, Use of Biochemical Scoring Matrices, Introduction to Graph Matching Algorithms, Automated Genome Comparison and its Implication, Automated Gene Prediction, Automated Identification of Bacterial Operons and Pathways.

Unit 3: Genome Analysis and Gene Mapping

Introduction to Signaling Pathways and Pathway Regulation. Gene Arrays, Analysis of Gene Arrays using programming paradigms: Greedy Algorithms, Dynamic Programming Algorithms, Dot Plots. Analysis tools for sequence and data bank, sequence homology using BLAST and FASTA, FASTA and BLAST Algorithm comparison.

Unit 4: Machine Learning

Machine-Learning Foundations: The Probabilistic Framework, Machine Learning Algorithms, Applications of Neural Networks in Bioinformatics,Ontologies, interchange languages and, standardization efforts, General Introduction to XML, UMLS, CORBA, PYTHON and OMG/LIFESCIENCE.

Course Materials

Required Text: Text books

1. Claverie , J.M. and Notredame C. 2003 Bioinformatics for Dummies. Wiley Editor.
2. Letovsky, S.I. 1999 Bioinformatics. Kluwer Academic Publishers.
3. Baldi, P. and Brunak, S. 1998 Bioinformatics. The MIT Press.

Optional Materials: Reference Books

1. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.
2. Lesk, A.M. 2002 Introduction to Bioinformatics. Oxford University Press.

Decision Support System

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108352IT

[Pre-requisites: Data Structures, Data Mining, Data Science & Machine Learning]

Course Objectives

1. To review and clarify the fundamental terms, concepts and theories associated with DSS, computerized decision aids, expert systems, group support systems and executive information systems.
2. To discuss and develop skills in the analysis, design and implementation of computerized DSS.
3. To understand that most DSS are designed to support rather than replace decision makers and the consequences of this perspective for designing DSS.

Course Content

Unit 1: Introduction to DSS

Strategic, tactical and operational, Consideration of organizational structures, Mapping of databases, MIS, EIS, KBS, expert systems, OR modeling systems and simulation, decision analytic systems onto activities within an organization, Extension to other 'non organizational' areas of decision making, Relationship with knowledge management systems.

Unit 2: Decision Making & Management Support System

Studies of human cognition in relation to decision making and the assimilation of information, Cultural issues, Implications for design of decision-making support, Communication issues.

Unit 3: Modelling and Analysis

Normative, descriptive and prescriptive analysis: requisite modelling, Contrast with recognition primed decision tools.

Unit 4: Data Mining in Business

Database, MIS, EIS, KBS, Belief nets, data mining, OR modeling tools: simulation and optimization, History, design, implementation: benefits and pitfalls, Risk assessment, Decision analysis and strategic decision support.Group decision support systems and decision conferencing, Intelligent decision support systems: tools and applications, Cutting-edge decision support technologies, History, design, implementation: benefits and pitfalls, Deliberative e-democracy and e-participation.

Course Materials

Required Text: Text books

1. P.R. Kleindorfer, H.C. Kunreuther, P.J.H. Schoemaker “Decision Sciences: an integration perspective' Cambridge University Press 1993.
2. G.M. Marakas, Decision support Systems in the 21st Century, Prentice Hall, 1999.

Optional Materials: Reference Books

1. E. Turban and J.E. Aronson (2001) Decision support Systems and Intelligent Systems. 6th Edition. PHI
2. V.S.Janakiraman and K.Sarukesi, Decision Support Systems, PHI.
3. Efrem G. Mallach, Decision Support and Data Warehouse Systems, tata McGraw-Hill Edition

SCHEME AND DETAILED SYLLABUS

FOR

Students Undergoing Major Internship

(8^{th} SEMESTER)

OF

B.TECH FOUR YEAR DEGREE COURSE

IN

INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

National Institute of Technology Raipur

Chhattisgarh – 492010

SCHEME AND DETAILED SYLLABUS

FOR

Students Undergoing Major Internship

(8^{th} SEMESTER)

OF

B.TECH FOUR YEAR DEGREE COURSE

IN

INFORMATION TECHNOLOGY

DEPARTMENT OF INFORMATION TECHNOLOGY

National Institute of Technology Raipur

Chhattisgarh – 492010

Table of Contents

]

NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR

Department of Information Technology

Semester: VIII

Eight Semester for Students Undergoing Major Internship

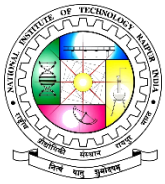
S.No	Course Name	L	T	P	Credits
1	Open Elective IV	3	0	0	3
2	Open Elective V	3	0	0	3
3	Major Internship	0	0	6	6 =(4^+2^^)
	Total Credits	**6**	**0**	**6**	**12**

^Mid-semester evaluation report and field evaluation report to be submitted by industry
^^Report submission and presentation in the department

S.No	OE
1	Big Data Processing
2	Cloud Computing
3	Pattern Recognition
4	Deep Learning
5	Bioinformatics
6	Decision Support System

Big Data Processing

[8thSemester, Fourth Year]



Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108301IT

[Pre-requisites: Artificial Intelligence, Programming Language]

Course Objectives

1. To study the basic technologies that forms the foundations of Big Data.
2. To understand the specialized aspects of big data including big data application, and big data analytics.
3. To study different types of case studies on the current research and applications of the Hadoop, Apache Spark, Map Reduce Programming, and machine learning tools.

Course Content

Unit 1: Introduction to Big Data

Big Data & Why is it Important, Characteristics of big data, Source of Big Data, Challenges of Big Data, Hadoop, Core components of the Hadoop ecosystem, NoSQL database, HIVE, Pig, Oozie, Storing Data in Hadoop
Hadoop Distributed File System (HDFS), HDFS Architecture, HBASE, HBase Architecture, HBase Schema Design, Programming for HBase, Combining HDFS and HBase for Effective Data Storage.

Unit 2: Map reduce Programming Model

MapReduce Execution Pipeline, Runtime Coordination and Task Management in MapReduce, Building and Executing MapReduce Programs,Designing MapReduce Implementations, Building Iterative MapReduce Applications, To MapReduce or Not to MapReduce?,Using MapReduce as a Framework for Parallel Processing.

Unit 3: Apache Spark

How Spark Works?, Spark Model of Parallel Computing, RDD, Types of RDDs, Spark Job Scheduling, DataFrame API , Data Representation in DataFrames.

Unit 4: Machine Learning in Apache Spark

Spark MLlib and ML:Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering,Clustering, Classification, feature Extraction algorithms and its implementation in Apache Spark, Spark SQL, Spark Screaming.

Course Materials

Required Text: Text books

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, ISBN: 9788126551071, 2015.
2. Chris Eaton, Dirk deroos et al., “Understanding Big data”, McGraw Hill, 2012.
3. Holden Karau et al., “Learning Spark: Lightning-Fast Big Data Analysis”, O'Reilly Media, 2015.

Optional Materials: Reference Books

1. Tom White “ Hadoop: The Definitive Guide” Third Edit on, O’reily Media, 2012
2. Jay Liebowitz, “Big Data and Business Analytics” Auerbach Publications, CRC press, 2013.
3. Anand Rajaraman and Jefrey David Ulman, “Mining of Massive Datasets”, Cambridge University Press,2012.
4. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015

Cloud Computing

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108302IT

[Pre-requisites: Operating System,DBMS]

Course Objectives

1. To introduce the fundamentals and essentials of Cloud Computing.
2. To understand the deployment of web services from cloud architecture.
3. To provide students a sound foundation of the Cloud computing so that they can start using and adopting Cloud Computing services and tools in their real-life scenarios.
4. To expose the students to frontier areas of Cloud Computing and information systems

Course Content

Unit 1: Introduction To Various Computing Paradigm And Cloud Computing

History of Centralized and Distributed Computing –overview of Distributed Computing, Cluster computing, Utility Computing, Grid Computing, etc. Cloud Computing overview, applications, Intranet and the Cloud, First movers in the Cloud. Cloud Computing – benefits, characteristics, challenges, security concerns, regulatory issues.

Unit 2: Cloud Computing Models and Virtualization

Cloud Computing –service delivery models, deployment models. Cloud resources– Network and API,virtual and physical computational resources, Data storage. Virtualization concepts – types of Virtualization, introduction to various Hypervisors, High Availability (HA)/Disaster Recovery (DR) using Virtualization, moving VMs.

Unit 3: Cloud Service Delivery Models

Infrastructure as a Service (IaaS) –Resource Virtualization: Server, Storage, Network, Case studies. Platform as a Service (PaaS) – Cloud platform & Management: Computation, Storage, Case studies. Software as a Service (SaaS) – Web services, Web 2.0, Web OS, Case studies. Anything as a service (XaaS).

Unit 4: Cloud Access, Security and Its Standards

Cloud Access: authentication, authorization and accounting. Cloud Provenance and meta-data. Cloud Reliability and fault-tolerance, Cloud Security, privacy, policy and compliance. Cloud federation, interoperability and standards, Cloud Computing Tools & Providers: Introduction and working of various Cloud Computing tools: Cloudsim, Aneka, KVM, OpenNebula, Eucalyptus, OpenStack, etc. Amazon AWS, Microsoft Azure, Google App Engine, Salesforce.com, etc.

Course Materials

Required Text: Text books

1. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, “Cloud Computing – APractical Approach”, Tata McGraw-Hill 2010.
2. Barrie Sosinsky, “ Cloud Computing Bible”, John Wiley & Sons, 2010.
3. RajkumarBuyya, James Broberg, Andrzej Goscinski, “Cloud Computing – Principles and Paradigms”, Wiley indiaPvt. Ltd, 2010

Optional Materials: Reference Books

1. Tim Mather, Subra Kumaraswamy, and Shahed Latif, “Cloud Security and Privacy An Enterprise Perspective on Risks and Compliance”, O'Reilly 2009.

Pattern Recognition

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108303IT

[Pre-requisites: Statistical Methods and Probability]

Course Objectives

1. To understand the basic concepts for probability and optimization for pattern recognition.
2. To understand various dimensionality reduction techniques.
3. To understand various Supervised Learning techniques.
4. To understand various Unsupervised Learning techniques.

Course Content

Unit-1: Basics of Linear Algebra, Probability and Optimization

Vectors, Inner product, Outer product, Inverse of a matrix, Eigen analysis, Singular value decomposition, Probability distributions - Discrete distributions and Continuous distributions, Independence of events, Conditional probability distribution and Joint probability distribution, Bayes theorem, Unconstrained optimization, Constrained optimization - Lagrangian multiplier method.

Unit 2: Methods for Function Approximation and Dimensionality Reduction Techniques

Methods for Function Approximation: Linear models for regression, Parameter estimation methods - Maximum likelihood method and Maximum a posteriori method, Regularization, Ridge regression, Lasso, Bias-Variance decomposition, Bayesian linear regression. Dimensionality Reduction Techniques: Principal component analysis, Fisher discriminant analysis, Multiple discriminant analysis.

Unit 3: Probabilistic Models for Classification

Bayesian decision theory, Bayes classifier, Minimum error-rate classification, Normal (Gaussian) density - Discriminant functions, Decision surfaces, Maximum-Likelihood estimation, Maximum a posteriori estimation; Gaussian mixture models, Expectation-Maximization method for parameter estimation, Naive Bayes classifier, Non-parametric techniques for density estimation, Parzen-window method, K-nearest neighbors method, Hidden Markov models (HMMs) for sequential pattern classification, Discrete HMMs and Continuous density HMMs.

Unit 4: Discriminative Learning, Non-Metric based Classification, Ensemble Methods for Classification, and Clustering

Discriminative Learning based Models for Classification: Logistic regression, Perceptron, Multilayer feedforward neural network - Gradient descent method, Error backpropagation method; Support vector machine. Non-Metric Methods for Classification: Decision trees, CART, Ensemble Methods for Classification: Bagging, Boosting, Gradient boosting. Pattern Clustering: Criterion functions for clustering, Techniques for clustering - K-means clustering, Hierarchical clustering, Density based clustering and Spectral clustering; Cluster validation.

Course Materials

Required Text: Text books

1. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006
2. R.O.Duda, P.E.Hart and D.G.Stork, Pattern Classification, John Wiley, 2001

Optional Materials: Reference Books

1. S. Theodoridis and K. Koutroumbas, Pattern Recognition, Academic Press, 2009
2. E. Alpaydin, Introduction to Machine Learning, Prentice-Hall of India, 2010.
3. G. James, D. Witten, T. Hastie and R. Tibshirani, Introduction to Statistical Learning, Springer, 2013.

Deep Learning

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108350IT

[Pre-requisites: Computational Mathematics, Data Mining, Artificial Intelligence, Neural Network and Fuzzy Logic]

Course Objectives:

1. To introduce fundamental problems in deep learning.
2. To understand complexity of Deep Learning algorithms and their limitations.
3. To be capable of confidently applying common Deep Learning algorithms in practice and implementing their own.
4. To provide understanding of theoretical foundations, techniques, mathematical concepts, common architectures, and algorithms used in deep learning and the way to apply them to solve problems.

Course Content

Unit 1: Introduction to basic Terminologies

Introduction to basic Terminologies: Types of errors, bias-variance trade-off, overfitting-underfitting, Vector Calculus and optimization, variants of gradient descent, momentum. Issues and Challenges in Deep Learning,Relation and Differences among Deep learning, Neural Networks, Machine Learning, Artificial Intelligence.

Unit 2: Deep Learning Architectures

Introduction to Deep Learning Architectures, Convolutional Neural Networks Architecture, CNN representations: invertibility, stability, invariance, covariance/invariance: capsules and related models. Applications of CNN. Deep Unsupervised Learning: Autoencoders (standard, denoising, contractive, etc.), VariationalAutoencoders, Adversarial Generative Networks, Maximum Entropy Distributions.

Unit 3**:** Recurrent Neural Networks

Recurrent Neural Networks (RNNs), Long-Short Term Memory (LSTM) architectures,Gated Recurrent Units, Bidirectional LSTMs, Bidirectional RNNs, Generative models: Restrictive Boltzmann Machines (RBMs), Introduction to MCMC and Gibbs Sampling, gradient computations in RBMs, Deep Boltzmann Machines.

Unit 4:Implications of Deep Learning

Python Programming in Deep Learning, Case studies on Deep Learning in Healthcare, Weather Forecasting, Business Intelligence, Biometrics.

Course Materials

Required Text: Text books

1. Deep Learning, Ian Goodfellow and YoshuaBengio and Aaron Courville, MIT Press, 2016.
2. Neural Networks and Deep Learning: A Textbook, Charu C. Aggarwal, Springer 2018.
3. Deep Learning with Python, Francois Chollet, Manning 2017.

Optional Materials: Reference Books

1. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996
2. Pattern Recognition and Machine Learning, Christopher Bishop, 2007

Bio- Informatics

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108351IT

[Pre-requisites: Computational Mathematics, Data Mining, Artificial Intelligence, Data Science & Machine Learning]

Course Objectives

1. To study data mining for Biological data
2. To study bioinformatics software
3. To study different databases and search techniques for biological data
4. To Learn Different Gene Analysistools and machine learning models for gene identification

Course Content

Unit 1: Introduction to Bio-Informatics

Definition and History of Bioinformatics, Internet and Bioinformatics, Data generation: Generation of large scale molecular biology data through Genomesequencing, Protein sequencing, Gel electrophoresis, NMR Spectroscopy, X-Ray Diffraction,and microarray, Introduction to data types and Source. Biological Databases;Nucleic acid databases (NCBI, DDBJ, and EMBL), Protein databases (Primary, Composite, and Secondary), Specialized Genome databases: (SGD, TIGR, and ACeDB), Structure databases (CATH, SCOP, and PDBsum), Applications of Bioinformatics.

Unit 2: Bio-Computing

Introduction to String Matching Algorithms, Database Search Techniques, Sequence Comparison and Alignment Techniques, Use of Biochemical Scoring Matrices, Introduction to Graph Matching Algorithms, Automated Genome Comparison and its Implication, Automated Gene Prediction, Automated Identification of Bacterial Operons and Pathways.

Unit 3: Genome Analysis and Gene Mapping

Introduction to Signaling Pathways and Pathway Regulation. Gene Arrays, Analysis of Gene Arrays using programming paradigms: Greedy Algorithms, Dynamic Programming Algorithms, Dot Plots. Analysis tools for sequence and data bank, sequence homology using BLAST and FASTA, FASTA and BLAST Algorithm comparison.

Unit 4: Machine Learning

Machine-Learning Foundations: The Probabilistic Framework, Machine Learning Algorithms, Applications of Neural Networks in Bioinformatics,Ontologies, interchange languages and, standardization efforts, General Introduction to XML, UMLS, CORBA, PYTHON and OMG/LIFESCIENCE.

Course Materials

Required Text: Text books

1. Claverie , J.M. and Notredame C. 2003 Bioinformatics for Dummies. Wiley Editor.
2. Letovsky, S.I. 1999 Bioinformatics. Kluwer Academic Publishers.
3. Baldi, P. and Brunak, S. 1998 Bioinformatics. The MIT Press.

Optional Materials: Reference Books

1. Setubal, J. and Meidanis, J. 1996 Introduction to Computational Molecular Biology. PWS Publishing Co., Boston.
2. Lesk, A.M. 2002 Introduction to Bioinformatics. Oxford University Press.

Decision Support System

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	3-0-0, (3)	Open Elective	IT108352IT

[Pre-requisites: Data Structures, Data Mining, Data Science & Machine Learning]

Course Objectives

1. To review and clarify the fundamental terms, concepts and theories associated with DSS, computerized decision aids, expert systems, group support systems and executive information systems.
2. To discuss and develop skills in the analysis, design and implementation of computerized DSS.
3. To understand that most DSS are designed to support rather than replace decision makers and the consequences of this perspective for designing DSS.

Course Content

Unit 1: Introduction to DSS

Strategic, tactical and operational, Consideration of organizational structures, Mapping of databases, MIS, EIS, KBS, expert systems, OR modeling systems and simulation, decision analytic systems onto activities within an organization, Extension to other 'non organizational' areas of decision making, Relationship with knowledge management systems.

Unit 2: Decision Making & Management Support System

Studies of human cognition in relation to decision making and the assimilation of information, Cultural issues, Implications for design of decision-making support, Communication issues.

Unit 3: Modelling and Analysis

Normative, descriptive and prescriptive analysis: requisite modelling, Contrast with recognition primed decision tools.

Unit 4: Data Mining in Business

Database, MIS, EIS, KBS, Belief nets, data mining, OR modeling tools: simulation and optimization, History, design, implementation: benefits and pitfalls, Risk assessment, Decision analysis and strategic decision support.Group decision support systems and decision conferencing, Intelligent decision support systems: tools and applications, Cutting-edge decision support technologies, History, design, implementation: benefits and pitfalls, Deliberative e-democracy and e-participation.

Course Materials

Required Text: Text books

1. P.R. Kleindorfer, H.C. Kunreuther, P.J.H. Schoemaker “Decision Sciences: an integration perspective' Cambridge University Press 1993.
2. G.M. Marakas, Decision support Systems in the 21st Century, Prentice Hall, 1999.

Optional Materials: Reference Books

1. E. Turban and J.E. Aronson (2001) Decision support Systems and Intelligent Systems. 6th Edition. PHI
2. V.S.Janakiraman and K.Sarukesi, Decision Support Systems, PHI.
3. Efrem G. Mallach, Decision Support and Data Warehouse Systems, tata McGraw-Hill Edition

Major Internship

[8thSemester, Fourth Year]

Course Description

Offered by Department	Credits	Status	Code
Information Technology	0-0-8, (4)	Internship	IT108701IT