

Detailed Syllabus
Lecture-wise Breakup

Subject Code	17B1NCI731	Semester Odd (specify Odd/Even)	Semester VII Session 2018 - 19 Month from July to December 2018
Subject Name	Machine Learning and Natural Language Processing		
Credits	3-1-0	Contact Hours	4

Faculty (Names)	Coordinator(s)	Bharat Gupta
	Teacher(s)	Bharat Gupta, Chetna Dabas

COURSE OUTCOMES		COGNITIVE LEVELS
C430-2.1	Explain different syntax and semantics approaches in NLP	C2
C430-2.2	Understand the fundamental mathematics applied in the field of NLP	C2
C430-2.3	Apply different models like Hidden Markov Model, SVM, CRF, RNN, LSTM in parts of speech tagging.	C3
C430-2.4	Apply different probabilistic parsing techniques in NLP	C3
C430-2.5	Apply different supervised and unsupervised techniques for document classification.	C3
C430-2.6	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
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20

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

Detailed Syllabus

Subject Code	17B1NCI746	Semester ODD (specify Odd/Even)	Semester: VII Session: 2018 - 19 Month from: July to Dec 2018
Subject Name	Image Processing		
Credits	3-1-0	Contact Hours	4
Faculty (Names)	Coordinator(s)	Dr. Ankit Vidyarthi	
	Teacher(s) (Alphabetically)	Dr. Ankit Vidyarthi	

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

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

Total number of Lectures			43
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Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (...)
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.	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

Course Code	17B1NCI732	Semester Odd (specify Odd/Even)	Semester 7th Session 2018 -2019 Month from July 2018- Dec 2018
Course Name	Computer and Web Security		
Credits	3-1-0	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Sangeeta Mittal
	Teacher(s) (Alphabetically)	Dr. Sangeeta Mittal

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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	9

	Attacks,Bots, Botnets	
Total number of Lectures		42
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Tut(5) + Attendance(5) +Quiz(5)+Mini Project(5))	
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.	Security in Computing 5 th Edition , Charles P Fleeger et. al. , Prentice Hall
2.	Information Security, Principles and Practice, Mark Stamp, Wiley
3.	Kali Linux, Abhinav Singh, Packt Publishing
4.	Computer Viruses and Malware, John Aycock, Springer
5.	Computer Security: Art and Science, Matt Bishop, Addison Wesley

Detailed Syllabus

Course Code	18B12CS434	Semester (Odd)	Semester I Session 2018 -2019 Month from July – December 2018
Course Name	Ethical Hacking		
Credits	3-1-0	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. P. Raghu Vamsi
	Teacher(s) (Alphabetically)	Dr. P. Raghu Vamsi

COURSE OUTCOMES		COGNITIVE LEVELS
C431-1.1	Define what is ethical hacking and penetration testing, and when and why penetration testing is required along with testing phases.	Remember Level (Level 1)
C431-1.2	Classify and outline the penetration testing phases and relate the phases to the specified context.	Understand Level (Level 2)
C431-1.3	Identify and analyse the stages a penetration tester requires to take in order to compromise a target system.	Apply Level (Level 3)
C431-1.4	Examine and implement tools and techniques to carry out a penetration testing.	Analyze Level (Level 4)
C431-1.5	Critically evaluate security techniques used to protect system and user data to suggest countermeasures.	Evaluate Level (Level 5)
C431-1.6	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 tunnelling 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
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz/project and 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.	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.	Engebretson, 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

Course Code	17B1NCI748	Semester ODD (specify Odd/Even)	Semester VII Session 2018 -2019 Month from July to December 2018
Course Name	Graph Algorithms and Applications		
Credits	3-1-0	Contact Hours	4
Faculty (Names)	Coordinator(s)	Dr Manish Kumar Thakur	
	Teacher(s) (Alphabetically)	Dr Manish Kumar Thakur	

COURSE OUTCOMES		COGNITIVE LEVELS
C431-1.1	Find the shortest path, minimum spanning tree, maximum flow, articulation points, bridges, <i>etc.</i> in the given graph	Remember Level (C1)
C431-1.2	Model the real world computational problems using graph	Understand Level (C2)
C431-1.3	Apply conventional, approximation and evolutionary algorithmic approaches for graph based computational problems like, covering problems, set matching, planarity testing, graph reliability, <i>etc.</i>	Apply Level (C3)
C431-1.4	Develop computing solutions for the real world computational problems modeled using graph	Create Level (C6)
C431-1.5	Analyze the time and space complexities of the designed algorithms and developed solutions for the computational problems	Evaluate Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Graph representation using Adjacency Matrix and List, Incidence Matrix, Cycle Matrix, Cut-set Matrix, Path Matrix, <i>etc.</i>	1
2.	Applications of Traversability	DFS, BFS, Shortest paths, Optimal tours, Cycle detection, Euler's Cycle, Hamiltonian Cycle, TSP, <i>etc.</i>	4
3.	Applications of Trees	Minimum Spanning Tree, Steiner Tree, Depth First Search Spanning Tree, Breadth First Search Spanning Tree, <i>etc.</i>	4
4.	Applications of Reliability	Reliable communication network design, Articulation points, Bridges, Multiway cut, Minimum K-cut, <i>etc.</i>	5
5.	Applications of Matching	Personnel assignment, Optimal assignment, Hungarian Algorithm, Territory demarcation, Stable Marriage, Project Allocation, <i>etc.</i>	5
6.	Applications of Coverings	Vertex Cover, Set Cover, Shortest superstring, Geometric problems, <i>etc.</i>	4
7.	Applications of Coloring	Algorithms for Graph Coloring, Applications in Storage management, Timetable schedules, <i>etc.</i>	3
8.	Applications of Planarity	Planarity detection, PCB design, Facilities layout and floor plan design, Software testing, Defense strategies, <i>etc.</i>	4

9.	Applications of Digraphs	Transport networks, Job sequencing, Disk scheduling, Participant rankings in tournaments, Choice consistency, Project management, etc.	5
10.	Applications of Flow Network	Max-flow min-cut, Feasible flows, Transportation problems, Assignment problems, etc.	4
11.	Graph Database	Embrace Relationships with Graph Databases, Querying Graphs: Cypher Query Language, Graph Database Application	3
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (5 Marks - Punctuality, 5 Marks - Assignment, 15 Marks - Mini-project)
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.	NarsinghDeo, Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall, 1974
2.	Kenneth H. Rosen, Discrete Mathematics and its Applications, 6e, McGraw-Hill, 2007
3.	V. A. Vazirani, Approximation Algorithms, Springer International Edition
4.	ReinhardDiestel, Graph Theory, 3e, Springer-Verlag, 2005
5.	Thomas H Cormen, Charles E Leiserson, Ronald L. Rivest, and Cliff Stein, Introduction to Algorithms, 2ed, MIT Press, 2001
6.	A Gibbons, Algorithmic Graph Theory, Cambridge University Press, 1985

Detailed Syllabus
Lecture-wise Breakup

Subject Code	15B1NCI738	Semester :odd	Semester Seventh Session 2017- 2018 Month from July to December
Subject Name	Social Network Analysis		
Credits	3-1-0	Contact Hours	4

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

SLNO	DESCRIPTION	COGNITIVE LEVEL (BLOOMS TAXONOMY)
C431-2.1	Define social network growth models and their characteristics.	Remember level (Level 1)
C431-2.2	Compare and interpret social network structure, size and its connectivity pattern using degree distribution, clustering coefficient, centrality, motifs, density, etc.	Understand Level (Level 2)
C431-2.3	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)
C431-2.4	Discover community structure in complex network using statistical techniques like Newman Girvan, Clique Percolation Method, Ford Fulkerman etc.	Analyse Level (Level 4)
C431-2.5	Model the cascading/flow of information in social network for maximizing the cascade, locating the seed nodes and influential nodes.	Apply Level (Level 3)
C431-2.6	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
Total number of Lectures			41

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.	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.	Easley, David, Jon Kleinberg. <i>Networks, Crowds, and Markets: Reasoning about a Highly Connected World</i> . New York, NY: Cambridge University Press, 2010.
9.	Jackson, Matthew O. <i>Social and Economic Networks</i> . Princeton, NJ: Princeton University Press, 2008

Detailed Syllabus

Course Code	17B1NCI749	Semester Odd (specify Odd/Even)	Semester VII Session 2018 -2019 Month from July-December
Course Name	Mobile Computing		
Credits	3-1-0	Contact Hours	4

Faculty (Names)	Coordinator(s)	Arpita Jadhav Bhatt
	Teacher(s) (Alphabetically)	Arpita Jadhav Bhatt (62), Dr.Sanjeev Patel (128)

COURSE OUTCOMES		COGNITIVE LEVELS
C431-4.1	Assess the suitability of different techniques in multiplexing, modulation, spread spectrum, frequency reuse factor for specific wireless network requirements.	Evaluate Level (Level 5)
C431-4.2	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 (Level 3)
C431-4.3	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 (Level 4)
C431-4.4	Apply functional aspects of Android mobile operating system in developing mobile applications.	Apply Level (Level 3)
C431-4.5	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 (Level 6)
C431-4.6	Explain the working of different protocols for mobile network layer and mobile transport layer.	Understand Level (Level 2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Mobile computing applications: vehicles, emergencies, business, replacement of wired networks, infotainment, location dependent services, mobile and wireless devices, history of wireless communication, open research topics, simplified reference model	03
2.	Wireless Transmission	Frequency for radio transmission, regulation, signals, antennas, signal propagation, multiplexing, modulation, spread spectrum, cellular systems	05
3.	Medium Access Control	Specialized MAC, Hidden and exposed terminals, near and far terminals, SDMA, FDMA, TDMA, CDMA., comparison of S/T/F/CDMA	04
4.	Telecommunication	GSM: Mobile Services, System Architecture, Radio	04

	Systems	Interface, Protocols, Localization and calling, Handover, Security, Data Services, UMTS and IMT-2000: UMTS releases and standardization, UMTS system architecture, UMTS radio interface, UTRAN, Core Network, Handover	
5.	Wireless LAN	Infra-red vs. radio transmission, 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	05
6.	Mobile network Layer	Mobile IP, Dynamic host configuration protocol, mobile ad-hoc networks	04
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	05
8.	File Systems	File systems, world wide web, wireless application protocol, WAP 2.0	02
9.	Mobile Operating Systems	Android OS- Installing, Setup, Getting started, Making and testing Android projects, Basic program structure, Java-based layout, XML-based layout, Android Studio, ADT visual layout editor, Hybrid layout, Project structure summary, Application fundamentals: DPI, Themes, Metrics and Grids, Typography, Color, Iconography, Writing Style, Patterns, Use of Dalvik Virtual machine in Android OS, Application components- Activities, Services, Broad cast receivers, content providers, SDK, setting Android Virtual Device, role of Manifest file, Event handling – buttons, image buttons, creating activity files, creating multiple activity files, creating layouts for activity files, Intent class, passing data using intents, List view using array adapters, creating customized list view, creating grid view using array adapter, creating customized list view, web view, spinners, parsing data using JSON parser iOS : Introduction to iOS Architecture, SDK for creating iOS applications, Building blocks for iOS apps, Interface file, Implementation file, Delegate file	10
10.	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	02
Total number of Lectures			44

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project:15, Assignment:5, Attendance:5)
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.	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.
4.	Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden , Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", McGraw-Hill Professional, 2005
5.	Griffiths D, Griffiths D. Head First Android Development: a brain-friendly guide. " O' Reilly Media, Inc."; 2017 Aug 9.
6.	Burd BA. Android application development all-in-one for dummies. John Wiley & Sons; 2015 Jul 9.
7.	Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.
8.	MartynMallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003.
9.	Raj Kamal, "Mobile Computing", first edition, Oxford University Press, 2007.
10.	Asoke K Talukder, and Roopa R. Yavagal, "Mobile Computing: Technology, Application and Service Creation", Tata McGraw-Hill Professional, 2005
11.	Abdel salam Helal, "Any Time, Anywhere Computing: Mobile Computing Concepts and Technology", Kluwer Academic Publishers, 1999.
12.	IEEE Transaction on Broadcasting

Detailed Syllabus

Subject Code	18B12CS435	Semester (Odd)	Semester Odd Session 2018 - 19 Month from July to Dec 2018
Subject Name	Open Data Centric Services		
Credits	3-1-0	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Gagandeep Kaur
	Teacher(s) (Alphabetically)	1. Dr. Gagandeep Kaur 2. Sarishty Gupta

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

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
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	Open data aggregation; Resource Association, Resource Aggregation, Composition & Aggregation , Manipulating aggregate resources in a REST API, Aggregation Functions, Representing non-resourceful aggregated data and integration, open data statistical analytics, Aggregate Statistics, SILK Transformation and Aggregation, Linked	8

		Statistical Data Analysis, fetching analysis data, applying statistical functions for analysis, Update and return analysis, predictive analysis,	
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
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.	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, https://data.gov.in/		
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, https://protege.stanford.edu/		
9.	IEEE, ACM Transactions, Journals and Conference papers on Semantic web		

Detailed Syllabus

Lecture-wise Breakup

Course Code	18B12CS436	Semester ODD (specify Odd/Even)	Semester VIII Session 2018 -2019 Month from July 2018- December 2018
Course Name	Software Construction		
Credits	3-1-0	Contact Hours	4
Faculty (Names)	Coordinator(s)	Dr. Sandeep Kumar Singh	
	Teacher(s) (Alphabetically)	Dr. Sandeep Kumar Singh	

COURSE OUTCOMES		COGNITIVE LEVELS
C431-6.1	Choose appropriate fundamental element of software construction for an actual software development.	Remembering Level (Level 1)
C431-6.2	Apply various Assertion, Error-Handling, Exceptions techniques for defensive programming.	Apply Level (Level 3)
C431-6.3	Make use of appropriate coding standards and conventions of code construction at class routines, variables, and statements level.	Apply Level (Level 3)
C431-6.4	Experiment with code improvement strategies like Code Refactoring, Code Optimisation and Tuning.	Apply Level (Level 3)
C431-6.5	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	Development Environments, GUI Builders, Unit Testing	3

	Release code	Tools, Profiling, Performance Analysis, and Slicing	
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignments and 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.	Maguire, Steve, Writing Solid Code – Microsoft’s Techniques for Developing Bug-Free C Software. Microsoft Press, 1993.
2.	McConnell, Steve, Code Complete: A Practical Handbook of Software Construction. Microsoft Press, 1993.
3.	Meyer, Bertrand, Object-Oriented Software Construction (Second Edition). Prentice-Hall, 1997.
4.	Warren, Nigel, and Bishop, Philip, Java in Practice – Design Styles and Idioms for Effective Java. Addison-Wesley, 1999.
5.	Fowler, Martin, Refactoring – Improving the Design of Existing Code. Addison-Wesley, 1999.
6.	Writing solid code : Maguire, Steve. LeBlanc, David. Publisher: Bangalore WP Publishers & Distributors Pvt. 2001

Detailed Syllabus

Course Code	17B1NCI736	Semester ODD (specify Odd/Even)	Semester VII Session 2018-2019 Month from July 2018 to Dec 2018
Course Name	Bioinformatics Algorithms		
Credits	3-1-0	Contact Hours	4

Faculty (Names)	Coordinator(s)	Mr. Prantik Biswas
	Teacher(s) (Alphabetically)	Mr.Prantik Biswas, Dr.Aparajita Nanda

COURSE OUTCOMES		COGNITIVE LEVELS
C432-1.1	Relate to different computational challenges in Computational Molecular Biology.	Level-2
C432-1.2	Examine proper algorithmic concepts to solve a computational problem.	Level-4
C432-1.3	Determine the importance of traditional to contemporary approaches for solving the biological problems.	Level-5
C432-1.4	Design strategy to resolve real-world biological challenges.	Level-6
C432-1.5	Identify appropriate algorithmic technique to solve a given bioinformatics related task.	Level-3
C432-1.6	Develop an optimized solution model for computational biology problems.	Level-6
C432-1.7	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 Gap Penalties, Multiple Alignment,	7

		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
Total number of Lectures			42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25
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	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). <i>Bioinformatics: Sequence and Genome Analysis</i> , David W. Mount. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press, 2004, 692 pp., ISBN 0-87969-712-1. <i>Clinical</i>

	<i>Chemistry</i> , 51(11), 2219-2219.
8	Cormen, T. H. (2009). <i>Introduction to algorithms</i> . MIT press.
9	IEEE/ACM Transactions on Computational Biology and Bioinformatics
10	Bioinformatics , https://academic.oup.com/bioinformatics
11	Nature Communications, http://www.nature.com/ncomms/

Detailed Syllabus

Course Code	18B12CS437	Semester Odd (specify Odd/Even)	Semester VIIth Session 2018 -2019 Month from July to Dec 2018
Course Name	Large Scale Database Systems		
Credits	3-1-0	Contact Hours	4
Faculty (Names)	Coordinator(s)	Indu Chawla	
	Teacher(s) (Alphabetically)	Indu Chawla, Parmeet Kaur	

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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	Data storage and indexing of massive databases in	7

	Indexing	databases and data warehouses. Introduction to technologies 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
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25
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.	Henry F Korth, Abraham Silberschatz, S. Sudurshan, Database system concepts, 5 th Edition, McGraw-Hill,2006
2.	RamezElmasri ,Shamkant B. Navathe, Fundamentals of Database Systems, 4 th Edition, Pearson Education, 2006.
3.	Sadalage, P.J. &Foowlwer, 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.	ShashankTiwari, Professional NoSQL, Wiley, 2011

Detailed Syllabus

Course Code	16B1NCI833	Semester ODD (specify Odd/Even)	Semester VII Session 2018 -2019 Month from Jul 2018 to December 2018
Course Name	Nature Inspired Computing		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Ankita Verma
	Teacher(s) (Alphabetically)	Dr. Ankita Verma

COURSE OUTCOMES		COGNITIVE LEVELS
C432-4.1	Explain the concepts of problem solving via search, optimization and pattern recognition with various practical examples.	Understand Level (C2)
C432-4.2	Apply the NIC methods to model, learn and optimize computing problems.	Apply Level (C3)
C432-4.3	Analyze the key ideas, algorithmic steps of various nature inspired computing methods and their general applicability in various domains.	Analyze Level (C4)
C432-4.4	Compare and contrast the similarities and differences among various nature inspired computing methods.	Evaluate Level (C5)
C432-4.5	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
Total number of Lectures			42

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)
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.	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

Course Description

Subject Code	17B2NCI731	Semester	Odd	Semester VII Session	2018 - 19
Subject Name	Computer Graphics				
Credits	3-1-0	Contact Hours	4		

Faculty (Names)	Coordinator(s)	Suma Dawn
	Teacher(s)	Suma Dawn

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

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.	2
2.	Graphics Pipeline and Hardware	Display Unit, Frame buffer, DPU, GPU	2
3.	Data structures and algorithms for Raster Graphics	Line, circle, ellipse, polygon, Area filling; Rasterization, clipping, polygonal fill; Introduction to hidden surface removal (z buffer);	8
4.	Colours	Color perception, color models (RGB, CMY, HLS), color transformations. Color in OpenGL. RGB and Indexed color;	2
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	11

		transformation in 3D, projective transformations;	
6.	Rendering and animation	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 pixel maps, texture mapping, compositing; Introduction to animation and key framing;	12
7.	Procedural modeling	Fractals and particle systems	5
Total number of Lectures			42

Evaluation Scheme	A. THEORY Examination	Marks
	I. Test1	20
	II. Test2	20
	III. End Term	35
	B. Internal - including Assignments, Quizzes, attendance, etc	25
	Total	100

Recommended Reading material:	
1.	Hearn, Donald and M. Pauline Baker, Computer Graphics, C version, 2nd Edition, Prentice Hall, Inc. Upper Saddle River, New Jersey, 1997, 652 pages, ISBN 0-13-530924-7.
2.	Introduction to Computer Graphics, James D. Foley, Andries van Dam, Steven K. Feiner, John F. Hughes, Richard L. Phillips, ISBN: 0-201-60921-5, Addison Wesley, 1994
3.	D. F. Rogers and J. A. Adams, Mathematical Elements for Computer Graphics, 2nd Edition, McGraw-Hill International Edition, 1990
4.	IEEE Transactions on Computer Graphics

Detailed Syllabus

Lecture-wise Breakup

Course Code	17B1NCI742	Semester: Odd	Semester: VIII Session: 2018 -2019 Month: July-December 2018
Course Name	ALGORITHMS AND ARTIFICIAL INTELLIGENCE		
Credits	3-1-0	Contact Hours	4
Faculty (Names)	Coordinator(s)	Satish Chandra	
	Teacher(s) (Alphabetically)	Satish Chandra	

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Implement and analyze the problem solving agents using various informed, uninformed and evolutionary search strategies.	Level-III (Apply)
CO2	Represent and illustrate constraint satisfaction problems and adversarial search algorithms for solving problems of game theory.	Level-II (Understanding)
CO3	Apply inference mechanisms using propositional logic (PL) and first order predicate logic (FOPL).	Level-III (apply)
CO4	Apply model of probabilistic reasoning in incomplete and uncertain environment	Level-III (Apply)
CO5	Evaluate and simulate learning based agent and empower the agents with natural language understanding.	Level-V (Evaluate)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Sorting and searching algorithms ($O(N^2)$ sorting, Heap, Quick and Merge sorting,	04
2.	Graph Algorithms	DFS, BFS, Shortest path algorithms;	05
3.	Algorithm Design Techniques: Greedy,	Greedy, Divide and Conquer and Dynamic Programming techniques.	05
4.	Artificial Intelligence approaches: Problem Solving- I	State Spaces, Uninformed search strategies (BFS, DFS, DLS, IDS, Bidirectional search),	05
5.	Problem solving-II	Informed Search and Exploration (A^* , Heuristic function, Local search algorithms, online search agents)	05
6.	Problem solving-III	Constraint satisfaction problems (backtracking, variable and value ordering, local search), Adversarial Search (games,	05

		alpha beta pruning, elements of chance, state of art games)	
7.	Propositional Logic	Knowledge based agents, PL, FOPL, Syntax and semantics, use, knowledge engineering) , Inference in FOPL((Propositional vs First order inference, Unification and lifting, f/w and b/w chaining) ,	5
8	Uncertainty	Probabilistic reasoning, Bayesian rule, Bayesian network, Inference, Reasoning over time	4
9	Natural Language Processing	Parsers, Derivations and Syntax trees, Grammar Free Analyzers, Sentence generation and Translation	4
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25
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.	Peter Norvig, Stuart Russel, Artificial Intelligence – A modern approach, PHI, 2009
2.	Sartaz Sahni and Horowitz, "Fundamentals of Computer Algorithms(second edition)– 2008

Detailed Syllabus

Course Code	18B12CS438	Semester Odd (specify Odd/Even)	Semester VII Session 2018 -2019 Month: from July 2018 to Dec 2018
Course Name	Java Programming and Software Engineering		
Credits	3-1-0	Contact Hours	4

Faculty (Names)	Coordinator(s)	Vikas Hassija
	Teacher(s) (Alphabetically)	Vikas Hassija

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Define all the basic terminologies related to software engineering and basic OOPS concepts.	Remember Level (Level 1)
CO2	Write basic java programs using basic loops, getter setter methods, switch cases and arrays.	Understand Level (Level 2)
CO3	Develop all core java programs using nested loops, methods, classes, interfaces and getting user input.	Apply Level (Level 3)
CO4	Test for the issues in the existing code using debugging tools or other exception handling methods.	Analyze Level (Level 4)
CO5	Basic understanding of the importance of various advanced concepts of java like servlets, JSPs, collection framework and serialization	Evaluate Level (Level 5)
CO6	Create or design an end to end application or project based on java.	Create Level (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Software Development Life Cycle Models, Waterfall Model, V-Shaped Model, Iterative Model, Spiral Model, Agile Model.	3
2.	Requirement Specification	Types of Requirements, SRS: Introduction, Characteristics of SRS, Structure of SRS (IEEE-830).	5
3.	UML	Introduction, Categories of diagram Structural diagram: Class diagram, Object Diagram Behavioral diagram: Use Case Diagram, Sequence Diagram, Data Flow Diagram, Activity Diagram, State Chart Diagram	9
4.	Implementation	Applications of Exception Handling, File Handling, GUI, Event Handling using Java Multi- Threading, J2EE: JDBC, Java Servlets, JSP.	5
5.	Testing	Testing methods, testing levels, testing types, writing test cases in Java	10
6.	Maintenance	Importance of Maintenance, Types of software Maintenance.	10

Total number of Lectures		42
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Attendance , Assignment and Quiz)	
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.	Java™ 2: The Complete Reference, Fifth Edition
2.	Head First Java, 2nd Edition by Bert Bates, Kathy Sierra

Detailed Syllabus

Lecture-wise Breakup

Course Code	17B1NCI748	Semester Odd (specify Odd/Even)	Semester VII Session 2018 -2019 Month from: July to December 2018
Course Name	Graph Algorithms and Applications		
Credits	4	Contact Hours	4
Faculty (Names)	Coordinator(s)	Manish Kumar Thakur (J62), Mukta Goyal (J128)	
	Teacher(s) (Alphabetically)	J62- Manish Kumar Thakur J128- Mukta Goyal	

COURSE OUTCOMES		COGNITIVE LEVELS
C431-1.1	Find the shortest path, minimum spanning tree, maximum flow, articulation points, bridges, etc. in the given weighted or unweighted graph	Remembering (Level-1)
C431-1.2	Model the real world computational problems using graph	Understanding (Level-2)
C431-1.3	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)
C431-1.4	Develop computing solutions for the real world computational problems modelled using graph	Creating (Level-6)
C431-1.5	Analyze the time and space complexities of the designed algorithms and developed solutions for the computational problems	Evaluating (Level-5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	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.	1
2.	Applications of Connectivity	Reliable communication network design, Cycle detection, Searches, Multiway cut, Minimum K-cut, etc.	5
3.	Applications of Traversability	Shortest paths, Optimal tours, Euler's Cycle, Hamiltonian Cycle, TSP, etc.	4
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</i>	5
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (5 Marks-Punctuality, 5 Marks-Assignment, 15 Marks-Mini-project)
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.	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

Detailed Syllabus

Lab-wise Breakup

Course Code	15B29CI793	Semester Odd (specify Odd/Even)	Semester VII Session 2018 -2019 Month from July-Dec 2018
Course Name	Summer Training Viva		
Credits	2	Contact Hours	...

Faculty (Names)	Coordinator(s)	Shardha Porwal
	Teacher(s) (Alphabetically)	Shardha Porwal

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Summarize the contemporary activities with respect to their module, and explored tools for hands-on in the respective project area	Understand Level (Level-2)
CO2	Analyse industry requirements and work culture	Analyze Level (Level-4)
CO3	Apply technical knowledge to construct computing-based solution with respect to the identified problem at industry/institute.	Apply Level (Level-3)
CO4	Interpret and critically evaluate the solution for the problem.	Evaluate Level (Level-5)
CO5	Create written discourse for presentation of work done at industry/institute.	Create Level (Level-6)

Module No.	Title of the Module	List of Experiments	CO
1.
2.
3.

Evaluation Criteria			
Components	Maximum Marks	...	
Summer viva	100		
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.	...
2.	...
3.	...

Detailed Syllabus

Lab-wise Breakup

Course Code	15B29CI791	Semester Odd (specify Odd/Even)	Semester VII Session 2018 -2019 Month from July 2018 – Dec 2018
Course Name	Major Project Part – 1 (IT)		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Manish Kumar Thakur
	Teacher(s) (Alphabetically)	All CSE/IT faculty members

COURSE OUTCOMES		COGNITIVE LEVELS
C450.1	Summarize the contemporary scholarly literature, activities, and explored tools for hands-on in the respective project area	Understand Level (Level 2)
C450.2	List out the specific requirements to develop the workable solution for the identified computing problem.	Analyze Level (Level 4)
C450.3	Develop a workable computing solutions for the identified problem	Apply Level (Level 3)
C450.4	Evaluate the performance of the developed solution	Evaluate Level (Level 5)
C450.5	Improve the communication and writing skills in terms of presenting the results in written and verbal formats	Create Level (Level 6)

Module No.	Title of the Module	List of Experiments	CO
1.
2.
3.

Evaluation Criteria			
Components	Maximum Marks	...	
Mid Semester Project Viva	20		
Final Project Viva	30		
Project Report	20		
Day to Day	30		
Total	100		

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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.	...
2.	...
3.	...

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NHS732	Semester : Even	Semester VII Session 2018 -2019
Course Name	Indian Financial System		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Mukta Mani(Sec62), Dr. Sakshi Varshney(Sec128)	
	Teacher(s) (Alphabetically)	Dr. Mukta Mani(Sec62), Dr. Sakshi Varshney(Sec128)	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C401-1.1	Understand the inter-linkage of components of financial system and financial instruments of Money market and Capital market.		Understanding Level (C2)
C401-1.2	Analyze ways of fund raising in domestic and international markets		Analyzing Level (C4)
C401-1.3	Understand functioning of Stock market and evaluate securities for investment.		Evaluating Level (C5)
C401-1.4	Apply the knowledge of Mutual Funds and Insurance in personal investment decisions		Applying Level (C3)
C401-1.5	Apply knowledge of Income tax for calculation of tax liability of individual.		Applying Level (C3)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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 Analysis	Investing basics: Consideration of Risk and Return, Stock Valuation and Analysis- Fundamental analysis: Economy, industry and company analysis; Technical Analysis of stocks using technical charts	6
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 rd Ed., Pearson Education, 2013		
2.	Madura Jeff, <i>Personal Finance</i> , 5 th Ed, Pearson Education, 2013.		
3.	Machiraju H R, <i>Indian Financial System</i> , 4 th Ed, Vikas Publication, 2010		
4.	Bhole L M, <i>Financial Institutions and Markets</i> , 4 th ed. Tata McGraw Hill Publication, 2006.		
5.	Singhania & Singhania, <i>Students Guide to Income Tax</i> , Taxmann Publication, 2013.		

Detailed Syllabus

Lecture-wise Breakup

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

Faculty (Names)	Coordinator(s)	Ms Puneet Pannu
	Teacher(s) (Alphabetically)	Ms Puneet Pannu

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C 401-19.1	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)
C 401-19.2	Apply feminist and gender theory in an analysis of gender including an examination of the social construct of femininity and masculinity	Apply (C3)
C 401-19.3	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)
C 401-19.4	Assess the need for Gender Sensitization and Gender Inclusivity and its practice in contemporary settings	Evaluate (C5)
C 401-19.5	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.	Introducing Gender Issues	<ul style="list-style-type: none"> • Sex and Gender • Types of Gender • Gender Roles and Gender Division of Labor • Gender Stereotyping and Gender Discrimination • The Other and Objectification 	8
2.	Gender Perspectives of Body & Language	<ul style="list-style-type: none"> • Biological, Phenomenological and Socio-Cultural Perspectives of body • Body as a Site and Articulation of Power Relations • Cultural Meaning of Female Body and Women's Lived Experiences • The Other and Objectification 	8
3.	Social Construction of Femininity & Feminism	<ul style="list-style-type: none"> • Bio-Social Perspective of Gender • Gender as Attributional Fact • Feminine & Feminist • Major Theorists of Feminism Challenging Cultural Notions of Femininity 	9

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

Evaluation Criteria

Components

Maximum Marks

T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Poster Presentation, 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	Davis K., et al, “ <i>Handbook of Gender and Women's Studies</i> . London: Sage. (2006)
2	Helgeson, Vicki S., “ <i>The Psychology of Gender</i> ”, Pearson(2012)
3	Friedan B., “ <i>The Feminine Mystique</i> ”, Penguin. (1971/1992)
4	Debeauvoir S. , “ <i>The Second Sex</i> ”, Vintage (1953/1997)
5	Wharton Amy S., “ <i>The Sociology of Gender: An Introduction to Theory & Research</i> ”, Wiley-Blackwell (2005)
6	Pachauri G., ” <i>Gender, School & Society</i> ”, R.Lall Publishers(2013)
7	Connell R.W, “ <i>Masculinities</i> ”, Cambridge: Polity. (1985)
8	MacInnes J., “ <i>The End of Masculinity</i> ”. Buckingham: Open University Press. (1998)
9	Kaul A.& Singh M., ” <i>New Paradigms for Gender Inclusivity</i> ”, PHI Pvt Ltd (2012)

Detailed Syllabus

Lecture-wise Breakup

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

Faculty (Names)	Coordinator(s)	Dr. Shirin Alavi
	Teacher(s) (Alphabetically)	Dr. Shirin Alavi

COURSE OUTCOMES		COGNITIVE LEVELS
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)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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 Customer Relationships	Evolution of CRM, Benefits, Schools of thought on CRM, Defining CRM. Customer Retention and Customer Acquisition, Customer Profitability is Skewed, Service 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.	7
3.	Relationship Marketing and	Internal and external relationships, Electronic Relationships, Operational, Analytical and Collaborative	6

	Economics of CRM	CRM, Market Share vs. Share of Customer, Customer Lifetime Value, and Activity based costing for CRM	
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
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project: Report and Viva)
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.	Customer Relationship Management-A strategic perspective, G. Shainesh, Jagdish Sheth, Reprinted Macmillan Publishers India Limited, 2009.
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., Data mining Techniques for Sales, Marketing and CRM, Second Edition, Wiley Publications, 2007.

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NHS732	Semester : Even	Semester VII Session 2018 -2019
Course Name	Indian Financial System		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Mukta Mani(Sec62), Dr. Sakshi Varshney(Sec128)	
	Teacher(s) (Alphabetically)	Dr. Mukta Mani(Sec62), Dr. Sakshi Varshney(Sec128)	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C401-1.1	Understand the inter-linkage of components of financial system and financial instruments of Money market and Capital market.		Understanding Level (C2)
C401-1.2	Analyze ways of fund raising in domestic and international markets		Analyzing Level (C4)
C401-1.3	Understand functioning of Stock market and evaluate securities for investment.		Evaluating Level (C5)
C401-1.4	Apply the knowledge of Mutual Funds and Insurance in personal investment decisions		Applying Level (C3)
C401-1.5	Apply knowledge of Income tax for calculation of tax liability of individual.		Applying Level (C3)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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 Analysis	Investing basics: Consideration of Risk and Return, Stock Valuation and Analysis- Fundamental analysis: Economy, industry and company analysis; Technical Analysis of stocks using technical charts	6
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 rd Ed., Pearson Education, 2013		
2.	Madura Jeff, <i>Personal Finance</i> , 5 th Ed, Pearson Education, 2013.		
3.	Machiraju H R, <i>Indian Financial System</i> , 4 th Ed, Vikas Publication, 2010		
4.	Bhole L M, <i>Financial Institutions and Markets</i> , 4 th ed. Tata McGraw Hill Publication, 2006.		
5.	Singhania & Singhania, <i>Students Guide to Income Tax</i> , Taxmann Publication, 2013.		

Detailed Syllabus

Lecture-wise Breakup

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

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

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Healthcare markets	About the various Regulatory bodies for approval of new medical innovations	02
2.	Clinical Pharmacokinetics and Clinical trials for new Drugs	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	05
3.	Regulatory approval pathways	Preclinical studies US and EU filings IND submissions, NDA and BLA Submissions, Non-patent exclusivities, data and market exclusivities cost analysis	06
4.	Patents of drugs and devices, Entry for generics in health care markets	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.	08
5.	Economics of healthcare	Stakeholders in healthcare- doctors, hospitals and insurers and their roles, technology and human capital	7
6.	Medical technology and insurance	For medical devices, pharmaceuticals, genetic diagnostic tests and their regulations	4

7.	Indian hospital sector	Various players – government, private, PPP models, strategic perspectives, case studies	4
8	Innovations in the marketplace	Health to market innovations	4
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

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

Faculty (Names)	Coordinator(s)	Vibha Gupta
	Teacher(s) (Alphabetically)	Vibha Gupta

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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	Time; Body Rhythms; Weather and Climate; Nutrition; Exercise; Drugs and Addictions; Violence and Post	2

	Environmental Interactions:	Traumatic Stress	
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 – Eastern & Western approaches	12
8.	The adaptive brain	Neuroplasticity – positive adaptation to stress	2
Total number of Lectures			40

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Quiz and class discussions)
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.	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

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 th Ed., Pearson Education, 1999.
2.	Conte, S.D. and DeBoor, C. , Elementary Numerical Analysis, 3 rd Ed., McGraw-Hill, 1980.
3.	Gupta, R.S. , Elements of Numerical Analysis, 1 st Ed., Macmillan 2009.
4.	Jain, M.K., Iyengar, S.R.K. and Jain, R.K. , Numerical Methods for Scientific and Engineering Computation 5 th Ed., New Age International, New Delhi, 2007.
5.	Smith, G.D. , Numerical Solution of Partial Differential Equations, 2 nd Ed., Oxford, 1978.

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	Bilinear and Quadratic forms, Positive definite matrices,	6

	Linear Algebra	Norm of a matrix, Condition number, Application to find solutions of ordinary differential equations	
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 rd 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 rd Edition, Schaum Series, 2001		
5.	Krishnamurthy, V., Mainra, V. P., and Arora, J. L. , An Introduction to Linear Algebra, Affiliated East-West, 1976		