

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	17B1NCI731	<b>Semester Odd</b>	<b>Semester VII Session 2018 - 19</b> <b>Month from July to December</b>
<b>Subject Name</b>	Machine Learning and Natural Language Processing		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Bharat Gupta	
	<b>Teacher(s)</b>	Bharat Gupta	
		Chetna Dabas	

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C430-2.1</b>	Explain different syntax and semantics approaches in NLP	C2
<b>C430-2.2</b>	Understand the fundamental mathematics applied in the field of NLP	C2
<b>C430-2.3</b>	Apply different models like Hidden Markov Model, SVM, CRF, RNN, LSTM in parts of speech tagging.	C3
<b>C430-2.4</b>	Apply different probabilistic parsing techniques in NLP	C3
<b>C430-2.5</b>	Apply different supervised and unsupervised techniques for document classification.	C3
<b>C430-2.6</b>	Analyse and apply appropriate Machine Learning techniques to solve the real world problem in NLP	C4

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1	Introduction to Machine Learning & NLP	Introduction to Machine Learning & NLP, Challenges & Requirements	3
2	Mathematical Foundation	Probability Theory, Vector Spaces, Matrix algebra, Probability, Data representation, Tokenization, Lemmatization	5
3	Parts of Speech Tagging	Various Models: Hidden Markov Model, SVM, CRF, RNN, LSTM	11
4.	Parsing	Linguistic Essentials, Markov Models, Applications of tagging, Probabilistic parsing - CFG, CNF, CYK	8
5.	Document classification	Supervised: Naive Bayes, Ngram's model, Sentiment analysis, Text classification, Unsupervised: K-means, MaxEnt classifier	8
6.	Topic Modelling	Latent Dirichlet Allocation (LDA) and its variants	5
7.	Applications	Machine Translation, Question Answering	2
<b>Total number of Lectures</b>			42
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
<b>T1</b>		<b>20</b>	
<b>T2</b>		<b>20</b>	

<b>End Semester Examination</b>	<b>35</b>
<b>TA</b>	<b>25 (Attendance and Tut Performance (10), Quiz/ Mini-Project/Assignment (15))</b>
<b>Total</b>	<b>100</b>
<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. )	
<b>1.</b>	Handbook of Natural Language Processing & Machine Translation by Olive, Joseph, Christianson, Caitlin, McCary, John (Eds.), Springer
<b>2.</b>	Statistical Machine Translation by Philipp Koehn, Cambridge University Press
<b>3.</b>	Readings in Machine Translation edited by Sergei Nirenburg, H. L. Somers, Yorick Wilks, MIT Press
<b>4.</b>	Natural Language Understanding by James Allen, Benjamin Cummins Publisher
<b>5.</b>	Foundations of Statistical NLP by Hinrich Schtze, Christopher D. Manning
<b>6.</b>	Natural Language Processing with Python by Steven Bird, Ewan Klein, and Edward Loper
<b>7.</b>	Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition (third edition) D. Jurafsky and J. Martin

### Detailed Syllabus

<b>Subject Code</b>	17B1NCI746	<b>Semester ODD</b>	<b>Semester: VII Session: 2018 - 19</b> <b>Month: July to Dec</b>
<b>Subject Name</b>	Digital Image Processing		
<b>Credits</b>	3	<b>Contact Hours</b>	3-1-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Ankit Vidyarthi	
	<b>Teacher(s) (Alphabetically)</b>	Dr. Ankit Vidyarthi	

**Course Objectives:** At the completion of this course, students will be able to

CO	Course objective	Cognitive Level
<b>C430-4.1</b>	Demonstrate the fundamental concepts of a digital image processing system	Understand (Level 2)
<b>C430-4.2</b>	Utilize various transformations to analyze images in the frequency domain	Apply (Level 3)
<b>C430-4.3</b>	Identify the techniques for image enhancement and image restoration.	Apply (Level 3)
<b>C430-4.4</b>	Categorize various Image Segmentation Techniques	Analyze (Level 4)
<b>C430-4.5</b>	Inspect various color models and their conversions	Analyze (Level 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Digital image processing	Elements of Digital Image Processing System, Visual perception and properties of human eye, Image representation, A simple image model, basic relationship between pixels, Image geometry	4
2.	Image Transformation and Frequency domain processing	Introduction to Fourier transform, DFT & FFT, Properties of 2D Fourier Transform, Separable Image Transforms –Walsh, Discrete Cosine Transform, Problems on above Transforms	5
3.	Image Enhancement	Image Enhancement – spatial domain techniques, enhancement through point processing technique, Histogram Manipulation, Mask processing. Image arithmetic:	6
4.	Image Filtering analysis	Filtering/smoothing/removing noise, convolution/correlation, image derivatives, Low pass filtering in frequency domain, High pass filtering in frequency domain, use of high pass filtering in spatial domain or image sharpening	5
5.	Image Restoration	Image degradation, types of image blur, classification of image restoration techniques, image restoration model, performance metric , applications of digital image restoration.	4

6.	Image Segmentation	Classification of image segmentation techniques, Region based approach to image segmentation, Image segmentation based on thresholding, Edge based segmentation, Edge detection, edge linking, Hough transform, Watershed transformation, Shape representation-Chain code, polygonal approximation	7
7.	Binary Image Processing	Binarisation, mathematical morphology, structuring element, logical operations, morphological image processing, erosion, dilation, opening, closing, morphological algorithms, boundary extraction, region filling, extraction of connected components, skeleton.	7
8	Color Image Processing	Light and color, color formation, human perception of color, color models, color-image quantization, histogram of color image, color-image filtering, color image segmentation	5
<b>Total number of Lectures</b>			<b>43</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (...)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	R. Gonzalez and R. Woods , Digital Image Processing, Pearson Education
2.	Jain Anil K. , Fundamentals of digital image processing, PHI
3.	W.K. Pratt, Digital Image Processing, John Wiley
4.	Chanda and Majumdar, Digital Image Processing and Analysis, PHI
5	Rosenfeld A. and A. C. Kak, Digital picture processing, Academic Press, Orlando
6.	Lecture Series of NPTEL

### Detailed Syllabus

<b>Course Code</b>	17B1NCI732	<b>Semester Odd (specify Odd/Even)</b>	<b>Semester VII Session 2018 -2019 Month from July 2018- Dec 2018</b>
<b>Course Name</b>	Computer and Web Security		
<b>Credits</b>	3	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Sangeeta Mittal
	<b>Teacher(s) (Alphabetically)</b>	Dr. Sangeeta Mittal

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C430-5.1</b>	Describe Vulnerability-Threat-Control Paradigm for assessing computing system's security challenges	Understand (Level-2)
<b>C430-5.2</b>	Explain Unintentional Software Security Issues and their solutions	Understand (Level-2)
<b>C430-5.3</b>	Evaluate various malware detection systems	Analyze (Level-4)
<b>C430-5.4</b>	Identify client-side web access threats like cross site scripting and SQL injection	Apply (Level-3)
<b>C430-5.5</b>	Apply mechanisms of correct Identification and Authentication for access control of computing resources	Apply (Level-3)
<b>C430-5.6</b>	Examine non-cryptographic network protocol vulnerabilities and their solutions	Analyze(Level-4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Vulnerability-Threat-Control Paradigm	Threats: Confidentiality, Integrity, Availability, Types of Threats, Types of Attackers, Software Security: Buffer Overflow, Coding threats	3
2.	Software Security Issues	Unintentional insecure Coding Practices, Buffer Overflow, Format String vulnerabilities, Stack Smashing	6
3.	Malware	Virus, Worms – Definition , Modelling and Solutions	5
4.	Malware Detection systems	Worm Detection, Worm Signature Extraction, Virus Detection, Intrusion Detection Systems – Anomaly Vs Signature Based and Host vs Network Based	4
5.	Web Access Threats	Web Browser Attacks: Browser Attack Types, Web Attacks Targeting Users, Obtaining User or Website Data, Code within Data, Foiling Data Attacks, Email Attacks: Phishing	7
6.	Access Control -1	Access Control and Authorization in OS	4
7.	Access Control -2	Authentication Protocols	4
8.	Non-Cryptographic network protocol vulnerabilities	Threats to Network Communications, Denial of Service: Flooding Attacks, Network Flooding Caused by Malicious Code, Network Flooding by Resource Exhaustion, Denial of Service by Addressing Failures, Traffic Redirection, DNS Attacks, Exploiting Known Vulnerabilities Distributed Denial-of-Service: Scripted Denial-of-Service Attacks,Bots, Botnets	9

<b>Total number of Lectures</b>		<b>42</b>
<b>Evaluation Criteria</b>		
<b>Components</b>	<b>Maximum Marks</b>	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Tut(5) + Attendance(5) +Quiz(5)+Mini Project(5))	
<b>Total</b>	<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	Security in Computing 5 <sup>th</sup> Edition , Charles P Fleege et. al. , Prentice Hall
<b>2.</b>	Information Security, Principles and Practice, Mark Stamp, Wiley
<b>3.</b>	Kali Linux, Abhinav Singh, Packt Publishing
<b>4.</b>	Computer Viruses and Malware, John Aycock, Springer
<b>5.</b>	Computer Security: Art and Science, Matt Bishop, Addison Wesley

### Detailed Syllabus

<b>Course Code</b>	17BINCI736	<b>Semester ODD (specify Odd/Even)</b>	<b>Semester VII Session 2018-2019 Month from July 2018</b>
<b>Course Name</b>	Bioinformatics Algorithms		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Mr. PrantikBiswas
	<b>Teacher(s) (Alphabetically)</b>	Mr.PrantikBiswas, Dr.Aparajita Nanda

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C432-1.1</b>	Relate to different computational challenges in Computational Molecular Biology.	Level-2
<b>C432-1.2</b>	Examine proper algorithmic concepts to solve a computational problem.	Level-4
<b>C432-1.3</b>	Determine the importance of traditional to contemporary approaches for solving the biological problems.	Level-5
<b>C432-1.4</b>	Design strategy to resolve real-world biological challenges.	Level-6
<b>C432-1.5</b>	Identify appropriate algorithmic technique to solve a given bioinformatics related task.	Level-3
<b>C432-1.6</b>	Develop an optimized solution model for computational biology problems.	Level-6
<b>C432-1.7</b>	Formulate prediction tools and estimate the solutions for biological problems.	Level-6

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1	Algorithms and Complexity	Introduction, Biological Algorithms versus Computer Algorithms, The Change Problem, Comparative Analysis of Various Classes of Algorithms.	2
2	Molecular Biology	Introduction, Structure of Genetic Materials, Structural Formation of Proteins, Information Passage Between DNA and Proteins, Evaluation of Bioinformatics.	3
3	Exhaustive Search	Restriction Mapping, Practical Restriction Mapping Algorithm, Regulatory Motifs in DNA Sequences, Profiles, Search Trees, Finding Motifs, Finding a Median String.	4
4	Greedy Algorithms	Genome Rearrangements, Sorting by Reversals, Approximation Algorithms, Breakpoints: A Different Face of Greed, A Greedy Approach to Motif Finding.	3
5	Dynamic Programming Algorithms	Classical Problems: DNA Sequence Comparison, The Manhattan Tourist Problem, etc, Edit Distance and Alignments, Global Sequence Alignment, Scoring Alignments, Local Sequence Alignment, Alignment with	7

		Gap Penalties, Multiple Alignment, Gene Prediction, Statistical Approaches to Gene Prediction, Similarity-Based Approaches to Gene Prediction, Spliced Alignment.	
6	Divide-and-Conquer Algorithms	Divide-and-Conquer Approach to Sorting, Space-Efficient Sequence Alignment, Block Alignment and the Four-Russians Speedup, Constructing Alignments in Sub-quadratic Time.	4
7	Graph Algorithms	Graphs and Genetics, DNA Sequencing, Shortest Superstring Problem, DNA Arrays as an Alternative Sequencing Technique, Sequencing by Hybridization, SBH as a Hamiltonian Path Problem, SBH as an Eulerian Path Problem, Fragment Assembly in DNA Sequencing, Protein Sequencing and Identification, The Peptide Sequencing Problem, Spectrum Graphs, Protein Identification via Database Search, Spectral Convolution, Spectral Alignment.	8
8	Combinatorial Pattern Matching	Repeat Finding, Hash Tables, Exact Pattern Matching, Keyword Trees, Suffix Trees, Heuristic Similarity Search Algorithms, Approximate Pattern Matching	4
9	Clustering and Trees	Hierarchical Clustering, k-Means Clustering, Evolutionary Trees, Distance-Based Tree Reconstruction, Reconstructing Trees from Additive Matrices, Evolutionary Trees and Hierarchical Clustering, Character-Based Tree Reconstruction	3
10	Applications	BLAST: Comparing a Sequence against a Database; The Motif Finding Problem, Gene Expression Analysis, Clustering and Corrupted Cliques, Small and Large Parsimony Problem, Hidden Markov Models, Randomized Algorithms	4
<b>Total number of Lectures</b>			<b>42</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	Jones, N. C., & Pevzner, P. (2004). <i>An introduction to bioinformatics algorithms</i> . MIT press.
2	Schölkopf, B., Tsuda, K., & Vert, J. P. (2004). <i>Kernel methods in computational biology</i> . MIT press.
3	Jiang, T., Xu, Y., & Zhang, M. Q. (2002). <i>Current topics in computational molecular biology</i> . MIT Press.
4	Pevzner, P. (2000). <i>Computational molecular biology: an algorithmic approach</i> . MIT press.
5	Gusfield, D. (1997). <i>Algorithms on strings, trees and sequences: computer science and computational biology</i> . Cambridge university press.
6	Lesk, A. (2013). <i>Introduction to bioinformatics</i> . Oxford University Press.



7	Gollery, M. (2005). Bioinformatics: Sequence and Genome Analysis, David W. Mount. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press, 2004, 692 pp., ISBN 0-87969-712-1. <i>Clinical Chemistry</i> , 51(11), 2219-2219.
8	Cormen, T. H. (2009). <i>Introduction to algorithms</i> . MIT press.
9	<i>IEEE/ACM Transactions on Computational Biology and Bioinformatics</i>
10	<i>Bioinformatics</i> , <a href="https://academic.oup.com/bioinformatics">https://academic.oup.com/bioinformatics</a>
11	Nature Communications, <a href="http://www.nature.com/ncomms/">http://www.nature.com/ncomms/</a>

### Detailed Syllabus

<b>Course Code</b>	18B12CS437	<b>Semester Odd</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from July to Dec</b>
<b>Course Name</b>	Large Scale Database Systems		
<b>Credits</b>	<b>4</b>	<b>Contact Hours</b>	<b>3-1-0</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	InduChawla
	<b>Teacher(s) (Alphabetically)</b>	InduChawla, ParmeetKaur

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C432-3.1</b>	Infer the background processes involved in queries and transactions, and explain how these impact on database operation and design	Understand level (Level 2)
<b>C432-3.2</b>	Explain the concept and challenge of big data and demonstrate the comparison of relational database systems with NoSQL databases	Understand level (Level 2)
<b>C432-3.3</b>	Compare and discover the suitability of appropriate large databases to manage, store, query, and analyze various form of big data	Analyze level (Level4)
<b>C432-3.4</b>	Apply techniques for data fragmentation, replication, and allocation to design a distributed or parallel database system	Apply Level (Level3)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction to large scale Databases	Review of database systems, modelling and query languages	2
2.	Query processing and Optimization	Query planning, evaluation and optimization	6
3.	Transaction processing	Transaction processing, Concurrency control techniques, ACID rules	4
4.	Overview of Big Data	Introduction to Big Data and the four dimensions of Big Data: volume, velocity, variety, veracity. Big data sources, types and applications, CAP Theorem (consistency, availability, partition tolerance)	5
5.	Storage and Indexing	Data storage and indexing of massive databases in databases and data warehouses. Introduction to technologies	7

		for handling big data, NOSQL databases	
6.	Basics of Hadoop	Introduction to Hadoop, Configuring a Hadoop Development Environment, HDFS Architecture, HDFS Programming Fundamentals, Analyzing big data with Hadoop, MapReduce Architecture, MapReduce Programming	4
7.	Application-driven databases	Parallel and Distributed databases, Distributed Database Design, Architecture of Distributed DBMS	8
8.	Distributed and parallel Query Processing	Query Processing, Distributed Query Optimization, Parallel Query Processing and Optimization	6
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 5 <sup>th</sup> Edition, McGraw-Hill, 2006
2.	Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 4 <sup>th</sup> Edition, Pearson Education, 2006.
3.	Sadalage, P.J. & Fowler, M. 2013. NoSQL distilled : a brief guide to the emerging world of polygot persistence. Addison-Wesley
4.	White, Tom. Hadoop: The definitive guide. "O'Reilly Media, Inc.", 2012.
5.	Zikopoulos, Paul, and Chris Eaton. Understanding big data: Analytics for enterprise class hadoop and streaming data. McGraw-Hill Osborne Media, 2011.
6.	Shashank Tiwari, Professional NoSQL, Wiley, 2011

### Detailed Syllabus

<b>Course Code</b>	16B1NCI833	<b>Semester ODD (specify Odd/Even)</b>	<b>Semester VII Session 2018 -2019 Month from: July 2018 to December 2018</b>
<b>Course Name</b>	Nature Inspired Computing		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr.AnkitaVerma
	<b>Teacher(s) (Alphabetically)</b>	Dr.AnkitaVerma

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C432-4.1</b>	Explain the concepts of problem solving via search, optimization and pattern recognition with various practical examples.	Understand Level (C2)
<b>C432-4.2</b>	Apply the NIC methods to model, learn and optimize computing problems.	Apply Level (C3)
<b>C432-4.3</b>	Analyze the key ideas, algorithmic steps of various nature inspired computing methods and their general applicability in various domains.	Analyze Level (C4)
<b>C432-4.4</b>	Compare and contrast the similarities and differences among various nature inspired computing methods.	Evaluate Level (C5)
<b>C432-4.5</b>	Formulate and design an efficient solution to a given problem by using the most appropriate nature inspired computing method.	Create Level (C6)

Module No.	Title of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction	Introduction to Nature Inspired Computing: Need and Motivation behind Nature Inspired Algorithms; Problem solving by Search and Optimization; Optimization: Continuous vs Combinatorial optimization, Single objective vs Multi-objective optimization, Implicit vs Explicit Constraints; Pattern Recognition.	5
2.	Heuristic Search Algorithms	Heuristics and Meta-heuristics; Problem Spaces: States, goals and operators; Heuristics search: Hill Climbing and Simulated Annealing.	3
3.	Evolutionary Algorithms (EA)	Genetic Algorithms: Introduction, Motivation, Basic Terminology, General framework; Encoding Techniques: Binary Encoding, Value Encoding, Permutation Encoding and Tree Encoding); Selection Operators: Fitness Proportionate Selection, Rank-based Selection, Tournament Selection; Crossover Techniques: Single-point Crossover, Two-point Crossover, Uniform Crossover, Partially Mapped Crossover, and Order Crossover; Mutation Operators; Replacement Strategies: Generational GA, Steady GA,	4

		Elitist GA	
4.	Hybrid Evolutionary Algorithms, Multi-objective Optimization Evolutionary Algorithms	Hybrid EA: Need of Hybridization, Memetic Algorithm, Intelligent Initialization, Local Search, Lamarckian vs. Baldwinian adaptation. Multi-objective Optimization EA: Dominance, Non-dominated Solution, Pareto Optimal Solution, Elitist Non-dominated Sorting Algorithm.	3
5.	Neuro-Computing	Introduction to Artificial Neural Network (ANN): Artificial vs Biological neuron, Basic terminology; Classification and Inductive Learning; Linear separability; Basic models of ANN; McCulloch-Pitts Neuron; Perceptron: Architecture, Perceptron learning rule, and Delta learning rule.	3
6.	Artificial Neural Network Models	Supervised Learning Network: Multi-layer Feed Forward Network, Back-propagation algorithm; Associate Memory Networks: Introduction and training algorithm for pattern association, Hopfield Network, Unsupervised Learning Network: Competitive Learning, Kohonen Self-Organizing Feature Maps.	6
7.	Swarm Intelligence	Introduction to Swarm Intelligence, Particle Swarm Optimization (PSO): Algorithm, PSO vs EAs; Ant Colony Optimization (ACO): ACO Procedure, Travelling Salesman Problem using ACo, Ant Systems and its direct Variants (Elitist Ant Systems, Rank-based Ant Systems, Max-Min AS, Ant Colony Systems);	7
8	Nature Inspired Algorithms	Artificial Bee Colony; Grey Wolf Optimization; Cuckoo Search	6
9.	Artificial Immune System	Immune System and Immunity; Artificial Immune System(AIS); Biological Immune System(BIS) vs Artificial Immune System(AIS); Typical Applications of AIS; General framework for AIS: Problem Representation, Affinity measure, Selection, Mutation; Basic Artificial Immune Models and Algorithms: Negative Selection Algorithms, Clonal Selection Algorithm, Immune Network Models; Movie Recommender System using AIS.	5
<b>Total number of Lectures</b>			<b>42</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (15 marks Project, 5 marks Attendance, 5 Marks Tutorial Assignment)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Xin-She Yang. <i>Nature-inspired optimization algorithms</i> . Elsevier, 2014.
2.	Raymond Chiong ed. <i>Nature-inspired algorithms for optimisation</i> . Vol. 193. Springer, 2009.
3.	Dario Floreano and Mattiussi Claudio. <i>Bio-inspired artificial intelligence: theories, methods, and technologies</i> . MIT press, 2008.
4.	De Castro, Leandro Nunes. <i>Fundamentals of natural computing: basic concepts, algorithms, and applications</i> . Chapman and Hall/CRC, 2006.
5.	Swarm and Evolutionary Computation: Elsevier

### Detailed Syllabus

<b>Course Code</b>	18B12CS436	<b>Semester</b> ODD	<b>Semester VII Session</b> 2018 -2019 <b>Month</b> July 2018- December 2018
<b>Course Name</b>	Software Construction		
<b>Credits</b>	3	<b>Contact Hours</b>	3-0-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Sandeep Kumar Singh
	<b>Teacher(s) (Alphabetically)</b>	Dr. Sandeep Kumar Singh

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C431-6.1</b>	Choose appropriate fundamental element of software construction for an actual software development.	Remembering Level (Level 1)
<b>C431-6.2</b>	Apply various Assertion, Error-Handling, Exceptions techniques for defensive programming.	Apply Level (Level 3)
<b>C431-6.3</b>	Make use of appropriate coding standards and conventions of code construction at class routines, variables, and statements level.	Apply Level (Level 3)
<b>C431-6.4</b>	Experiment with code improvement strategies like Code Refactoring, Code Optimisation and Tuning.	Apply Level (Level 3)
<b>C431-6.5</b>	Demonstrate use of software construction techniques like parameterisation, debugging and tools for GUI builders, unit testing , profiling, performance analysis and slicing .	Understanding Level (Level 2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Fundamentals of software construction	What and Why Software Construction, Construction Decisions, Design in Construction, Software Metaphors use and importance, Code Quality, Managing Construction, Practical Considerations, Metaphors for Software development.	3
2.	Code Construction	Design in Construction, Class Design and Working Classes, High-Quality Routines. Variables, Statements, Pseudo code Programming Process, limiting dependencies, Meta Programming	6
3.	Defensive Programming	Protecting Your Program from Invalid Inputs, Assertion, Error-Handling, Exceptions, Protecting Code from damage caused by errors, Debugging Aids, Determining How Much Defensive Programming to Leave in Production Code	8
4.	Code Improvements	Debugging, Code Refactoring, Code Optimisation and Tuning strategies and techniques	7
5.	Code Analysis	Tracing, Static and Dynamic analysis	3
6.	Source Code Control	Version Control, CVS, working and organising source tree, branching ,Jump start with Git	6
7.	Scaling Code	Parameterization and Generics, Internationalization of code, Securing Code	6
8.	Build , Test and Release code	Development Environments, GUI Builders, Unit Testing Tools, Profiling, Performance Analysis, and Slicing	3
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>	<b>Maximum Marks</b>		
T1	20		

T2	20
End Semester Examination	35
TA	25 (Assignments and Attendance)
<b>Total</b>	<b>100</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	Maguire, Steve, Writing Solid Code – Microsoft’s Techniques for Developing Bug-Free C Software. Microsoft Press, 1993.
<b>2.</b>	McConnell, Steve, Code Complete: A Practical Handbook of Software Construction. Microsoft Press, 1993.
<b>3.</b>	Meyer, Bertrand, Object-Oriented Software Construction (Second Edition). Prentice-Hall, 1997.
<b>4.</b>	Warren, Nigel, and Bishop, Philip, Java in Practice – Design Styles and Idioms for Effective Java. Addison-Wesley, 1999.
<b>5.</b>	Fowler, Martin, Refactoring – Improving the Design of Existing Code. Addison-Wesley, 1999.
<b>6.</b>	Writing solid code : Maguire, Steve. LeBlanc, David. Publisher: Bangalore WP Publishers & Distributors Pvt. 2001



## Detailed Syllabus

<b>Subject Code</b>	<b>18B12CS435</b>	<b>Semester Odd</b>	<b>Semester VII Session 2018 - 19</b> <b>Month from July to Dec</b>
<b>Subject Name</b>	Open Data Centric Services		
<b>Credits</b>	<b>4</b>	<b>Contact Hours</b>	<b>3-1-0</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. GagandeepKaur
	<b>Teacher(s) (Alphabetically)</b>	1. Dr. GagandeepKaur 2. Sarishty Gupta

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C431-5.1</b>	Understand facts and concepts of open data, open govt. data by comparing & interpreting linked data.	Understand Level (Level 2)
<b>C431-5.2</b>	Apply RDF and Silk frameworks to create, interlink and publish linked data repositories.	Apply Level (Level 3)
<b>C431-5.3</b>	Create & implement RESTful API enabled data resource objects using Python Libraries.	Evaluate Level (Level 5)
<b>C431-5.4</b>	Plan various phases of data cleaning, preprocessing, transforming, analysis and prediction	Apply Level (Level 3)
<b>C431-5.5</b>	Choose open data statistical and predictive analysis techniques to perform static and dynamic data plotting and visualization	Evaluate Level (Level 5)

<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
1.	Introduction to Open Data	Open data concepts, open government data initiatives, challenges, open data infrastructures,	4
2.	Role of Open Data	Linking Open Government Data , linked open data, multidimensional linked open data, providing open data;	10
3.	Open Data Frameworks	RDF and SILK frameworks, Using the Silk API , Silk Server , Silk Workbench , SILK integration with SPARQL Endpoint, open data protocol, RESTful Interface and Open Data APIs, Queries with the REST API	8
4.	Open Data Analysis	<i>Open data aggregation; Resource Association, Resource Aggregation, Composition &amp; Aggregation , Manipulating aggregate resources in a REST API, Aggregation Functions, Representing non-resourceful aggregated data</i>	8

		<i>and integration, open data statistical analytics, Aggregate Statistics, SILK Transformation and Aggregation, Linked Statistical Data Analysis, fetching analysis data, applying statistical functions for analysis, Update and return analysis, predictive analysis,</i>	
5.	Open Data Visualization	open data visualizations, Linked Data Visualization, Challenges for Linked Data visualization, Challenges for Open Linked Data visualization, Classification of visualization techniques	8
6.	Protégé based Open Data Design	Designing ontologies using Protégé, Steps in ontology development process, Use of semantic web technology Sparql, OWL Querying, Entities/Classes Ontology driven application development , Introduction to Ontology, Introduction to OWL, Developing an Ontology in Protégé OWL - Classes and Properties , Developing an Ontology in Protégé OWL - Axioms and Restrictions, SPARQL Query Language for RDF , Protégé Ontology case studies	4
			42

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Linked Open Data: The Essentials A Quick Start Guide for Decision Makers, Florian Bauer, Martin Kaltenböck
2	Silk Link Discovery Framework for the web of data, Julius Volz. Et. al.
3.	Open Government Data, <a href="https://data.gov.in/">https://data.gov.in/</a>
4.	Ontologies and the Semantic Web. Grimm S., Abecker A., Völker J., Studer R. (2011) In: Domingue J., Fensel D., Hendler J.A. (eds) Handbook of Semantic Web Technologies. Springer, Berlin, Heidelberg
5.	Ubaldi, B. (2013), “Open Government Data: Towards Empirical Analysis of Open Government Data Initiatives”, <i>OECD Working Papers on Public Governance</i> , No. 22, OECD Publishing.
6.	Algemili, U. A. (2016). Outstanding Challenges in Recent Open Government Data Initiatives. <i>International Journal of e-Education, e-Business, e-Management and e-Learning</i> , 6(2), 91.
7.	Bob DuCharme, "Learning SPARQL", O'Reilly
8.	Protégé Tool, <a href="https://protege.stanford.edu/">https://protege.stanford.edu/</a>
9.	IEEE, ACM Transactions, Journals and Conference papers on Semantic web

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	18B12CS314	<b>Semester Odd (specify Odd/Even)</b>	<b>Semester VII Session 2018 -2019 Month from July 18 to Dec 18</b>
<b>Course Name</b>	Software Development and Management		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>4</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr Chetna Gupta
	<b>Teacher(s) (Alphabetically)</b>	Dr Chetna Gupta

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C430-8.1</b>	Compare and evaluate various analysis techniques to elicit, select, negotiate, and prioritize requirements along with their mathematical specification.	Evaluate Level (C5)
<b>C430-8.2</b>	Apply logical and critical thinking to analyze, synthesize and apply risk management principles and processes to determine risk and its mitigation plans.	Evaluate Level (C5)
<b>C430-8.3</b>	Apply appropriate software design and modeling processes to specify, structure, model and validate requirements.	Apply Level (C3)
<b>C430-8.4</b>	Analyze design and code to find effective solutions to optimize performance of system by making changing in them	Analyze Level (C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	<b>Software Systems Analysis</b>	Balancing Development Needs with Organizational Expectations, Writing Requirements and Requirements Specifications, Requirements captured as a set of use cases, Requirement Traceability matrix – types and creation, Quality Assurance of Requirements, Requirements Negotiation and prioritization – ways and techniques, Crowd-centric requirement gathering, OOA and goal modeling, Connections and Alignment between Requirements Engineering and other Software Engineering activities, Study and analysis of various tools and techniques.	<b>6</b>
<b>2.</b>	<b>Formal methods</b>	Basic concepts, mathematical preliminaries, Applying mathematical notations for formal specification, formal specification languages using Z to represent an example software component.	<b>5</b>
<b>3.</b>	<b>Risk Assessment and management</b>	Task Analysis, Accident Theory, Accident Investigation and Reporting, Accident Statistics, Safety Inspection Procedures, Disaster Planning, Risk Management Systems, Analysis of risk at various stages of SDLC, Tools and techniques	<b>5</b>
<b>4.</b>	<b>System Modeling</b>	Domain Model Distinctions, steps, identify and organize concepts, conceptual model, documenting a domain model, code design process and principles.	<b>5</b>

5.	Cleanroom Software Engineering	Approach, functional specification, design and testing.	5
6.	Component-Based Software Engineering	CBSE process, domain engineering, component-based development, classifying and retrieving components, and economics of CBSE. Component-Based Software Engineering and Search Based Software Engineering	5
7.	Client/Server Software Engineering	Structure of client/server systems, software engineering for Client/Server systems, analysis modeling issues, design for Client/Server systems, testing issues.	6
8.	Computer-Aided Software Engineering	Building blocks for CASE, taxonomy of CASE tools, integrated CASE environments, integration architecture, CASE repository.	5
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignment, Class Test)	
Total		100	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Roger S. Pressman, “Software Engineering: A practitioner approach”, Fifth Edition-TMH International .
2.	Sommerville , “Software Engineering” , Seventh Edition - Addison Wesley
3.	GRADY BOOCH, JAMES RUMBAUGH, IVAR JACOBSON, <a href="#">The Unified Modeling Language User Guide</a> , Addison Wesley, Reading, Massachusetts, May 2005
4.	Richard Thayer , “Software Engineering Project Management”, Second Edition - Wiley-IEEE Computer Society Press.
5.	B. Bezier, “Software Testing Techniques”, Second Edition- International Thomson Computer Press.
6.	Pankaj Jalote, “An Integrated Approach to Software Engineering” Third addition , Springer Press

### Detailed Syllabus

<b>Course Code</b>	<b>18B12CS434</b>	<b>Semester Odd</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from July - December</b>
<b>Course Name</b>	Ethical Hacking		
<b>Credits</b>	3	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. P. Raghu Vamsi
	<b>Teacher(s) (Alphabetically)</b>	Dr. P. Raghu Vamsi

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C431-1.1</b>	Define what is ethical hacking and penetration testing, and when and why penetration testing is required along with testing phases.	Remember Level (Level 1)
<b>C431-1.2</b>	Classify and outline the penetration testing phases and relate the phases to the specified context.	Understand Level (Level 2)
<b>C431-1.3</b>	Identify and analyse the stages a penetration tester requires to take in order to compromise a target system.	Apply Level (Level 3)
<b>C431-1.4</b>	Examine and implement tools and techniques to carry out a penetration testing.	Analyze Level (Level 4)
<b>C431-1.5</b>	Critically evaluate security techniques used to protect system and user data to suggest countermeasures.	Evaluate Level (Level 5)
<b>C431-1.6</b>	Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.	Create Level (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Unit -1 Ethics and Legality	Networking and security and areas of security like Application security, Web security, Network security, Privileges, Foot Printing, scanning virus and worms. Understand 18 U.S.C. § 1030 US Federal Law, Understand the legal implications of hacking.	6
2.	Unit 2: Scanning	Define the terms port scanning, network scanning, and vulnerability scanning, Understand the CEH scanning methodology, Understand Ping Sweep techniques Understand nmap command switches Understand SYN, Stealth, XMAS, NULL, IDLE, and FIN scans List TCP communication flag types ,Understand war dialing techniques ,Understand banner grabbing and OF fingerprinting techniques , Understand how proxy servers are used in launching an attack ,How do anonymizers work? , Understand HTTP tunneling techniques , Understand IP spoofing techniques.	6
3.	Unit 3: Trojans and Backdoors	Understanding Netcat, Trojan, Wrapping, Trojan Evading techniques.	6
4.	Unit 4: Sniffers	ARP poisoning, Wireless Sniffers, mac flooding, DNS spoofing, IP spoofing.	6
5.	Unit 5: Web servers	Web application vulnerabilities, hacking web servers, SQL-Injections.	6

6.	Unit 6: Virus and worms	Linux hacking, virus and worms, Evading IDS, Firewalls, Reverse shell.	6
7.	Unit 7: Mobile Security	Detecting infected APKs, securing Bluetooth	6
<b>Total number of Lectures</b>			<b>42</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz/project and Attendance)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Kimberly Graves, CEH certified ethical hacking, 2015, Wiley publication.
2.	Alper, Al. "Revealed! The Secrets to Protecting Yourself from Cyber-Criminals", Lulu. com, 2016
3.	Wright, Joshua, and Johnny Cache. "Hacking exposed wireless: wireless security secrets & solutions". McGraw-Hill Education Group, 2015.
4.	Engelbreton, Patrick, "The basics of hacking and penetration testing: ethical hacking and penetration testing made easy", Elsevier, 2013
5.	Cannings, Rich, Himanshu Dwivedi, and Zane Lackey. Hacking exposed web 2.0: Web 2.0 security secrets and solutions. McGraw Hill, 2008

### Detailed Syllabus

<b>Course Code</b>	15B22CI521	<b>Semester Odd</b>	<b>Semester VII Session 2018 -2019</b> <b>Month: from July 2018</b>
<b>Course Name</b>	Cloud based enterprise systems		
<b>Credits</b>	3	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	VikasHassija
	<b>Teacher(s) (Alphabetically)</b>	VikasHassija

COURSE OUTCOMES		COGNITIVE LEVELS
<b>CO1</b>	Define all the basic terminologies related to cloud computing and basic nodejs concepts.	Remember Level (Level 1)
<b>CO2</b>	Write basic nodejs programs for creating server, rendering html, routing, get and post methods.	Understand Level (Level 2)
<b>CO3</b>	Develop all nodejs programs using nested loops and api methods to restrict post and get requests.	Apply Level (Level 3)
<b>CO4</b>	Test for the issues in the existing code using debugging tools or other exception handling methods.	Analyze Level (Level 4)
<b>CO5</b>	Basic understanding of the importance of various advanced concepts of big data like hadoop, mapreduce, mongodb, combiners, practitioners, pig and hive.	Evaluate Level (Level 5)
<b>CO6</b>	Create or design an end to end API using nodejs and store the posted data in a mongodb collection.	Create Level (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Module 1: Cloud computing defined	<i>We will introduce and define cloud computing and cloud based enterprise systems, explain the structure and operational aspects of cloud systems, and compare different types of cloud based applications.</i>	8
2.	Module 2: Basics of Node js	We will discuss the basics of node js programming language. We will be creating web pages, connect them using routing functions and create basic APIs to interact with the data structure.	6
3.	Module 3: Big data	We will discuss the concept of Big data and the need of Big data storage and analysis. We will be defining various V's in big data and the end to end process of data generation, cleaning, analysis and decision making.	5
4.	Module 4: Hadoop and Mapreduce	The purpose of this module is to introduce the concept of hadoop and maps reduce in big data. We will be studying the detailed architecture of hadoop, the way files are stored and retrieved from hadoop and the concept of name nodes. We will be studying the algorithms used in map reduce to analyze the data.	7
5.	Module 5: Nosql basics	The purpose of this module is to introduce the basics of Nosql. We will be discussing a lot about the differences of sql and nosql data bases. We will be studying the CAP	7

		theorem to form the foundation of nosql data bases. We will be also studying the format of data stored in nosql data bases.	
6.	Module 6: Mongo db	We will explore the most commonly used nosql database i:e mongo db. We will be running various basic and complex commands to query the collections in mongodb data base.	3
7.	Module 7: AWS, Azure and Dockers	We will explore practically the implementation of web applications on different cloud service providers like AWS and Azure. We will be studying the concept of dockers and will be comparing it to virtual machines.	5
<b>Total number of Lectures</b>			<b>42</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance , Assignment and Quiz)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	"Cloud Computing: From Beginning to End" written by Mr. Ray J Rafaels
2.	Big Data: A Revolution That Will Transform How We Live, Work, and Think
3.	Hadoop: The Definitive Guide, 4th Edition by Tom White
4.	IEEE Transactions on cloud computing
5	ACM Transactions on cloud computing



### Detailed Syllabus

<b>Course Code</b>	18B12CS439	<b>Semester Odd</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from July to Dec, 2018</b>
<b>Course Name</b>	Cloud Computing and Internet of Things		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Prakash Kumar
	<b>Teacher(s) (Alphabetically)</b>	1. Dr.Prakash Kumar

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C430-1.1</b>	Understand various Cloud Service Models and Virtualization Technology to Create Virtual Machines for cloud based applications using Virtual Machine Monitors (VMMs).	Understanding (Level 2)
<b>C430-1.2</b>	Analyze various VM migration techniques and their performances in cloud environments.	Analyze Level (Level 4)
<b>C430-1.3</b>	Optimize the performances of VMs for application specific cloud environments.	Create Level (Level 6)
<b>C430-1.4</b>	Understanding and Modeling of Process, Domain, Information and Service specifications for IoT devices.	Apply Level (Level 3)
<b>C430-1.5</b>	Create functional blocks and use the layer-wise communication protocols based on technological requirements for IoT devices	Create Level (Level 6)
<b>C430-1.6</b>	Design and implement various applications on cloud and IoT models for sustainable development.	Create Level (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Overview of Distributed Computing	Trends of computing, Introduction to distributed computing, System models for Distributed and Cloud Computing, Enabling Technologies.	2
2.	Introduction to Cloud Computing , Issues and Challenges, Cloud Architecture	What's cloud computing, Characteristics and benefits of cloud computing, Service Models, Deployment models. challenges of cloud computing, Cloud Architecture	3
3.	Virtualization Techniques	Role of Virtualization in Cloud Computing, Virtualization Technologies, Virtual Machines Monitors (VMM), Virtualization Techniques, Virtualization of resources and related issues.	8
4.	Web Services for Cloud Environments	Web Services and their approach to Distributed Computing, Web Services Technologies, Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL), Universal Description Discovery and Integration ( UDDI).	5
5.	Cloud Security and Data Management	Network level security, Data level security, Access management and control, Authentication, Managing data-storage & processing	5

		in Cloud.	
	Introduction to IoT	Characteristics, Physical and Logical Design of IoT, Enabling Technologies	4
6.	IoT Platform Design Methodology	Generic Design methodologies for IoT, Design of Process, Domain and Information Models for IoT, Design as per Functional and Operational views. Component Integration and Development of Applications for Sustainable computing.	4
7.	Protocols and Technologies for IoT	IoT Protocols and Technologies, 802.15.4, 6LoWPan. ZigBee.	6
8.	Roles for Cloud and IoT for Green and Sustainable Computing,	Energy aware computing in Cloud Environments and IoTs, Roles and Opportunities for Cloud and IoT for meeting Sustainability Challenges.	5
			42

### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Presentations of assigned topics)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	K. Hwang, Geoffrey C. Fox, Jack J. Dongarra, "Distributed and Cloud Computing- From Parallel Processing to the Internet of Things", Morgan Kauffman Publishers, Elsevier.
2.	Tanenbaum, A.S, Marten, V. Steen, Distributed Systems : Principles and Paradigms, 2 <sup>nd</sup> Edition, Prentice Hall .
3.	M. Singhal, N. G. Shivaratri, Advanced Concepts in Operating Systems, 1 <sup>st</sup> Ed., Tata McGraw-Hill, 1994.
4.	"Introduction to Cloud Computing Architecture" Sun's White Paper, 1 <sup>st</sup> Edition, June, 2009.
5.	Tanenbaum, A. S Distributed Operating Systems, 1 <sup>st</sup> Ed., Prentice-Hall, Englewood Cliffs, NJ, 1995.
6.	Sanderson, Dan, Programming Google's Application Engine, O'Reilly, Google Press.
7.	IEEE, ACM Transactions, Journals and Conference papers on "Distributed and Cloud Computing."
8.	George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud" O'REILLY publication.
9.	"Virtualization Overview", White paper, VM Ware.
10.	"Implementing Virtualization" White paper, Intel virtualization Technology, 2008
11.	Tulloch, Mitch, Understanding Microsoft virtualization solutions: From the Desktop to Data Center, Microsoft Press.

### Detailed Syllabus

<b>Course Code</b>	<b>17B2NCI743</b>	<b>Semester</b> Odd	<b>Semester</b> 7th <b>Session</b> 2019 -2020 <b>Month</b> from July to Dec
<b>Course Name</b>	Cryptography and Network Security		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Nitin Shukla
	<b>Teacher(s) (Alphabetically)</b>	Nitin Shukla

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C432-7.1</b>	Recall mathematical preliminaries essential for cryptography	Recall level (Level 1)
<b>C432-7.2</b>	Understand security goals and classical encryption methods	Understand level (Level 2)
<b>C432-7.3</b>	Apply hashing algorithms in digital signatures, MAC, OPT etc.	Apply Level (Level 3)
<b>C432-7.4</b>	Analyze asymmetric & symmetric encryption algorithms, Cryptographic hash algorithms	Analyse Level (Level 4)
<b>C432-7.5</b>	Compare and Choose cryptographic techniques to provide Network Security for IP, transport and e-mail security	Evaluating Level (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Need, Security Services and Mechanisms, OSI Security Architecture, Model for Network Security, Preliminary mathematics	3
2.	Symmetric Cipher	Classical Encryption Techniques, Block cipher DES, AES, Block Cipher Operation, Pseudorandom Number Generator and Stream Ciphers	13
3.	Asymmetric Ciphers	Public Key Cryptography, RSA, Diffie Hellman Key Exchange, Elgamal cryptosystem, Elliptic curve Cryptography	8
4.	Data Integrity Algorithms	Cryptographic Hash Function, MAC, Digital Signature	6
5.	Network and System Security	Transport Layer Security, Electronic Mail Security, IP Security	8
6.	Other Security Technology	Intrusion Detection System, Firewalls	4
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			

<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment and Class Assessment)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc.  
( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

<b>1.</b>	Cryptography and Network Security by William Stallings, Pearsons Publications, Fifth Edition
<b>2.</b>	Network security: Private communication in a public world by Kaufman, Perlman, and Speciner, Prentics Hall; 2 <sup>nd</sup> edition
<b>3.</b>	Network security essentials: applications and standards by William Stallings.,5/e, Prentice Hall,
<b>4.</b>	ACM Transactions on Information and system security
<b>5.</b>	IEEE Press Computer Security and Privacy
<b>6.</b>	USENIX Security Symposium
<b>7.</b>	Network and Distributed System Security Symposium (NDSS)
<b>8.</b>	International Cryptology Conference (CRYPTO)
<b>9.</b>	International Conference on Theory and Applications of Cryptographic Techniques (EUROCRYPT)

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	15B1NCI738	<b>Semester : Odd</b>	<b>Semester VII Session 2018- 2019</b> <b>Month from July to December</b>
<b>Subject Name</b>	Social Network Analysis		
<b>Credits</b>	3	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	1. Dr. Neetu Sardana
	<b>Teacher(s) (Alphabetically)</b>	1. Dr. Anuja Arora    2. Dr. Neetu Sardana    3.Somya Jain

SLNO	Course objectives:	COGNITIVE LEVEL (BLOOMS TAXONOMY)
<b>C431-2.1</b>	Define social network growth models and their characteristics.	Remember level (Level 1)
<b>C431-2.2</b>	Compare and interpret social network structure, size and its connectivity pattern using degree distribution, clustering coefficient, centrality, motifs, density, etc.	Understand Level (Level 2)
<b>C431-2.3</b>	Apply link prediction techniques like Jaccard Coefficient, Adamic Adar, Preferential attachment, Katz score, etc. to discover new links in the social network.	Apply Level (Level 3)
<b>C431-2.4</b>	Discover community structure in complex network using statistical techniques like Newman Girvan, Clique Percolation Method, Ford Fulkerman etc.	Analyse Level (Level 4)
<b>C431-2.5</b>	Model the cascading/flow of information in social network for maximizing the cascade, locating the seed nodes and influential nodes.	Apply Level (Level 3)
<b>C431-2.6</b>	Develop secured social networks by applying mechanisms like K-anonymity, L-diversity, T-closeness, etc. to ensure privacy and security.	Apply Level (Level 3)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction	Concepts: how services such as Facebook, LinkedIn, Twitter, etc. are using SNA to understand their users and improve their functionality.	2
2.	Network Concept	Introduction: Graphs, Paths and components, Adjacency Matrices, Ways and Modes, Matrix Product, node degree, types of nodes and types of ties, actor attributes	4
3.	Random network models	Erdos-Renyi , Barabasi-Albert , Watts-Strogatz small-world model, shortest path, six degree of separation	5
4.	Social Network Visualization	Tools: Gephi, NetLogo, Pajek, EgoNet	2
5.	Characterizing whole network	Cohesion, reciprocity, Transitivity and clustering Coefficient, Triad census	2
6.	Network centrality	Undirected Non-valued networks: Degree, Eigenvector, betweenness. Directed Non-valued Networks: Degree, Eigenvector, closeness. Valued Networks, Negative tie Networks, subgroup: Cliques and groups	5
7.	Community Detection	clustering, community structure, modularity, overlapping communities	5
8.	Link Prediction	The Katz Score, Hitting & Commute Time, Rooted PageRank, SimRank, Predictors Summary, Meta-measures	5
9.	Information Diffusion	Cascading Behavior: Herd Behaviour, Information Cascade Model, Threshold Model, Cascade Maximization, Epidemic Modeling	5
10.	Security and Privacy in Social Network	Introduction, K-Anonymity, L-Diversity, Q-Anon, T- Closeness	6
<b>Total number of Lectures</b>			<b>41</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Liu, Bing. Web data mining. Springer-Verlag Berlin Heidelberg, 2007.
2.	Chakrabarti, Soumen. Mining the Web: Discovering knowledge from hypertext data. Morgan Kaufmann, 2003.
3.	Scime, Anthony, ed. Web mining: applications and techniques. IGI Global, 2005.
4.	Hitzler, Pascal, Markus Krotzsch, and Sebastian Rudolph. Foundations of semantic web technologies. CRC Press, 2011.
5.	King, Andrew B. Website optimization. " O'Reilly Media, Inc.", 2008.
6.	Segaran, Toby. Programming collective intelligence: building smart web 2.0 applications. " O'Reilly Media, Inc.", 2007.

7.	Charu.C. Aggarwal, Social Network Data Analytics, Springer Science+Business Media, LLC 2011
8.	<i>Easley, David, Jon Kleinberg. Networks, Crowds, and Markets: Reasoning about a Highly Connected World. New York, NY: Cambridge University Press, 2010.</i>
9.	Jackson, Matthew O. <i>Social and Economic Networks</i> . Princeton, NJ: Princeton University Press, 2008

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	17B1NCI748	<b>Semester Odd</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from: July to December 2018</b>
<b>Subject Name</b>	Graph Algorithms and Applications		
<b>Credits</b>	<b>4</b>	<b>Contact Hours</b>	<b>3-1-0</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr Manish Kumar Thakur Dr. Mukta Goyal
	<b>Teacher(s) (Alphabetically)</b>	Dr Manish Kumar Thakur Dr. Mukta Goyal

<b>S. N.</b>	<b>Course Outcome</b>	<b>Cognitive Level (Bloom's Taxonomy)</b>
<b>C431-1.1</b>	Find the shortest path, minimum spanning tree, maximum flow, articulation points, bridges, etc. in the given weighted or unweighted graph	Remembering (Level-1)
<b>C431-1.2</b>	Model the real world computational problems using graph	Understanding (Level-2)
<b>C431-1.3</b>	Apply conventional, approximation and evolutionary algorithmic approaches for graph based computational problems like, covering problems, bipartite set matching, planarity testing, graph reliability, etc.	Applying (Level-3)
<b>C431-1.4</b>	Develop computing solutions for the real world computational problems modelled using graph	Creating (Level-6)
<b>C431-1.5</b>	Analyze the time and space complexities of the designed algorithms and developed solutions for the computational problems	Evaluating (Level-5)

<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	Introduction	Scope, Basic concepts and terminology, Adjacency Matrix, Incidence Matrix, Cycle Matrix, Cut-set Matrix, Path Matrix, Determining lower bounds, Adversary arguments, Problem reductions, NP-completeness, etc.	<b>1</b>
<b>2.</b>	Applications of Connectivity	Reliable communication network design, Cycle detection, Searches, Multiway cut, Minimum K-cut, etc.	<b>5</b>
<b>3.</b>	Applications of Traversability	Shortest paths, Optimal tours, Euler's Cycle, Hamiltonian Cycle, TSP, etc.	<b>4</b>



4.	Applications of Trees	Spanning trees, Steiner Tree, Minimum cost constructions, Coding theory, Phylogeny construction, etc.	4
5.	Applications of Matching/Partitioning	Personnel assignment, Optimal assignment, Hungarian Algorithm, Territory demarcation, Stable Marriage, Project Allocation, etc.	5
6.	Applications of Coverings	Vertex Cover, Set Cover, Shortest superstring, Geometric problems, etc.	3
7.	Applications of Colourability	Storage management, Timetable schedules, etc.	3
8.	Applications of Planarity	Planarity detection, PCB design, Facilities layout and floor plan design, Software testing, Defense strategies, etc.	4
9.	Applications of Digraphs	Circuit theory and electrical network analysis, Transport networks, Job sequencing, Disk scheduling, Participant rankings in tournaments, Choice consistency, Project planning, etc.	4
10.	Applications of Flows	Max-flow min-cut, Feasible flows, Transportation problems, etc.	4
11.	Graph Databases	I. Embrace Relationships with Graph Databases, Querying Graphs: Cypher Query Language, Graph Database Application	5
<b>Total number of Lectures</b>			<b>42</b>

<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA (project )	25 (5 Marks - Punctuality, 5 Marks - Assignment, 15 Marks - Mini-project )
<b>Total</b>	<b>100</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall, 1974

2.	Frank Harary, Graph Theory, Addison-Wesley, 1969
3.	Reinhard Diestel, Graph Theory, 3e, Springer-Verlag, 2005
4.	Kenneth H. Rosen, Discrete Mathematics and its Applications, 6e, McGraw-Hill, 2007
5.	Thomas H Cormen, Charles E Leiserson, Ronald L. Rivest, and Cliff Stein, Introduction to Algorithms, 2e, MIT Press, 2001
6.	A Gibbons, Algorithmic Graph Theory, Cambridge University Press, 1985
7.	V. A. Vazirani, Approximation Algorithms, Springer International Edition

### Syllabus Description

<b>Course Code</b>	17B2NCI731	<b>Semester</b>	Odd	<b>Semester VII Session</b>	2018 - 19
<b>NBA Code:</b>	432.6			<b>Month from July '18 to Dec '18</b>	
<b>Subject Name</b>	Computer Graphics				
<b>Credits</b>	3	<b>Contact Hours</b>	3-1-0		

<b>Faculty</b>	<b>Coordinator</b>	Dr. Suma Dawn / Gaurav Kumar Nigam
	<b>Teacher(s)</b>	Dr. Suma Dawn / Gaurav Kumar Nigam

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C432-6.1</b>	Explain the basics and core concepts of computer graphics including different graphics systems, usage of GPUs, applications of computer graphics, and others.	Understanding Level (Level 2)
<b>C432-6.2</b>	Compose scenes by applying common 2D & 3D graphics algorithms such as, viewing transformations, clipping, projections, rendering, etc. using OpenGL.	Creating Level (Level 6)
<b>C432-6.3</b>	Analyze models for lighting – distant and multiple light sources; reflection and models for shading – flat, smooth, Phong, etc.	Analyzing Level (Level 4)
<b>C432-6.4</b>	Demonstrate the use of planer and surface curves, and use of visible surface detection methods for scene presentation.	Understanding Level (Level 2)
<b>C432-6.5</b>	Explain animation and key framing.	Understanding Level (Level 2)
<b>C432-6.6</b>	Interpret and critique procedural modelling, fractals, and particle systems and critique existing systems.	Evaluating Level (Level 5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction	Context, Requirements, and Application: History of computer graphics, graphics architectures and software, imaging: pinhole camera, human vision, synthetic camera, modeling vs rendering.	3
2.	Graphics Pipeline and Hardware	Display Unit, Frame buffer, DPU, GPU	2
3.	Raster Graphics & related Data structures	Line, circle, ellipse, polygon, Area filling; Rasterization: line drawing via Bresenham's algorithm, clipping, polygonal fill; Introduction to hidden surface removal (z buffer);	10
4.	Colours	Color perception, color models (RGB, CMY, HLS), color transformations. Color in OpenGL. RGB and Indexed color;	3
5.	2D and 3D Planer and Curved objects	Data structures for modeling; Algorithms for Mesh generation, Clipping, 2D and 3D; Geometric Transformations, and so on; Geometric transformations: affine transformations (translation, rotation, scaling, shear), homogeneous coordinates, concatenation, current transformation and matrix stacks; Three dimensional graphics: classical three dimensional viewing, specifying views, affine transformation in 3D, projective transformations;	10
6.	Rendering	Data Structures, Algorithms and hardware support; Ray Tracing; Shading: illumination and surface modeling, Phong shading model, polygon shading; Discrete Techniques: buffers, reading and writing bitmaps and pixelmaps, texture mapping, compositing;	10

7.	Animation	Introduction to animation and keyframing; vector-based animations	2
8.	Procedural modeling	Fractals and particle systems	4
<b>Total number of Lectures</b>			<b>44</b>

<b>Evaluation Criteria</b>	<b>A. THEORY Examination</b>	<b>Max. Marks</b>
	I. Test1	20
	II. Test2	20
	III. End Term	35
	<b>B. Internal</b> - including Assignments, Quizzes, attendance, etc	25
	<b>Total</b>	100

<b>Recommended Reading material: (APA format)</b>	
1.	Foley, J. D., Dam, A. V., Feiner, S. K., Hughes, J. F., & Carter, M. P. (1997). Computer graphics: Principles and practice, in c. <i>Color Research and Application</i> , 22(1), 65-65.
2.	Marschner, S., & Shirley, P. (2015). <i>Fundamentals of computer graphics</i> . CRC Press.
3.	Hearn, D., & Baker, M. P. (1997). Computer graphics, C version.
4.	Angel, E. (1997). <i>Interactive Computer Graphics: A top-down approach with OpenGL</i> (Vol. 2). Addison-Wesley.
5.	Hill Jr, F. S. (2008). <i>Computer graphics using open gl</i> . Pearson education.
6.	Rogers, D. F. (1986). <i>Procedural elements for computer graphics</i> . McGraw-Hill, Inc..
7.	Newman, W. M., & Sproull, R. F. (1979). <i>Principles of interactive computer graphics</i> . McGraw-Hill, Inc..
8.	ACM Transactions on Graphics
9.	IEEE Transactions on Visualization and Computer Graphics

## Detailed Syllabus Lecture-wise Breakup

Subject Code	17B2NCI735	Semester Odd	Semester VII Session 2018_2019 Month from July to Dec
Subject Name	Advanced Databases		
Credits	4	Contact Hours	3-1-0

Faculty (Names)	Coordinator(s)	Dr Devpriya Soni
	Teacher(s) (Alphabetically)	
<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVEL</b>
<b>C431-8.1</b>	Analyze concurrency control, transaction and recovery in data management.	Analyze Level (Level 4)
<b>C431-8.2</b>	Choose appropriate ways to optimize queries.	Create Level (Level 6)
<b>C431-8.3</b>	Apply queries in different forms (relational algebra, SQL, XQuery, CQL etc).	Apply Level (Level 3)
<b>C431-8.4</b>	Show understanding of modern data processing paradigms such as NoSQL and XML	Remembering Level (Level 1)
<b>C431-8.5</b>	Explain methods suitable for particular types of data such as temporal, multimedia or spatial data.	Understanding Level (Level 2)
<b>C431-8.6</b>	Develop and connect a sample web application with a given NOSQL database.	Create Level (Level 6)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Refresher on databases and modelling	SQL: Data Definition and Data Manipulation, Relational Algebra, ER& EER Modelling	2
2.	Different Types of Data	Unstructured, Semi-Structured and Structured Data and their Storage Concerns	2
3.	Stored Procedures and Triggers	Blocks of code stored and executed on the server, creating Triggers.	2
4.	Transaction Management	Transactions Processing, ACID rules Concurrency Control, Recovery	9

5.	Query Optimization	Data storage, Query processing and Techniques of optimization	4
6.	Query Languages	Basics and Need of various Query Languages	2
7.	Database security and privacy	Database security and privacy, including anonymisation and release	6
8.	NoSQL Databases	NoSQL to relax ACID rules; consistency, availability, partition tolerance	8
9.	XML Databases	XML, XPath and XQuery, XSLT, Integrating XML with Databases	6
10.	Special purpose databases	Temporal, spatial, or multimedia databases	2
			<b>43</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc)

1.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 5th Edition, McGraw-Hill,2006
2.	Ramez Elmasri , Shamkant B. Navathe , Fundamentals of Database Systems, 4th Edition, Pearson Education, 2006.
3.	Thomas Connolly, Carolyn Begg, Database Systems-A Practical Approach to design, Implementation and Management, 3rd Edition, Addison-Wesley,2002.
4.	NoSQL for Mere Mortals by Dan Sullivan
5.	Administering Oracle by Ivan Bayross
6.	Handbook of Database Security: Applications and Trends, Editors: Michael Gertz, Sushil Jajodia, 2016.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	18B12CS424	<b>Semester Odd</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from July to December</b>
<b>Course Name</b>	Algorithm Analysis and Artificial Intelligence		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>3-0-0</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Varsha Garg	
	<b>Teacher(s)</b> <b>(Alphabetically)</b>	Varsha Garg	

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C401-12.1</b>	Analyse algorithm's time complexities (Master's method, Recursion tree and substitution method- Sorting and Searching algorithms)	Analyse Level (Level 4)
<b>C401-12.2</b>	Propose solutions for real life computing problems using greedy, divide & conquer, and dynamic programming techniques.	Create Level (Level 6)
<b>C401-12.3</b>	Apply informed and uninformed searching algorithms(A*, Hill Climbing and Simulated Annealing) in AI related problems.	Apply Level (Level 3)
<b>C401-12.4</b>	Solve constraint satisfaction problems and adversarial search algorithms	Create Level (Level 6)
<b>C401-12.5</b>	Apply inference mechanisms( propositional logic , first order predicate logic, and probabilistic reasoning)	Apply Level (Level 3)
<b>C401-12.6</b>	Design and simulate Genetic Algorithms for Optimization.	Create Level (Level 6)

<b>Sr.</b>	<b>Module</b>	<b>Chapters</b>	<b>Lectures</b>
1.	Introduction	Time Complexity analysis: Master's Method. Divide and Conquer methods: Insertion Sort, Merge Sort, Quick Sort	04
2.	Greedy Algorithms	Knapsack Problem; Coin change Problem; Huffman Coding; Activity Selection; Minimum Spanning tree	05
3.	Dynamic Programming Algorithms	Knapsack Problem; Coin change Problem; Matrix chain Multiplication, Longest common subsequence	05
4.	Artificial Intelligence : Problem Solving- I	State Spaces, Uninformed search strategies (BFS, DFS, DLS, IDS, Bidirectional search),	05
5.	Problem solving-II	Informed Search & Explorartion (A*,Heuristic, Local search algorithms, online search agents)	05
6.	Problem solving-III	Constraint satisfaction problems (backtracking, variable and value ordering, local search), Adversarial Search (games, alpha beta pruning, elements of chance, state of art games)	05
7.	Propositional Logic	Knowledge based agents, PL, FOPL, Syntax and semantics, use, knowledge engineering) , Inference in FOPL(Propositional vs First order inference, Unification amd lifting, f/w and b/w chaining) ,	05
8.	Uncertainty	Probabilistic reasoning, Bayesian rule, Bayesian network, Inference, Reasoning over time	04

9.	Genetic Algorithms	Travelling Salesman Problem, Knapsack Problem, Linear Programming	04
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz+Test)	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein , Introduction to Algorithms, MIT Press, 3rd Edition, 2009
2.	Steven Skiena ,The Algorithm Design Manual, Springer; 2nd edition , 2008
3.	Knuth, The art of Computer Programming Volume 1, Fundamental Algorithms, Addison-Wesley Professional; 3 edition,1997
4.	Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 1978
5.	Artificial Intelligence – A modern approach by Stuart Russel and Peter Norvig, PHI, 2008.
6.	Artificial Intelligence Review: An International Science and Engineering Journal, Springer
7.	Nunes de Castro, Leandro, “ Nature-Inspired Computing Design, Development, and Applications” IGI Global, 31-May-2012 - 435 pages



**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	<b>18B12CS440</b>	<b>Semester : ODD</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from: July-Dec</b>
<b>Course Name</b>	<b>IoT ARCHITECTURE AND PROTOCOLS</b>		
<b>Credits</b>	<b>4</b>	<b>Contact Hours</b>	<b>3-1-0</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Charu
	<b>Teacher(s) (Alphabetically)</b>	

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C432-10.1</b>	Identification and description of various components of Internet of Things (IoT)	Remember (01)
<b>C432-10.2</b>	Outline and illustrate various IOT architecture protocols and their applications in the real world applications	Understand (02)
<b>C432-10.3</b>	Identify and model various requirements of IoT for real world applications	Apply(03)
<b>C432-10.4</b>	Compare and assess a variety of existing and developing architecture technologies for IoT	Evaluate(05)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	<b>INTRODUCTION &amp; BASIC CONCEPTS</b>	IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management	<b>06</b>
<b>2.</b>	<b>REFERENCE ARCHITECTURE</b>	IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.	<b>12</b>
<b>3.</b>	<b>IOT DATA LINK LAYER &amp; NETWORK</b>	PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,Z-Wave,Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4, IPv6,	<b>10</b>

	<b>LAYER PROTOCOLS</b>	6LoWPAN, 6TiSCH, ND, DHCP, ICMP, RPL, CORPL, CARP	
<b>4.</b>	<b>TRANSPORT &amp; SESSION LAYER PROTOCOLS</b>	Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)- (TLS, DTLS) – Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT	08
<b>5.</b>	<b>SERVICE LAYER PROTOCOLS &amp; SECURITY</b>	Service Layer -oneM2M, ETSI M2M, OMA, BBF – Security in IoT Protocols – MAC 802.15.4 , 6LoWPAN, RPL,	06
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignments, 02 nos)	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
<b>2.</b>	Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1st Edition, Academic Press, 2014
<b>3.</b>	Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications
<b>4.</b>	Peter Waher, “Learning Internet of Things”, PACKT publishing, BIRMINGHAM – MUMBAI
<b>5.</b>	<a href="http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html">http://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html</a>

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	16B1NCI831	<b>Semester</b> Odd	<b>Semester VII Session</b> 2018 -2019 <b>Month from July to Dec</b>
<b>Course Name</b>	<b>Machine Learning</b>		
<b>Credits</b>	<b>4</b>	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Himanshu Mittal
	<b>Teacher(s) (Alphabetically)</b>	Himanshu Mittal

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C430-10.1</b>	To learn basic concepts of probability, statistics, linear algebra, convex optimization.	Remembering (Level 1)
<b>C430-10.2</b>	To understand concepts of learning system, supervised learning, unsupervised learning.	Understanding (Level 2)
<b>C430-10.3</b>	Apply techniques to handle issues related to learning model such as overfitting, feature scaling, dimensionality reduction.	Applying (Level 3)
<b>C430-10.4</b>	Compare the different learning models using the evaluation parameters.	Analyzing (Level 4)
<b>C430-10.5</b>	Determine the applicability of a learning model for a given problem.	Evaluating (Level 5)
<b>C430-10.6</b>	Design a learning model for a specific real-world problem.	Create (Level 6)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	<i>Unit-1</i>	<b>Introduction:</b> Definition of learning systems. Goals and applications of machine learning. Aspects of developing a learning system.	4
2.	<i>Unit-2</i>	<b>Supervised Learning:</b> Naïve Bayes, Maximum Entropy, CRF, Hidden Markov Model, KNN, Vector space model and cosine similarity, Decision Trees, Overfitting, noisy data, and pruning, Active Learning- Bagging and Boosting.	11
3.	<i>Unit-3</i>	<b>Unsupervised Learning: Clustering:</b> Learning from unclassified data using Implementation and Case studies Hierarchical Agglomerative Clustering, k-means partitional clustering. Expectation maximization (EM). Semi-supervised learning with EM using labeled and unlabelled data.	10
4.	<i>Unit-4</i>	<b>Support Vector Machine, Artificial Neural Networks:</b> SVM- Linear and Non- Linear Kernel functions. Perceptrons: representational limitation and gradient descent training. Multilayer networks and backpropagation.	9
5.	<i>Unit-5</i>	<b>Features and Dimensionality Reduction and Experimental Evaluation of Learning Algorithms:</b>	8

		Feature Extraction, PCA , LDA, Feature Scaling. Comparing learning algorithms: cross-validation, learning curves, and statistical hypothesis testing.	
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quizzes/Tutorial	: 20
		Attendance	: 5)
Total		100	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>Text Book(s):</b>	
1.	<b>Ethem Alpaydin, <i>Introduction to Machine Learning, Second Edition.</i></b>
2.	<b>Stephen Marsland, <i>Machine Learning: An Algorithmic Perspective.</i></b>
<b>Reference Book(s):</b>	
3.	<b>Christopher M. Bishop, <i>Pattern Recognition and Machine Learning.</i></b>

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	17B1NCI749	<b>Semester ODD</b>	<b>Semester VII Session 2018-2019</b> <b>Month from JUL to DEC</b>
<b>Subject Name</b>	MOBILE COMPUTING		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	2. DR. SANJEEV PATEL (J128) 3. MS. ARPITA JATHAV BHATT (J62)
	<b>Teacher(s) (Alphabetically)</b>	

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C431-4.1</b>	Assess the suitability of different techniques in multiplexing, modulation, spread spectrum, frequency reuse factor for specific wireless network requirements	Evaluate Level (C5)
<b>C431-4.2</b>	Identify important issues and concerns on security and privacy of a mobile computing environment and assess technical solution for security and privacy of user data.	Apply Level (C3)
<b>C431-4.3</b>	Analyze performance aspects of medium accessing, transport layer methodologies and routing techniques in wireless networks (WLAN, WPAN) and mobile networks (GSM, UMTS, UTRAN).	Analyze Level (C4)
<b>C431-4.4</b>	Apply functional aspects of Android mobile operating system in developing mobile applications.	Apply Level (C3)
<b>C431-4.5</b>	Build contemporary mobile applications based on different widgets, different views and view groups, SMS, mail, and location aware services through Internet for mobile environments.	Create Level (C6)
<b>C431-4.6</b>	Explain the working of different protocols for mobile network layer and mobile transport layer.	Understand Level (C2)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	Introduction to mobile computing: Applications, mobile and wireless devices, history of wireless communication, open research topics, simplified reference model	3
2.	Wireless Transmission	Frequency for radio transmission, regulation, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum, cellular systems	6
3.	Medium Access Control	Specialized MAC, Hidden and exposed terminals, near and far terminals, SDMA, FDMA, TDMA, CDMA., comparison of	4

		S/T/F/CDMA	
4.	Telecommunication Systems	GSM: Mobile Services, System Architecture, Radio Interface, Protocols, Localization and calling, Handover, Security, Data Services, UMTS and UTRAN, Core Network, Handover	6
5.	Wireless LAN	Infrastructure and ad-hoc network, IEEE802.11: System architecture, protocol architecture, Physical Layer, Medium access control layer, MAC management, 802.11b, 802.11a, HIPERLAN, Bluetooth	5
6.	Mobile network Layer	Mobile IP, Dynamic host configuration protocol, mobile ad-hoc networks, routing	4
7.	Mobile transport layer	Traditional TCP: congestion control, slow start, fast retransmit/fast recovery, implications of mobility, TCP improvements, TCP over 2.5, 3.5 wireless networks, performance enhancing proxies, Mobility.	4
8.	Mobile Operating Systems	Android OS- Installing, Setup, Getting started, Making and testing Android projects, Basic program structure, Java-based layout, XML-based layout, Hybrid layout, Project structure summary, Android Programming: running Simple 'Hello World' Applications.	8
9.	Research Issues in Wireless and Mobile Computing	Mobile networking, Quality of Service in Mobile Networks, Mobile access to World-Wide-Web, Mobile Data Management, Mobile Transactions, Mobile Computing Models	2
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Jochen Schiller, “Mobile Communications”, second edition, Addison-Wesley, 2004.
2.	Stojmenovic, and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002.
3.	Reza Behravanfar, “Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML”, Cambridge University Press, 2004.

<b>4.</b>	Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill Professional, 2005
<b>5.</b>	Hansmann, Merk, Nicklous, Stober, “Principles of Mobile Computing”, Springer, second edition, 2003.
<b>6.</b>	Martyn Mallick, “Mobile and Wireless Design Essentials”, Wiley DreamTech, 2003.
<b>7.</b>	Raj Kamal, “Mobile Computing”, first edition, Oxford University Press, 2007.
<b>8.</b>	Asoke K Talukder, and Roopa R. Yavagal, “Mobile Computing: Technology, Application and Service Creation”, Tata McGraw-Hill Professional, 2005
<b>9.</b>	Abdelsalam Helal, “Any Time, Anywhere Computing: Mobile Computing Concepts and Technology”, Kluwer Academic Publishers, 1999.
<b>10.</b>	IEEE Transaction on Broadcasting
<b>11.</b>	IEEE Transaction on Communication
<b>12.</b>	IEEE Transaction on Computers
<b>13.</b>	IEEE Transaction on VT
<b>14.</b>	IEEE Communication Letters

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	17B2NCI742	<b>Semester ODD</b>	<b>Semester VII Session 2018-2019</b> <b>Month from JUL to DEC</b>
<b>Subject Name</b>	NATURAL LANGUAGE PROCESSING		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	4. DR. ARTI JAIN
	<b>Teacher(s) (Alphabetically)</b>	1. DR. ARTI JAIN

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C432-9.1</b>	Identification and description of various stages of Natural Language Processing (NLP)	Understand Level (C2)
<b>C432-9.2</b>	Determine, identify and apply models related to NLP in distinguished application domains	Apply Level (C3)
<b>C432-9.3</b>	Classify and analyze various challenges, issues and complexity in NLP systems	Analyze Level (C4)
<b>C432-9.4</b>	Compare and assess a variety of existing and emerging use cases and technologies for NLP	Evaluate Level (C5)
<b>C432-9.5</b>	Design and develop novel NLP applications	Create Level (C6)

Module No.	Title of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction to NLP	Application, Challenges, Rationalist and Empiricist approach, Why NLP is difficult, Dirty Hands, tools (NLTK, Gensim, LingPipe)	2
2.	Mathematical Foundation	Probability Theory, Bayes Theorem, Expectation and Variance, Standard distributions, Information Theory, Entropy, Relative Entropy, Joint Entropy, Entropy of English .	4
3.	Collocations	Frequency, Mean and Variance, Hypothesis Testing, MI	6
4.	N-Gram Models	Building N-gram Model, Statistical Estimator, MLE Cross validation, Combining Estimators, Simple Linear estimators, General Linear Interpolation, Applications	5
5.	Word Sense Disambiguation	Pseudowords, Supervised Bayesian, Dictionary Based Disambiguation based on sense definition, Thesaurus Based, Unsupervised Disambiguation, Applications	7



6.	Grammar	Linguistic Essentials, Markov Models, Hidden Markov models, HMM properties, variants, POS Markov model taggers, Hidden Markov model taggers, Tagging Accuracy and applications of tagging, Probabilistic parsing	12
7.	Applications	Machine Translation, Text Categorization, Spell Correction, Regular expression	5
<b>Total number of Lectures</b>			<b>41</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Hinrich Schtze, Christopher D. Manning, “ Foundations of Statistical Natural Language Processing “ , MIT Press. Cambridge, 1999.
2.	Daniel Jurafsky , James H. Martin, Speech and Language Processing , Prentice Hall; 2nd edition, 2008.
3.	Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, “An introduction to Information Retrieval”, Cambridge University Press, 2009.
4.	U. S. Tiwary and Tanveer Siddiqui, Natural Language Processing and Information Retrieval, Oxford University Press (7 April 2008).
5.	Steven Bird, Ewan Klein, Edward Loper, Natural Language Processing with Python- Analyzing Text with the Natural Language Toolkit, O'Reilly Media, 2009
6.	Taming Text: How to Find, Organize, and Manipulate It,Taming Text: How to Find, Organize, and Manipulate It, Manning Publications, 2013.
7.	ACM Transactions on Speech, and Language Processing.
8.	IEEE Transactions on Audio, Speech, and Language Processing.
9.	Hinrich Schtze, Christopher D. Manning, “ Foundations of Statistical Natural Language Processing “ , MIT Press. Cambridge, 1999.
10.	Daniel Jurafsky , James H. Martin, Speech and Language Processing , Prentice Hall; 2nd edition, 2008.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	17B2NCI739	<b>Semester</b> Odd	<b>Semester VII Session</b> 2018 -2019 <b>Month from July to December</b>
<b>Course Name</b>	Cognitive Radio Network		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Himanshu Agrawal
	<b>Teacher(s) (Alphabetically)</b>	Himanshu Agrawal

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C432-8.1</b>	Define the spectrum scarcity problem and design of the wireless networks based on the cognitive radios.	<b>Remembering</b> Level (C1)
<b>C432-8.2</b>	Understand the technologies to allow an efficient use of TVWS for radio communications.	<b>Understanding</b> Level (C2)
<b>C432-8.3</b>	Apply various algorithms to achieve efficient sharing of the unutilized spectrum among cognitive and licensed users.	<b>Applying</b> Level (C3)
<b>C432-8.4</b>	Able to analyze the challenges for deployment of dynamic spectrum access for various applications of wireless networks such as Internet of things, wireless sensor networks and cognitive radio networks.	<b>Analyzing</b> Level (C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction & Basic Concepts	Cognitive radio: goals, benefits, definitions, architectures, relations with other radios, issues, enabling technologies, policies, interoperability/coexistence, etc.	8
2.	Spectrum	Licensed, unlicensed, shared unlicensed, opportunistic unlicensed, Current spectral usage and issues, Regulations, regulation changes	6
3.	Next generation networks	XG (soft spectrum usage, related to spectrum only), and relations with Cognitive radio, Spectral awareness, Spectrum adaptation, Dynamic frequency selection, Spectrum Sharing (secondary users in licensed spectrum), priority allocation, Adaptive bandwidth control, Policies	5
4.	Adaptation and optimization	PHY, MAC, Network, source/channel joint coding, joint routing and link adaptation, routing/power adaptation, Efficiency measures and metrics, network and system aspects, etc.	7
5.	SDR	Hardware limitations, Processing, programmability (flexibility) vs power consumption	7
6.	Sensing	Internal and external, awareness, Spectral awareness, Power efficiency, energy/battery awareness, Device capability awareness, RF Awareness, Interference/noise temperature, channel (medium, radio channel), Time of day, day of	6

		week, Location (in 3D), Geolocation, End-user environment, User profile, User needs and preferences, User contents, Radio Environment, Network Environment etc.	
7.	Miscellaneous	Current cellular cognitive features, Hand-off, Channel allocation, cellular network design, Link adaptation, incremental redundancy, Interference avoidance, detection, and cancellation, Power control	3
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Hseyin Arslan (Ed.), "Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems," Ser. Signals and Communication Technology, xviii, 470 p., I. edition, ISBN: 978-1-4020-5541-6, Springer, August 2007.
2.	Joseph Mitola, III, "Cognitive Radio Architecture: The Engineering Foundations of Radio XML," John Wiley and Sons Ltd., February 2006.
3.	Jeffrey H. Reed, "Software Radio: A Modern Approach to Radio Engineering," Prentice Hall PTR, 2002.
4.	Walter H.W. Tuttlebee, "Software Defined Radio: Enabling Technologies," John Wiley and Sons Ltd., 2002.
5.	Markus Dillinger and Kambiz Madani and Nancy Alonistioti, "Software Defined Radio: Architectures, Systems and Functions," John Wiley and Sons Ltd., 2003.
6.	Simon Haykin, "Cognitive radio: brain-empowered wireless communications," Selected Areas in Communications, IEEE Journal on, Vol.23, Iss.2, Feb. 2005 Pages: 201- 220.
7.	J. Walko, "Cognitive radio," IEE Review, Vol.51, Iss.5, Pg.:34-37, May 2005.
8.	IEEE Personal Communications: Special issue on Software Radios, Aug. 99, Vol. 6, No. 4.



**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	15B1NHS731	<b>Semester</b> ODD	<b>Semester</b> 7 <sup>th</sup> Session 2018 -2019 <b>Month</b> from July 2018 to December 2018
<b>Course Name</b>	DISASTER MANAGEMENT		
<b>Credits</b>	3	<b>Contact Hours</b>	3-0-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr Nilu Choudhary
	<b>Teacher(s) (Alphabetically)</b>	Dr Nilu Choudhary

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C401-2.1</b>	Understand disasters, their hazards and natural and social phenomena related to them.	Understanding level(C2)
<b>C401-2.2</b>	Analyse information on risks and relief	Analyzing level(C4)
<b>C401-2.3</b>	Make use of disaster management principles and community involvement methods in Disaster Risk Reduction.	Apply level(C3)
<b>C401-2.4</b>	Evaluate the role of different approaches and Humanitarian Assistance needed to manage pre and post- disaster periods	Evaluate level(C5)
<b>C401-2.5</b>	Formulate strategies for mitigation in future scenarios by applying technological innovations and learning lessons from past.	Creating level(C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	<b>Introduction to Disasters</b>	Concepts and definitions of Disaster, Hazard, Vulnerability, Resilience, Risks	4
2.	<b>Disasters: Types Of Disaster</b>	Natural and manmade disasters, their Impacts, Hazards.	4
3.	<b>Disaster :Caste, Class and Gender</b>	Caste and disaster, Disaster discrimination, Social class, Differential impacts of disaster - in terms of caste, class, gender, age location, Role of Women's in Disaster.	5
4.	<b>Approaches to Disaster Risk reduction</b>	Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation and preparedness, community based DRR, Structural - nonstructural measures roles and responsibilities of community	5
5.	<b>Inter-relationship between Disasters and Development:</b>	Factors affecting Vulnerabilities, differential impacts, impact of appropriate technology and local resources.	5
6.	<b>Disaster Risk Management in India:</b>	Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, and Health	5

7.	<b>Risk Society</b>	Risk Society in 1992,Ulrick Beck, Processes of Modernization, The new paradigm of risk society	4
8	<b>Disaster Management Act(2005)</b>	DM Act and Policy, Other related policies, plans, programmes and Legislation).	2
9	<b>Global trends in disasters, Urban Disaster, Pandemics, Climatic Change and Complex Emergencies</b>	MDG and Disaster, Agenda 21: For Local actions, Global trends in disasters, urban disasters, pandemics, Epidemics, complex emergencies, Climate change.	4
10	<b>Disaster, Environment and Development</b>	Environment Management, Importance of Waste Management, Types of Disaster Waste, Sources of Waste	4
<b>Total number of Lectures</b>			<b>42</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Oral Questions)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	National Disaster Management Policy. Government of India, 2009.
2.	Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi. 2011
3.	Indian Journal of Social Work. Special Issue on Psychosocial Aspects of Disasters, Volume 63, Issue 2, April. 2002
4.	Alexander David, Introduction in "Confronting Catastrophe", Oxford University Press, 2000
5	Coppola P Damon, Introduction to International Disaster Management, Elsevier. 2007

#### **Detailed Syllabus** **Lecture-wise Breakup**

<b>Course Code</b>	18B12HS412	<b>Semester <u>Odd</u></b>	<b>Semester <u>VII</u> Session 2018 -2019</b> <b>Month from <u>July 2018 - December 2018</u></b>
<b>Course Name</b>	HUMAN RESOURCE ANALYTICS		
<b>Credits</b>	3	<b>Contact Hours</b>	3-0-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr Kanupriya Misra Bakhru
	<b>Teacher(s)</b> <b>(Alphabetically)</b>	Dr Kanupriya Misra Bakhru

COURSE OUTCOMES		COGNITIVE LEVELS
C401-20.1	Understand different analytical techniques used for solving HR related problems.	Understand Level (C 2)
C401-20.2	Apply descriptive and predictive analysis techniques to understand trends and indicators in human resource data.	Applying Level (C 3)
C401-20.3	Analyze key issues related to human resource management using analytical techniques.	Analyze Level (C 4)
C401-20.4	Critically asses and evaluate the outputs obtained from analytical tools and recommend HR related decisions.	Evaluate Level (C 5)
C401-20.5	Create hypotheses, propose solutions and validate using appropriate analytical tehcniques	Create Level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Human Resource (HR) Analytics	Understanding the need for mastering and utilizing HR analytic techniques, Human capital data storage and 'big (HR) data' manipulation, Predictors, prediction and predictive modeling, Current state of HR analytic professional and academic training, HR's Contribution to Business Value, the Changing Nature of HR.	8
2.	Human Resource information systems and data	Understanding HR metrics and data, Data collection, tracking, entry, Data availability in the entire Employment Lifecycle, Approaches and costs of collecting HR related data, Analysis software options, Using SPSS, Preparing the data.	8
3.	Analysis Strategies	From descriptive reports to predictive analytics, Statistical significance, Data integrity, Types of data, Categorical variable types, Continuous variable types, Using group/team-level or individual-level data, Dependent variables and independent variables, Introduction of tools for HR data analysis: Correlation, Regression, Factor Analysis, Cluster Analysis, Structural equation modeling.	10
4.	Application of Human Resource Analytics	Workforce Planning Analytics, Diversity Analytics, Talent Sourcing Analytics, Talent Acquisition Analytics, Talent Engagement Analytics, Training and Intervention Analytics, Analytical Performance Management, Retention Analytics.	10
5.	Future of Human Resource Analytics	Rise of Employee Behavioral Data, Automated Big Data Analytics, Big Data Empowering Employee Development, Quantification of HR, Artificial Intelligence in HR.	6
<b>Total number of Lectures</b>			<b>42</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Quiz)
<b>Total</b>	<b>100</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Bhattacharyya, HR Analytics: Understanding Theories and Applications, Sage, 2017
2.	Pease, Byerly and Jac Fitz-enz, Human Capital Analytics: How to Harness the Potential of Your Organization's Greatest Asset, Wiley, 2012
3.	Isson, Harriott and Jac Fitz-enz, People Analytics in the Era of Big Data: Changing the Way You Attract, Acquire, Develop, and Retain Talent, Wiley, 2016
4.	Guenole, Ferrar and Feinzig, The Power of People: How Successful Organizations Use Workforce Analytics To Improve Business Performance, First Edition, Pearson, 2017
5.	Sesil, Applying Advanced Analytics to HR Management Decisions: Methods for Selection, Developing, Incentive and Improving Collaboration, Pearson, 2014

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	17B1NHS731	<b>Semester: Odd</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from July 2018 to Dec 2018</b>
<b>Course Name</b>	Customer Relationship Management		
<b>Credits</b>	3	<b>Contact Hours</b>	3-0-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Shirin Alavi
	<b>Teacher(s) (Alphabetically)</b>	Dr. Shirin Alavi

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
C401-17.1	Apply the financial, social and electronic aspects of the Customer Relationship in business situations.	Apply Level (C3)
C401-17.2	Appraise the role of customer share and customer centricity in organizations.	Apply Level (C3)
C401-17.3	Develop the skills to understand customization, innovation and co-creation in organizations and apply them in business contexts.	Analyze Level (C4)
C401-17.4	Analyze the role of interactive technology for customer engagement, customer retention and customer experience management in organizations.	Analyze Level (C4)
C401-17.5	Evaluate the technological solutions and their applications for effective Customer Relationship Management across different functions in organizations.	Evaluate Level (C5)
C401-17.6	Develop specific models for response modelling and consumer profiling in organizations.	Create Level (C6)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	CRM-The Strategic Imperatives	Introduction, CRM in Marketing and IT, CRM for Business Leadership, Criticality of customer relationships, Why businesses should adopt CRM, Implementing CRM.	3
2.	Conceptual Foundations of CRM, Building	Evolution of CRM, Benefits, Schools of thought on CRM, Defining CRM. Customer Retention and Customer Acquisition, Customer Profitability is Skewed, Service	7



	Customer Relationships	Benefits of CRM, Transaction Marketing vs. Relationship Marketing, Relationship Building as a process, Bonding for Customer Relationships-Financial, Social, customization and Structural bonds, Ladder of Loyalty Zero Customer Defection, CRM Framework.	
3.	Relationship Marketing and Economics of CRM	Internal and external relationships, Electronic Relationships, Operational, Analytical and Collaborative CRM, Market Share vs. Share of Customer, Customer Lifetime Value, and Activity based costing for CRM	6
4.	CRM in B2C ,B2B Markets , Customer Experience Management	CRM in Product and Service Markets, Case Studies, Characteristics of Business Markets, Participants in the business buying process, Key Account Management, Using KAM for Customer Segmentation, Customer Retention Strategy, KAM as a growth and Development Strategy, Customer Value Management in Business Markets, Importance of CRM in B2B Markets, Customer Emotion, Customer Knowledge, Reciprocity, Voice of the Customer, Participation.	7
6.	Components of e CRM solutions (Overview) and Role of Digital Technologies	Data warehousing, Datamining and CRM, Market Basket Analysis and Retail sector, Campaign Management, Sales Force Automation, Customer Service and Support, Corporate Blogs, Online communities, Twitter, Wikis. The Experience ecosystem. CEM, Consumer engagement, segmentation and differentiation.	7
7.	Product offerings in the CRM Marketplace(Overview) and CRM Roadmap	Evaluating Technological solutions for CRM, Comparison of Siebel, Oracle, MySAP.com and People Soft Enterprise solutions, Comparison of Talisma, Sales logix, Microsoft and Sales notes for small and medium enterprises, Defining a CRM strategy, CRM Implementation Roadmap, Developing a relationship orientation, Customer centric marketing and processes, Building organizational capabilities through internal marketing, Issues in implementing a technology solution for CRM.	7
8.	Operational issues in implementing CRM,Social CRM	Process view of CRM, Budgeting for attraction vs. retention, Learning from customer defections, Customer Retention Plans, Evaluating Retention programs, Social Customer Relationship Management, Social Customer Insights, Social CRM Strategy, and Social Customer Analytics.	5
<b>Total number of Lectures</b>			<b>42</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project: Report and Viva)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Customer Relationship Management-A strategic perspective, G. Shainesh, Jagdish Sheth, Reprinted Macmillan Publishers India Limited, 2009.
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2.	Mukerjee, K., Customer Relationship Management-A Strategic approach to Marketing,Third Edition Prentice Hall of India, 2007.
3.	Customer Relationship Management Concepts and Technologies-Francis Buttle ,Third Edition Taylor and Francis,2015.
4.	Berry, Michael, J. A, Linoff, Gordon S., Datamining Techniques for Sales, Marketing and CRM, Second Edition, Wiley Publications, 2007.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	16B1NHS831	<b>Semester:</b> Odd	<b>Semester:</b> VII <b>Session</b> 2018 -2019 <b>Month</b> from July 2018-Dec 2018
<b>Course Name</b>	Gender Studies		
<b>Credits</b>	3	<b>Contact Hours</b>	3-0-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Ms Puneet Pannu
	<b>Teacher(s) (Alphabetically)</b>	Ms Puneet Pannu

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
<b>C 401-19.1</b>	Demonstrate knowledge of the construct of gender and the way it intersects with other social and cultural identities of race, class, ethnicity and sexuality	Understand( C2)
<b>C 401-19.2</b>	Apply feminist and gender theory in an analysis of gender including an examination of the social construct of femininity and masculinity	Apply (C3)
<b>C 401-19.3</b>	Analyze the ways in which societal institutions and power structures such as the family, workplace impact the material and social reality of women's lives	Analyze (C4)
<b>C 401-19.4</b>	Assess the need for Gender Sensitization and Gender Inclusivity and its practice in contemporary settings	Evaluate (C5)
<b>C 401-19.5</b>	Evaluate and interpret information from a variety of sources including print and electronic media, film, video and other information technologies	Evaluate (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	<b>Introducing Gender Issues</b>	<ul style="list-style-type: none"> <li>Sex and Gender</li> <li>Types of Gender</li> <li>Gender Roles and Gender Division of Labor</li> <li>Gender Stereotyping and Gender Discrimination</li> <li>The Other and Objectification</li> </ul>	8
2.	<b>Gender Perspectives of Body &amp; Language</b>	<ul style="list-style-type: none"> <li>Biological, Phenomenological and Socio-Cultural Perspectives of body</li> <li>Body as a Site and Articulation of Power Relations</li> <li>Cultural Meaning of Female Body and Women's Lived Experiences</li> <li>The Other and Objectification</li> </ul>	8
3.	<b>Social Construction of</b>	<ul style="list-style-type: none"> <li>Bio-Social Perspective of Gender</li> <li>Gender as Attributional Fact</li> </ul>	9

	<b>Femininity &amp; Feminism</b>	<ul style="list-style-type: none"> <li>• Feminine &amp; Feminist</li> <li>• Major Theorists of Feminism Challenging Cultural Notions of Femininity</li> <li>• Feminism Today: Radical, Liberal, Socialist, Cultural, Eco feminism &amp; Cyber feminism</li> <li>• Images of Women in Sports, Arts, Entertainment, Media and Fashion Industry ;Cultural Feminism &amp; Celebrating Womanhood</li> <li>• Analysis of role women have played across cultures</li> </ul>	
4.	<b>Social Construction of Masculinity</b>	<ul style="list-style-type: none"> <li>• Definition and Understanding of Masculinities</li> <li>• Sociology of Masculinity&amp; its Types</li> <li>• Social Organization of Masculinity and Privileged Position of Masculinity</li> <li>• Politics of Masculinity and Power</li> <li>• Major Theorists of Masculinity</li> <li>• Masculine Identities in Literature, Cinema &amp; Media.</li> </ul>	9
5.	<b>Gender Sensitization Empowerment &amp; Gender Inclusivity</b>	<ul style="list-style-type: none"> <li>• Women , Law &amp; Women Rights In India</li> <li>• From Women's Studies to Gender Studies: A Paradigm Shift</li> <li>• Gender Studies &amp; Media: Creating New Paradigms in Gender &amp; Culture</li> </ul>	8
<b>Total number of Lectures</b>			<b>42</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Poster Presentation, Attendance)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1	<b>Davis K., et al</b> , “ <i>Handbook of Gender and Women's Studies</i> . London: Sage. (2006)
2	<b>Helgeson, Vicki S.</b> , “ <i>The Psychology of Gender</i> ”, Pearson(2012)
3	<b>Friedan B.</b> , “ <i>The Feminine Mystique</i> ”, Penguin. (1971/1992)
4	<b>Debeauvoir S. ,</b> “ <i>The Second Sex</i> ”, Vintage (1953/1997)
5	<b>Wharton Amy S.</b> , “ <i>The Sociology of Gender: An Introduction to Theory &amp; Research</i> ”, Wiley-Blackwell (2005)
6	<b>Pachauri G.</b> ,” <i>Gender, School &amp; Society</i> ”, R.Lall Publishers( 2013)
7	<b>Connell R.W</b> , “ <i>Masculinities</i> ”, Cambridge: Polity. (1985)
8	<b>MacInnes J.</b> , “ <i>The End of Masculinity</i> ”. Buckingham: Open University Press. (1998)
9	<b>Kaul A.&amp; Singh M.</b> , ” <i>New Paradigms for Gender Inclusivity</i> ”, PHI Pvt Ltd (2012)

<b>Course Code</b>	<b>17B1NHS732</b>	<b>Semester : Even</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from July 2018 to Dec 2018</b>
<b>Course Name</b>	<b>Indian Financial System</b>		
<b>Credits</b>	3	<b>Contact Hours</b>	3-0-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Mukta Mani(Sec62), Dr. Sakshi Varshney(Sec128)	
	<b>Teacher(s)</b> <b>(Alphabetically)</b>	Dr. Mukta Mani(Sec62), Dr. Sakshi Varshney(Sec128)	
<b>COURSE OUTCOMES</b>			<b>COGNITIVE LEVELS</b>
After pursuing the above mentioned course, the students will be able to:			
<b>C401-1.1</b>	Understand the inter-linkage of components of financial system and financial instruments of Money market and Capital market.		Understanding Level (C2)
<b>C401-1.2</b>	Analyze ways of fund raising in domestic and international markets		Analyzing Level (C4)
<b>C401-1.3</b>	Understand functioning of Stock market and evaluate securities for investment.		Evaluating Level (C5)
<b>C401-1.4</b>	Apply the knowledge of Mutual Funds and Insurance in personal investment decisions		Applying Level (C3)
<b>C401-1.5</b>	Apply knowledge of Income tax for calculation of tax liability of individual.		Applying Level (C3)
<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	Meaning, Importance, and functions of Financial system. Informal and Formal financial system, Financial markets, Financial Institutions, Financial services and Financial instrument	4
2.	Money Market	Features of money market Instruments: Treasury bills, commercial bills, commercial papers, certificates of deposit, call and notice money, Functions of money market, Linking of money market with Monetary policy in India	5
3.	Capital Market	Features of Capital market instrument: Equity shares, Bonds. Fund raising through Initial Public Offering, Rights issue, Preferential allotment and Private Placement. Process of IPO-Intermediaries in IPO, Book building process and allotment of shares	6
4.	Foreign investments in India	Fund raising from foreign market through: Foreign direct investment and foreign institutional investment, ADR, GDR, ECB, and Private equity.	5
5.	Stock Market	Trading in secondary market- Stock exchanges, regulations, demutualisation, broker, listing of securities, dematerialisation, trading, short selling, circuit breaker, stock market indices-methods of calculation of indices.	5
7.	Stock Valuation and	Investing basics: Consideration of Risk and Return, Stock Valuation and Analysis-Fundamental analysis: Economy, industry and	6

	Analysis	company analysis; Technical Analysis of stocks using technical charts	
8.	Investing in Mutual Funds and Insurance	Mutual Funds: Basics, Types of funds, risk and return considerations in selection of funds; Insurance: Basics, Life insurance and health insurance, types of policies	4
9.	Overview of Income Tax	Basics of Income tax- Concept of previous year, assessment year, person, income. Calculation of Income tax liability for individuals: Income from salaries- basic, DA, HRA, leave salary pension and other allowances; Income from House Property- self occupied house, rented house; Income from Capital Gain, Deductions under section 80C to 80U.	7
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, class test)	
Total		100	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	Pathak Bharti V, <i>Indian Financial System</i> , 3 <sup>rd</sup> Ed.,Pearson Education, 2013		
2.	Madura Jeff, <i>Personal Finance</i> , 5 <sup>th</sup> Ed, Pearson Education, 2013.		
3.	Machiraju H R, <i>Indian Financial System</i> , 4 <sup>th</sup> Ed, Vikas Publication, 2010		
4.	Bhole L M, <i>Financial Institutions and Markets</i> , 4 <sup>th</sup> ed. Tata McGraw Hill Publication, 2006.		
5.	Singhanian & Singhanian, Students Guide to Income Tax, Taxmann Publication, 2013.		

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	17B1NHS734	<b>Semester</b> Odd	<b>Semester VII Session</b> 2018 -2019 <b>Month from</b> July 2018 to Dec 2018
<b>Course Name</b>	Managerial and Communication Skills		
<b>Credits</b>	3	<b>Contact Hours</b>	3-0-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Anshu Banwari	
	<b>Teacher(s) (Alphabetically)</b>	Dr. Anshu Banwari	

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C401-3.1</b>	Demonstrate understanding of basic aspects of business communication and realize the importance of it	Understand Level (C2)
<b>C401-3.2</b>	Assess one's and other's communication skills and adapt oneself in order to meet challenges at the competitive workplace	Evaluate Level (C5 )

<b>C401-3.3</b>	Apply the appropriate conflict handling style for effective conflict management	Apply Level (C3)
<b>C401-3.4</b>	Demonstrate understanding about the opportunities and challenges of intercultural communication and recognizing cultural variations	Understand Level (C2)
<b>C401-3.5</b>	Apply the appropriate steps for better decision making by interpreting information	Apply Level (C3)
<b>C401-3.6</b>	Develop an understanding of professional ethics	Apply Level (C3)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	Communication Skill Assessment (CSA) & Development Plan	Build an overall understanding and expectations of the professional environment, Introspection and SWOT analysis of self, Gap Analysis, Guidelines for developing necessary skills and required knowledge to help students in their professional life, Strategies in the Job- Search process, Work on their personality profile and communication skills to make them ready to face the professional world	5
<b>2.</b>	Fundamentals and Functions of Business Communication	Definition and Importance of Business Communication, Communication requirements and characteristics of Managerial Communication, Interpersonal & Intrapersonal Business Communication	5
<b>3.</b>	Building Active Communication Skills	Writing for effect in business messages, Listening, Formal Speaking, Defensive and Non-Defensive Communication, Corporate Body language, Audio and Visual communication, Business Etiquettes and Mannerism	5
<b>4.</b>	Conflict Resolution and Negotiation skills	Origins of Conflict, Guidelines for Effective conflict management, Effective Negotiation in professional environment, Gaining leverage through Persuasion, Impasse and Alternative Dispute Resolution (ADR)	5
<b>5.</b>	Corporate communication	Meeting Management: Need and Importance of Meetings, Conduct of Meeting, Public Relations : Meaning, Functions of PR Department, Roles and responsibilities of an Internal and External PR team, Corporate Social Responsibility	5
<b>6.</b>	Group Discussion and Interview Preparation and, Psychometric Tests	Introduction to the Job recruitment process, Criteria and methods of selection, Interview and GD concepts. Types of Interviews – Selection, Appraisal, Grievance, Exit, Preparing for an Interview, mock group discussion sessions, Psychometric Tests: Importance, Pattern & Practice sessions	5
<b>7.</b>	Data Interpretation and Decision making	Importance of Data Interpretation, Decision Making Techniques, Case Study: Approaches to solve , Reasoning: Interpretation Techniques	5
<b>8.</b>	Communicating Interculturally	Understanding the opportunities and challenges of Intercultural communication, Enhancing Intercultural sensitivity, Improving intercultural communication skills	5
<b>9.</b>	Ethics of Business Communication	Ethics, Fairness & Trust in Business Communication	2

<b>Total number of Lectures</b>		<b>42</b>
<b>Evaluation Criteria</b>		
<b>Components</b>	<b>Maximum Marks</b>	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Assignments, Discussion Questions)	
<b>Total</b>	<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	<b>R.V. Lesikar, &amp; M.E. Flatley</b> , Basic Business Communication Skills for Empowering the Internet Generation, 10 <sup>th</sup> Ed,Tata McGraw Hill Publishing Company, 2005
2.	<b>S. Sengupta</b> , Business and Managerial Communication, Prentice Hall of India, 2011.
3.	<b>A.C. Krizan, P. Merrier, J. Logan, &amp; K. Williams</b> , Business Communication, 7 <sup>th</sup> Ed, Thomson South-Western, 2008.
4.	<b>C.L.Bovee, J.V.Thill</b> , Business Communication Today,8 <sup>th</sup> Ed, Pearson Education, 2008

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	<b>17B1NHS733</b>	<b>Semester : ODD</b>	<b>Semester: VII Session 2018-19</b> <b>Month from July- Dec</b>
<b>Subject Name</b>	<b>Human Rights and Social Justice</b>		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>(3-0-0)</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	
	<b>Teacher</b>	

<b>CO Code</b>	<b>COURSE OUTCOMES</b>	<b>COGNITIVE LEVELS</b>
C401-18.1	Interpret anthropological and sociological approaches to the provision of human rights for peoples and cultures	Understand (C2)
C401-18.2	Appraise human rights practice within the context of local, national and global civil society;	Evaluate(C5)
C401-18.3	Explain social justice framework to evaluate conflicts between rights	Understand (C2)
C401-18.4	Apply organizational and management theories within the context of civil society;	Apply (C3)

Module No.	Subtitle of the Module	Topics in the module	No. of Hours for the module
1.	Conceptual understanding of Human Rights and Social Justice	<ul style="list-style-type: none"> <li>• Meaning and Concept of Human Rights &amp; Social Justice</li> <li>• Notion and Classification of Rights : Natural, Moral and Legal Rights,</li> <li>• Concept of Civil Rights</li> <li>• Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights; Collective/Solidarity Rights)</li> <li>• Distinction between CPR &amp; ESCR</li> </ul>	12
2.	Evolution of Human Rights	<ul style="list-style-type: none"> <li>• Human Rights in Middle Ages: Magna Carta</li> <li>• Modern Movement for Human Rights: The United States Declaration of Independence; The French Declaration of the Rights of Man and the Citizen; United States Bill of Rights; Geneva Convention of 1864</li> <li>• International Norms and Standard Setting: Universal Declaration of Human Rights, 1948.</li> <li>• International Bill of Rights: International Covenant on Civil and Political Rights; and the International Covenant on Economic, Social and Cultural Rights</li> <li>• Universal Values of Human Rights: Human Dignity and Justice; Equality, Liberty and Fraternity</li> </ul>	14
3.	Contemporary Issues in Human Rights and Social Justice	<ul style="list-style-type: none"> <li>• Barriers to social inclusion: Social Hierarchy and social prejudices and exploitation; Socially approved racial and communal discrimination</li> <li>• Internally Displaced Person (IDP) and Human Rights: - Protection during and after Displacement: Humanitarian Assistance Movement-Related Rights- Life- Food- Water and Sanitation- Basic Shelter and Adequate Housing- Health- Recognition, Issuance, and Replacement of Documentation- Property and Possession- Employment- Economic Activities- Social Protection- Electoral Rights Education</li> <li>• Women and Human Rights: Gender Bias, harassment and offences against women, Special laws and institutional mechanisms for the protection of Women's rights.</li> <li>• Minorities and Human Rights: International Convention on Elimination of All Forms of Racial</li> </ul>	16



		Discrimination, Multiculturalism and Minority Rights: Protection and Promotion of Human Rights in Diverse societies <ul style="list-style-type: none"> <li>Human Dignity and Human Rights: International Concerns Regarding Self-Rule and the Rights of Self-Determination, Concept of the Violations of Human Rights as an International Crime, International Criminal Court: War Crimes Including Genocide and War Tribunals</li> </ul>	
Total number of Hours			<b>42</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)													
1.	Donnelly, J. (2013). <i>Universal Human Rights and Practices</i> . Ithaca: Cornell University Press												
2.	Sen, A. (1999). <i>Development as Freedom</i> . Oxford: Oxford University Press												
3.	Easterly, W. (2014). <i>The tyranny of experts: Economists, dictators, and the forgotten rights of the poor</i> . New York: Basic Books												
<b>Evaluation Criteria</b> <table> <tr> <th>Components</th><th>Maximum Marks</th></tr> <tr> <td>T1</td><td>20</td></tr> <tr> <td>T2</td><td>20</td></tr> <tr> <td>End Semester Examination</td><td>35</td></tr> <tr> <td>TA</td><td>25 (5- attendance, 20- assignment)</td></tr> <tr> <td><b>Total</b></td><td><b>100</b></td></tr> </table>		Components	Maximum Marks	T1	20	T2	20	End Semester Examination	35	TA	25 (5- attendance, 20- assignment)	<b>Total</b>	<b>100</b>
Components	Maximum Marks												
T1	20												
T2	20												
End Semester Examination	35												
TA	25 (5- attendance, 20- assignment)												
<b>Total</b>	<b>100</b>												

**Detailed Syllabus**  
**Lecture-wise Breakup**

Course Code	17B1NMA731	Semester Odd (specify Odd/Even)	Semester VII Session 2018 -2019 Month from July 2018-Dec. 2018
Course Name	Applied Linear Algebra		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. R. C. Mittal	
	Teacher(s) (Alphabetically)	Dr. R. C. Mittal	
COURSE OUTCOMES : After pursuing the above mentioned course, the students will be able to:			COGNITIVE LEVELS
C401-7.1	explain field, vectors, vector spaces and their dimensions.		Understanding level (C2)
C401-7.2	apply linear transformations in solving practical engineering problems.		Applying Level (C3)
C401-7.3	develop the concept of rank, determinant, existence and uniqueness of solution of a system of linear equations.		Applying Level (C3)
C401-7.4	explain the concept of length, distance and inner-product.		Understanding level (C2)
C401-7.5	apply the concept of orthogonality and orthogonal matrices to orthogonalize a set of linearly independent vectors.		Applying Level (C3)
C401-7.5	analyze eigenvalues, eigenvectors and their properties to solve a system of ordinary differential equations.		Analyzing Level (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Vector Space and Dimension	Field, Vector Space, Vector subspace, linear dependence and independence, Span of a set, Dimension of a vector space, Direct Sum and Complement	7
2.	Linear Transformation I	Linear Transformation and its algebra, and its matrix representation, homomorphism, isomorphism, rank and null subspace, rank-nullity theorem, Solution of a system of Linear Equations, Determinant	7
3.	Linear Transformation II	Change of basis, Inverse of a linear transformation, Linear functional, transpose	5
4.	Inner Product and Metric	Inner product space, Metric and normed spaces. Orthonormal basis, Orthogonal Subspaces, Gram-Schmidt orthogonalization.	8
5.	Eigen Values and Eigen Vectors	Eigen values and Eigenvectors, Modal matrix and diagonalization, Similarity Transformation, Eigen systems of real symmetric, orthogonal, Hermitian and unitary matrices	9
6.	Applications of Linear Algebra	Bilinear and Quadratic forms, Positive definite matrices, Norm of a matrix, Condition number, Application to find solutions of ordinary differential equations	6
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignments, Quizzes)	
Total		100	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	Hoffman, K and Kunze, R. , Linear Algebra, Fourth Edition, Prentice Hall of India, 2005		
2.	Strang, G., Linear Algebra and its Applications, 3 <sup>rd</sup> Ed., 1998		
3.	Noble, B. and Daniel, J. , Applied Linear Algebra, Prentice Hall of India, 2000		
4.	Lipshutz, S. and Lipsom, M. , Linear Algebra, 3 <sup>rd</sup> Edition, Schaum Series, 2001		
5.	Krishnamurthy, V., Mainra, V. P., and Arora, J. L. , An Introduction to Linear Algebra, Affiliated East-West,		

Detailed Syllabus  
**Lecture-wise Breakup**

Course Code	17B1NMA732	Semester - Odd (specify Odd/Even)	Semester VII Session 2017 -2018 Month from July 2018 – Dec 2018
Course Name	Applied Numerical Methods		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Prof. Sanjeev Sharma and Dr. Neha Ahlawat	
	Teacher(s) (Alphabetically)	Dr. Neha Ahlawat and Prof. Sanjeev Sharma	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C401-8.1	solve system of linear equations using direct and iterative methods with their applications in various engineering problems.		Applying Level (C3)
C401-8.2	explain finite and divided difference formulae for numerical interpolation.		Understanding Level (C2)
C401-8.3	apply the methods of least squares to best fit the given data.		Applying Level (C3)
C401-8.4	apply numerical differentiation and integration in engineering applications.		Applying Level (C3)
C401-8.5	solve system of non-linear equations and analyze the convergence of the methods.		Analyzing Level (C4)
C401-8.6	evaluate the solutions of initial and boundary value problems using various numerical methods.		Evaluating Level (C5)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Numerical Linear Algebra	Gauss-elimination and LU-Decomposition, Iterative methods: Gauss Seidel. Power method for largest eigenvalues, Jacobi method for real symmetric matrices	10
2.	Interpolation and Approximation	Interpolating polynomial, Lagrange formula with error, Formulae for equispaced points, Divided differences, Hermite interpolation, Least square approximation	8
3.	Numerical Differentiation and quadrature	Approximation of derivatives, Newton-Cote formulae, Gauss-Legendre quadrature formulae, Double integration	8
4.	Non-linear Algebraic Equations	Iterative methods for one or more nonlinear equations with convergence	4
5.	Numerical Solutions of ODE and PDE	Runge-Kutta and predictor corrector methods for IVPs, Finite difference methods for BVPs, Shooting methods, Numerical solutions of parabolic and elliptic partial differential equations	12
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz , Assignments, Tutorials)	
Total		100	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	Gerald, C.F. and Wheatley P.O., Applied Numerical Analysis, 6 <sup>th</sup> Ed., Pearson Education, 1999.		
2.	Conte, S.D. and DeBoor, C., Elementary Numerical Analysis, 3 <sup>rd</sup> Ed., McGraw-Hill, 1980.		
3.	Gupta, R.S., Elements of Numerical Analysis, 1 <sup>st</sup> Ed., Macmillan 2009.		
4.	Jain, M.K., Iyengar, S.R.K. and Jain, R.K., Numerical Methods for Scientific and Engineering Computation 5 <sup>th</sup>		

	Ed., New Age International, New Delhi, 2007.
5.	<b>Smith, G.D.</b> , Numerical Solution of Partial Differential Equations, 2 <sup>nd</sup> Ed., Oxford, 1978.

**Detailed Syllabus**  
**Lecture-wise Breakup**

Course Code	18B12MA411	Semester - Odd (specify Odd/Even)	Semester VII Session 2018 -2019 Month from July 2018 to December 2018
Course Name	Ecological Mathematical Modelling		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Lakhveer Kaur	
	Teacher(s) (Alphabetically)	Dr. Lakhveer Kaur	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C401-10.1	Explain the concept of Mathematical Modelling with its classifications and limitations.		Understanding Level (C2)
C401-10.2	Explain continuous and discrete time model formulations with ecological interactions.		Understanding Level (C2)
C401-10.3	Demonstrate exponential growth, self-limited growth, period-doubling bifurcations and chaos.		Applying Level (C3)
C401-10.4	Analyze stability of ecological systems using ordinary differential equations.		Analyzing Level (C4)
C401-10.5	Analyze and interpret results of various ecological systems.		Analyzing Level (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction of mathematical modelling	Introduction to modelling, Definition and examples, Classification of mathematical modelling, Dimensional Analysis, Traffic flow modelling, Techniques of mathematical modelling.	8
2	Characteristics of mathematical modelling	Characteristics of mathematical modelling, Steps in mathematical modelling, Limitations of mathematical modelling.	7
3	Single species population models	Continuous and discrete time model formulations and analysis, Exponential growth, self-limited growth, Period-doubling bifurcations, chaos.	7
4	Stability Analysis	Nondimensionalisation, linear stability analysis Graphical stability analysis and cobweb diagrams, Harvesting problems, insect population dynamics, Insect outbreak models.	7
5	Multi species population models	Models for interacting species, symbiotic, competitive, predator-prey host-parasite ecological interactions; Age-structured models.	7
6	Development and Analysis of mathematical models	Developing mathematical models from descriptive information of ecological systems, Model analysis and biological interpretation of results.	6
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, Tutorials)	
Total		100	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	Giordano, F. R., Weir, M. D. and Fox, W. P., A First Course in Mathematical Modeling, Brooks/Cole Publishing, Pacific Grove, CA, 1997.		

2.	<b>Gibbons, M. M.</b> , A Concrete Approach to Mathematical Modeling, John Wiley and Sons, 2007.
3.	<b>Kapur, J. N.</b> , Mathematical Modeling, New Age International (P) Ltd. Publishers, New Delhi, 2015.
4.	<b>Britton, N. F.</b> , Essential Mathematical Biology, Springer International Edition, 2003.
5.	<b>Murray, J. D.</b> , Mathematical Biology, Springer International Edition, 2002.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	17B1NMA734	<b>Odd Semester</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from: July 2018- December 2018</b>
<b>Course Name</b>	Fuzzy Logic and Nature Inspired Optimization		
<b>Credits</b>	3	<b>Contact Hours</b>	<b>3-0-0</b>
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Dinesh C. S. Bisht	
	<b>Teacher(s)</b> <b>(Alphabetically)</b>	Dr. Dinesh C. S. Bisht	
<b>COURSE OUTCOMES</b>			<b>COGNITIVE LEVELS</b>
<b>C401-9.1</b>	Explain the basic concepts of fuzzy sets, fuzzy rules and fuzzy reasoning.		Understanding Level (C2)
<b>C401-9.2</b>	Apply fuzzy inference in the area of control and robotics.		Applying Level (C3)
<b>C401-9.3</b>	Compare the classical and nature inspired optimization techniques.		Understanding Level (C2)
<b>C401-9.4</b>	Apply various nature inspired techniques to solve optimization problems.		Applying Level (C3)
<b>C401-9.5</b>	Demonstrate MATLAB for aforementioned techniques.		Understanding Level (C2)
<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Basics	Fuzzy Sets, Basic Definition and Terminology, Set-theoretic Operations, Membership Function Formulation, Fuzzy Rules and Fuzzy Reasoning.	6
2.	Fuzzy Logic and Applications	Crisp logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, Fuzzy Inference Systems, Engineering Applications of fuzzy logic.	6
2.	Optimization	Introduction to Optimization, Finding the Best Solution, Minimum-Seeking Algorithms, Exhaustive Search, Analytical Optimization.	5
3.	Nature Inspired Optimization Techniques	Natural Optimization Methods, Biological Optimization, Binary Genetic Algorithm, Natural Selection on a Computer, Components of a Binary Genetic Algorithm, The Continuous Genetic Algorithm, Components of a Continuous Genetic Algorithm, Basic Applications, Introduction to Particle Swarm Optimization and Ant colony optimization.	17
4.	Practical Application using MATLAB	MATLAB Introduction, Files in MATLAB, Graphs, Programming in MATLAB, Fuzzy logic toolbox, nature inspired optimization programming using MATLAB.	8
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>	<b>Maximum Marks</b>		
T1	20		
T2	20		
End Semester Examination	35		
TA	25 (Quiz , Assignments)		
<b>Total</b>	<b>100</b>		

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, 2004, Pearson Education 2004.
2.	Timothy J.Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill, 1997.
3.	Davis E.Goldberg, “Genetic Algorithms: Search, Optimization and Machine Learning”, Addison Wesley, N.Y., 1989
4.	S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
5.	S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing, Wiley Publications, 2008.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	10B1NPH732	<b>Semester : Odd</b>	<b>Semester: VII Session: 2018 -2019</b> <b>Month: from July to December</b>
<b>Course Name</b>	Nanoscience and Technology		
<b>Credits</b>	3	<b>Contact Hours</b>	3

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Navendu Goswami and Dr. Sandeep Chhoker
	<b>Teacher(s) (Alphabetically)</b>	Dr. Navendu Goswami and Dr. Sandeep Chhoker

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C401-4.1</b>	Define the Nanoscience and Technology and to know about various other terminologies and developments involved with Nanoscience and Technology	Remembering (C1)
<b>C401-4.2</b>	Classify the nanomaterials depending on the nature of dimensionalities, type of materials classes and explain the basic concepts of nanomaterials	Understanding (C2)
<b>C401-4.3</b>	Apply the concepts of Nanoscience for solving the theoretical and numerical problems	Applying (C3)
<b>C401-4.4</b>	Determine the properties of nanomaterials through suitable characterization tools	Analyzing (C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	Development of nanoscience and nanotechnology, naturally occurring nanomaterials, Crystallinity of nanomaterials, Metallic nanostructures, Semiconductor nanostructures, Magnetic nanomaterials, Chemically assisted nanostructures, Growth in 2-D nanostructures, Carbon nanomaterials	10
2.	Properties of Nanomaterials	Surface to volume ratio, Surface states and energy, Nanoscale oscillators, Confinement in nanostructures, Density of States and number of states of 0-, 1-, 2-, 3-dimensional systems, Change in Band structure and gap, Energy levels, confinement energy and emission in nano, Fluorescence by QDs, Concept of Single electron transistor	5
3.	Nanomaterials Synthesis	Introduction to synthesis techniques, Top down and bottom up approach, Biological methods, Sol-gel method, Nucleation and growth, Ball Milling technique, Chemical vapor deposition, Physical Vapor deposition: Concept of Epitaxy and sputtering, Basics of Photolithography and its limitations, Soft Lithography and Nanolithography	10
4.	Characterization of Nanomaterials	Resolving power (Rayleigh and other criteria) of microscopes and their limitations for nanostructure measurements, Concept of Far and Near field and modification by NSOM, Basic principle, Design of setup, Theory and working, Characterization procedure, result analysis, Merits/demerits of SEM, TEM, STM, AFM	5
5.	Application of	Nanoelectronics, Nanobiotechnology, Catalysis by	10

	Nanomaterials	nanoparticles, Quantum dot devices, Quantum well devices, High T <sub>c</sub> nano-Superconductors, Nanomaterials for memory application, CNT based devices, MEMS and NEMS	
<b>Total number of Lectures</b>			<b>40</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]	
<b>Total</b>		<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	<i>Nanostructures and nanomaterials: synthesis properties and application</i> , Guozhong Cao, Imperial college press, London.
<b>2.</b>	<i>Introduction to nanotechnology</i> , Charles Poole <i>et al</i> J John Wiley & Sons, Singapore.
<b>3.</b>	<i>The Handbook of Nanotechnology: Nanometer Structures, Theory, Modeling, and Simulation</i> , A. Lakhtakia, Spie Press USA.
<b>4.</b>	<i>Springer Handbook of Nanotechnology</i> , Edited by B. Bhushan, Springer Verlag.



**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	17B1NPH731	<b>Semester : Odd</b>	<b>Semester: I, Session : 2018 -2019</b> Month from: July to December
<b>Subject Name</b>	Introduction to Quantum Information Processing		
<b>Credits</b>	<b>03</b>	<b>Contact Hours</b>	<b>03</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Prof Anirban Pathak and Dr Amit Verma
	<b>Teacher(s) (Alphabetically)</b>	Prof Anirban Pathak and Dr Amit Verma

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C401-5.1</b>	Correlate Quantum Information Processing and their applications in quantum communication and computation.	Remembering (C1)
<b>C401-5.2</b>	Explain quantum information, Qubit, quantum gates, and quantum circuits. Their applications in quantum computing, quantum cryptography and communications.	Understanding (C2)
<b>C401-5.3</b>	Demonstrate the use of basic principles in solving various problems related to quantum circuits with the use of linear algebra and many algorithms and protocols.	Applying (C3)
<b>C401-5.4</b>	Prove and estimate solution of numerical problems using physical and mathematical concepts involved with various quantum circuits.	Evaluating (C5)
<b>C401-5.5</b>	Design of quantum circuits of desired output for quantum cryptography applications.	Creating (C6)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	What is information? Why do we need to know how to manage the information growth? Is the information independent of physical laws used to store and process it? What is the present status of the subject and how far can we go? Definitions of classical information, Quantum information and their differences.	3
2.	Thermodynamics and statistical mechanics	Introduction to thermodynamics; First and second law of thermodynamics; Microstates and Macro states; Entropy, Conditional entropy; Entropy as a measure of disorder (up to $S = k \ln(\Omega)$ )	6
3.	Classical theory of information	Basic ideas of classical information theory, Measures of information (information content and entropy); Maxwell's Demon; Data compression; The binary symmetric channel; error correcting codes; Classical theory of computation; Universal computer; Turing machine; Computational complexity; Uncomputable functions; Shortcomings of classical information theory and necessity of information theory.	8

4.	Introduction to quantum mechanics	Basic ideas of quantum mechanics; Probability interpretation; Measurement problem; Hilbert space; Schrodinger equation.	8
5.	Quantum information	Quantum gates; No cloning theorem (Why quantum information can't be perfectly copied); Dense coding; Quantum teleportation; Quantum data compression; Quantum cryptography; The universal quantum computer; Universal gate; Church-Turing principle; Quantum algorithms; Simulation of Physical systems; Shor's factorization algorithm; Grover's search algorithm; Experimental quantum information processors; Quantum error correction.	9
6	Computers and Intelligent machines	Basic ideas of quantum computers and intelligent machines.	4
7	Summary	Summary of entire course and a short of introduction to the present goals of quantum information technology.	2
<b>Total number of Lectures</b>			<b>40</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (10 M), Attendance (10 M) and Class performance (5 M)]
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Neil Gershenfeld, The Physics of information technology, Cambridge University Press.
2.	H Hirvensalo, Quantum computing, Springer Verlag.
3.	Lecture notes for Physics 229: Quantum Information and Computation, John Preskil <a href="http://www.theory.caltech.edu/people/preskill/ph229/#describe">http://www.theory.caltech.edu/people/preskill/ph229/#describe</a>
4	Andrew Steane, Quantum computing, Rep. Prog. Phys. 61, 117-173 (1998) or quant-ph/9708022 <a href="http://xxx.lanl.gov">http://xxx.lanl.gov</a>
5	P A M Dirac, The principles of Quantum mechanics, Oxford University Press.
6	David J.C. MacKay, Information Theory, Inference and Learning Algorithm.
7	A. Barenco, Quantum Physics and Computers, Contemporary Physics, <b>37</b> , 375-89 (1996).
8	C.H. Bennett, Quantum Information and Computation, Physics Today, Oct., 1995, <b>24-30</b> (1995).
9	A. Ekert, P. Hayden, H Inamori, Basic concepts in quantum computation, quant-ph/0011013.
10	D. Gottesman and H K Lo, From quantum cheating to quantum security, Physics Today, Nov., 2000.
11	J Preskill, battling decoherence: the fault – tolerant quantum computer. Physics Today, 24-30, June 1999.
12	A. M. Steane and W. Van Dam, Physicists triumph at guess my number, Physics Today, 35-39, Feb. 2000.
13	V. Vedral and M. B. Plenio, Basics of quantum computation, Prog. Quant. Electron, 22 1-39 (1998)
14	A. Zeilinger, Fundamentals of quantum information, Physics World, 11, March, 1998.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	16B1NPH732	<b>Semester :ODD</b>	<b>Semester VII Session 2018 -2019</b> <b>Month: July-December</b>
<b>Course Name</b>	Green Energy and Climate Modeling		
<b>Credits</b>	3	<b>Contact Hours</b>	3

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Prashant Chauhan
	<b>Teacher(s)</b>	Dr. Prashant Chauhan

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C401-6.1</b>	Recall the basic information about different energy resources, reserves and define the problem with fossil fuel	Remembering (C1)
<b>C401-6.2</b>	Explain green house effect, modelling of temperature measurement and physics behind the global warming	Understanding (C2)
<b>C401-6.3</b>	Demonstrate the basic principles and designs of different solar collectors and concentrators, and identify the best design/material/location to absorb maximum solar energy	Applying (C3)
<b>C401-6.4</b>	Analyze the potential of different renewable energy sources like wind, ocean and bio mass energy	Analyzing (C4)
<b>C401-6.5</b>	Compare the output of renewable energy source using different design under different conditions/location	Evaluating (C5)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	Man and energy, world and Indian production /reserve of conventional energy sources, alternative energy sources.	02
2.	The greenhouse effect	Physics behind greenhouse effect, Blackbody radiation, layer model depending on energy flux and temperature at earth surface, radiation effect on Greenhouse gases, temperature structure of the atmosphere, Heat, pressure, wind, feedback mechanism. Carbon Cycle and Climate, Fossil Fuels, Effect of Conventional energy sources.	10
3.	Solar energy	Nature and availability of radiation, estimation of solar energy radiation. Effect of receiving surface, location and orientation, heat transfer consideration relevant to solar energy, Characteristics of materials and surface used in solar energy absorption. Device for thermal collection and storage	06
4.	Ocean Energy	Tidal energy, and its characteristics, tidal energy estimation, important component of tidal energy plant, single basin plant, double basin plant, turbine, tidal power plant development in India, wave energy, design parameters of wave energy plant, introduction and working of ocean thermal energy conversion,	06
5.	Wind Energy and Bio Mass energy	Introduction to wind energy, Nature, power, forces, conversion and estimation. Components of wind energy system types, safety and environment, Introduction to bio mass energy, conversion and utilization of biogas plants and gasifiers	10
6.	Fusion Energy	Basics of DT fusion, Magnetic confinement fusion, laser inertial fusion, present status of fusion reactors and future scope at international and national level	6

<b>Total number of Lectures</b>		<b>40</b>
<b>Evaluation Criteria</b>		
<b>Components</b>	<b>Maximum Marks</b>	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]	
<b>Total</b>	<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	Global Warming : Understanding the forecast by David Archer, Wiley
<b>2.</b>	Kothari D.P. renewable energy resources and emerging technologies, Prentice of India
<b>3.</b>	G D, Non-conventional energy sources, Khanna Publishers
<b>4.</b>	Duffie J A & Beckmann W A, Solar engineering of thermal process, Wiley-International Publication

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	16 B19EC691	<b>Semester Odd</b> (specify Odd/Even)	<b>Semester 7th Session 2018 -2019</b> <b>Month from Jan to June</b>
<b>Course Name</b>	Renewable Energy		
<b>Credits</b>	2	<b>Contact Hours</b>	2

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Vinay A. Tikkiwal
	<b>Teacher(s)</b> (Alphabetically)	Mandeep Narula, Vinay A. Tikkiwal

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO1</b>	Explain the need of renewable sources of energy, impact of renewable energy on environment, challenges in the electric grid, Smart Grid.	Understanding (Level II)
<b>CO2</b>	Analyze basics of Solar radiation and Solar photovoltaics, Balance of PV systems	Analysis (Level IV)
<b>CO3</b>	Analyze wind energy resource and designing of Wind Energy Generators	Analysis (Level IV)
<b>CO4</b>	Illustrate different biomass energy resources, and extraction of biomass energy	Understanding (Level II)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	<b>Introduction</b>	Overview of energy use and related issues, major energy options, issues of supply and demand, energy conversions, global climate change issues, effects on ecology and biodiversity, status of renewable energy in India.	4
<b>2.</b>	<b>Solar Energy</b>	Fundamentals of Solar radiation, Solar Resource Assessment, Solar Photovoltaics, Balance of PV Systems, and Solar Thermal.	10
<b>3.</b>	<b>Wind Energy</b>	Wind resource, Basics of aerodynamics, Maximum power extraction from wind resource fundamental power equations, Basic design concepts of Wind Energy Generators	8
<b>4.</b>	<b>Biomass Energy</b>	Biomass resource, extracting biomass energy, landfill gas, waste to energy, energy balances and economics.	6
<b>5.</b>	<b>Electric Grid</b>	Basic operations, performance related issues, new developments and challenges in the electric grid.	2

<b>Total number of Lectures</b>			<b>30</b>
<b>Evaluation Criteria</b>			
<b>Components</b>	<b>Maximum Marks</b>		
Mid-Term	30		
End Semester Examination	40		
TA	30		
<b>Total</b>	<b>100</b>		

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	Solanki, C.S., <i>Solar Photovoltaics: Fundamental, technologies and applications</i> , 3rd ed., Delhi: Prentice Hall of India, 2015
<b>2.</b>	Momoh, J., <i>Smart Grid: Fundamentals of Design and Analysis</i> , Wiley-IEEE Press, 2012.
<b>3.</b>	Ahmed S., <i>Wind Energy: Theory and Practice</i> , 3rd ed., Delhi: Prentice Hall of India, 2016
<b>4.</b>	Earnest J., <i>Wind Power Technology</i> , 2nd ed., Delhi: Prentice Hall of India, 2015
<b>5.</b>	Kothari, D.P., Singal, K.C. and Ranjan, R., <i>Renewable Energy Sources and Emerging Technologies</i> , 2nd ed., Delhi: Prentice Hall of India, 2016.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	17B1NBT732	<b>Semester Odd</b> <b>(specify Odd/Even)</b>	<b>Semester VII Session 2018 -2019</b> <b>Month from July-December</b>
<b>Course Name</b>	Healthcare Marketplace		
<b>Credits</b>	3	<b>Contact Hours</b>	3

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Indira P. Sarethy
	<b>Teacher(s)</b> <b>(Alphabetically)</b>	Dr. Indira P. Sarethy, Dr. Shweta Dang

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C401-14.1</b>	Explain healthcare market, drugs and devices, role of various stakeholders	Understand Level (C2)
<b>C401-14.2</b>	Apply related intellectual property laws and regulatory approvals for healthcare sector	Apply Level (C3)
<b>C401-14.3</b>	Analyze the various business models/ innovations in the healthcare industry	AnalyzeLevel (C4)
<b>C401-14.4</b>	Compare and examine economic aspects pertaining to the sector	AnalyzeLevel (C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	<b>Introduction to Healthcare markets</b>	About the various Regulatory bodies for approval of new medical innovations	<b>02</b>
<b>2.</b>	<b>Clinical Pharmacokinetics and Clinical trials for new Drugs</b>	Biologic sampling techniques, analytical methods for the measurement of drugs and metabolites, and procedures that facilitate data collection and manipulation. Clinical Trials: PhI, II, III and IV	<b>05</b>
<b>3.</b>	<b>Regulatory approval pathways</b>	Preclinical studies US and EU filings IND submissions, NDA and BLA Submissions, Non-patent exclusivities, data and market exclusivities cost analysis	<b>06</b>
<b>4.</b>	<b>Patents of drugs and devices, Entry for generics in health care markets</b>	Role of patents on new drugs and devices, Ever-greening of patents, Product and Process patents. Hatch Waxman act and Introduction of generics and resulting cost reduction, Orange book (FDA) and related case studies.	<b>08</b>
<b>5.</b>	<b>Economics of healthcare</b>	Stakeholders in healthcare- doctors, hospitals and insurers and their roles, technology and human capital	<b>7</b>
<b>6.</b>	<b>Medical technology and insurance</b>	For medical devices, pharmaceuticals, genetic diagnostic tests and their regulations	<b>4</b>
<b>7.</b>	<b>Indian hospital sector</b>	Various players – government, private, PPP models, strategic perspectives, case studies	<b>4</b>
<b>8</b>	<b>Innovations in the marketplace</b>	Health to market innovations	<b>4</b>

9	Healthcare informatics	e-health, collection of health data, data processing, evaluation, health information systems, case studies	2
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignments 1, 2, 3, Attendance)	
Total		100	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	Research papers and online resources		



**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	17B1NBT733	<b>Semester Odd (specify Odd/Even)</b>	<b>Semester VII Session 2018 -2019 Month from July-December</b>
<b>Course Name</b>	Stress: Biology, Behaviour and Management		
<b>Credits</b>	3 (3-0-0)	<b>Contact Hours</b>	3

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Vibha Gupta
	<b>Teacher(s) (Alphabetically)</b>	Vibha Gupta

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C401-16.1</b>	Explain the biological basis of stress.	<b>Understand Level (C2)</b>
<b>C401-16.2</b>	Relate cognitive processes and stress management.	<b>Understand level (C2)</b>
<b>C401-16.3</b>	Apply acquired knowledge in understanding and adjusting to different people and situations.	<b>Apply level (C3)</b>
<b>C401-16.4</b>	Improve quality of life by reducing stress.	<b>Create level (C6)</b>

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	The concept of Stress - Major stressors vs. routine hassles ; Major types of Stressors - Occupational Stressors; Organization Stress; Environmental Stressors	2
2.	Scientific Foundations of Stress	The Nature of Stress; Human Physiology; Stress and Relaxation Responses; Stress and Disease	4
3.	Body Systems activated by stressors	Nervous System, Endocrine System, immune system, Cardiovascular system, Gastrointestinal System, Muscles	7
4.	Cognitive Psychology	Theoretical models: psychodynamic, behavioral, and cognitive; Thoughts, Beliefs and Emotions: Behavioral Patterns; Self-concept and Self-esteem; Stress emotions - Anger and Fear; Personality Traits – Stress prone and Stress resistant	9
5.	Social Psychology	Family and Culture; Demands and Responsibilities; Relationships; Verbal and Non-verbal Communication; Human Spirituality	2
6.	Stress and the Human Environmental Interactions:	Time; Body Rhythms; Weather and Climate; Nutrition; Exercise; Drugs and Addictions; Violence and Post Traumatic Stress	2
7.	Stress management techniques and therapeutic strategies	Psychological interventions; Developing Cognitive Coping Skills; DIY Strategies- Exercise and Health; Journal Writing; Music and Art Therapy; Humor and Comic Relief; Creative Problem Solving; Meditation; Mindfulness –	12

		Eastern & Western approaches	
8.	The adaptive brain	Neuroplasticity – positive adaptation to stress	2
<b>Total number of Lectures</b>			<b>40</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Quiz and class discussions)
<b>Total</b>	<b>100</b>

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	George Fink “Stress: Concepts, Cognition, Emotion, and Behavior: Handbook in Stress Series; Volume 1; Academic Press; 2016
2.	Jeanne Ricks “The Biology of Beating Stress”Kindle Edition; 2014
3.	Jerrold S. Greenberg “Comprehensive Stress Management” Tata McGraw-Hill Edition; Tenth Ed., 2009
4.	Brian Luke Seaward “Managing Stress: Principles and Strategies for Health and Well-Being” Sixth Ed., Jones and Bartlett Publishers, 2009
5.	Saundra E. Ciccarelli, and Glenn E. Meyer “Psychology” South Asian Edition; Published by Pearson Education (2008); ISBN 10:8131713873 / ISBN 13: 9788131713877