

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B2NCI743	Semester Even (specify Odd/Even)	Semester VIII Session 2018 -2019 Month from Jan 2019 – June 2019
Course Name	Cryptography and Network Security		
Credits	3	Contact Hours	3-0-0

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

COURSE OUTCOMES		COGNITIVE LEVELS
C433-1.1	Describe classical encryption methods based on Substitution and Permutation	Understand (Level 2)
C433-1.2	Implement and apply modern block and stream cipher techniques like DES, AES and RC4	Apply (Level 3)
C433-1.3	Analyse the role of prime number theory and quadratic congruence in cryptography	Analyse (Level 4)
C433-1.4	Implement and apply asymmetric encryption algorithms of RSA , ElGamal and Elliptic Curve Cryptography	Apply (Level 3)
C433-1.5	Criticize hashing algorithms like SHA-512 and SHA – 1024	Analyse (Level 4)
C433-1.6	Compare and Choose cryptographic techniques for using Digital Signatures and certificates in existing applications	Evaluate (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Classical Encryption Techniques	Modular Arithmetic , Substitution Ciphers: Shift , Playfair, Vernam, Vignere, Affine, Hill, Rail fence, Transposition Ciphers	6
2.	Modern Block Ciphers	Fiestel and Non Fiestel Encryptions, Data Encryption Standard, polynomial modular arithmetic, fields, generators, Advanced Encryption Standard	8
3.	Modern Stream Ciphers	Linear Feedback Shift Registers and RC4	4
4.	Mathematics for Public Key Cryptography	Prime number theory, Euler's theorem, Fermat's theorem Chinese Remainder Theorem, quadratic congruence, discrete logarithm, fast exponentiation	6
5.	Public Key Cryptography	RSA, Knapsack, Rabin , ElGamal and Elliptic Curve Cryptography	10

6.	Hashing Algorithms	Requirements of Hashes for Cryptography, Message Digests,SHA-1	4
7.	Digital Signatures and Certificates	Elgamal Signatures, Digital Signature Standards, X.509 Certificates, Kerberos	4
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (5 Quiz + 5 Assignment+ 5 Attendance+10 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.	William Stallings, Cryptography and Network Security 5 th Edition, Prentice Hall 2011
2.	B A Forouzan and Debdeep Mukhopadhyay, Cryptography and Network Security, 3 rd Edition, Mc Graw Hill, 2015
3.	W Trappe, L.C. Washington, Introduction to Cryptography with Coding Theory 2 nd Edition, Pearson Education,2006
4.	Network security essentials: applications and standards by William Stallings.,5/e, Prentice Hall,2013
5.	ACM Transactions on Information and system security
6.	IEEE Press Computer Security and Privacy

Detailed Syllabus
Lecture-wise Breakup

Subject Code	18B12CS419	Semester (Even)	Semester VIII Session 2018 - 19 Month from January to May
Subject Name	Distributed Computing		
Credits	3+1	Contact Hours	3 Lectures +1 Tutorial

Faculty (Names)	Coordinator(s)	Dr. Parmeet Kaur
	Teacher(s) (Alphabetically)	1. Dr. Parmeet Kaur 2. Dr. Prakash Kumar

COURSE OUTCOMES		COGNITIVE LEVELS
C433-2.1	Identify and solve event ordering related problems occurring due to various synchronization related issues in distributed systems (e.g., using Lamport, Vector, Matrix clock implementations).	Identify, Solve Level 3
C433-2.2	Compare and explain the solutions for mutual exclusion and deadlock related issues for various application specific scenarios that may occur in distributed environments (e.g., using token and non-token based techniques). [Level 2]	Compare Level 2
C433-2.3	Examine and distinguish data consistency and replication related issues for various distributed scenarios.	Examine and Distinguish Level 4
C433-2.4	Evaluate and assess fault tolerance related issues for perceiving reliable systems in distributed environments.	Evaluate Level 5
C433-2.5	Show how the concepts of distributed computing have been applied in existing distributed database systems, distributed file systems and cloud based systems.	Show Level 1

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Review of principles, concepts foundation to Distributed Systems.	Review of Operating Systems principles, Introduction to Distributed Systems.	2

2.	Consistency and Replication Issues	Data-centric consistencies, Client-centric consistencies. Epidemic Protocols and Implementation Issues.	6
3.	Fault Tolerance and Reliability	Fault Tolerance, Reliability in Distributed Systems, group communications, and Distributed commit. Two Phase commit and Three Phase commit. Failure Recovery.	7
4.	Synchronization mechanisms	Resource models. Clock synchronization, Inherent limitations of distributed operating systems. Event ordering. Timestamps. Global state collection mechanisms. Termination Detection, Bully Algorithm. Ring Algorithm.	6
5.	Mutual Exclusion and Deadlock handling	Process deadlocks in DS. Distributed mutual exclusion. Token and non-token based algorithms. Comparative performance analysis.	9
6.	Agreement Protocols	System Model, Classification, Byzantine Problems and solutions.	4
7.	Distributed Computing Vs Cloud Computing.	Introduction, Challenges, Cloud Computing architectures, Virtualization in Cloud Computing, Building applications and Infrastructures in the cloud, Security Issues.	2
8.	Self Stabilizing Systems	System model, Self-Stabilization design issues and methodologies, Theoretical Foundations, Stabilizing DMEs, Stabilizing protocols, and Stabilizing Synchronization, Limitations etc.	4
9.	Case Studies	Distributed File Systems and Distributed Databases	2
			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Programming assignment:10, Assignments:10, 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.	Tanenbaum, A.S, Marten, V. Steen, Distributed Systems : Principles and Paradigms, 2 nd Edition, Prentice Hall .		
2	M. Singhal, N. G. Shivaratri, Advanced Concepts in Operating Systems, 1 st Ed., Tata		

	McGraw-Hill, 1994.
3.	“Introduction to Cloud Computing Architecture” Sun’s White Paper, 1 st Edition, June, 2009.
4.	Tanenbaum, A. S Distributed Operating Systems, 1 st Ed., Prentice-Hall, Englewood Cliffs, NJ, 1995.
5.	Sukumar Ghosh “Distributed Systems An Algorithmic Approach”. Chapman and Hall/ CRC, Taylor and Francis Group.
6.	IEEE, ACM Transactions, Journals and Conference papers on “Distributed and Cloud Computing.”
7.	George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud” O’REILLY publication.
8.	“Virtualization Overview”, White paper, VM Ware.
9.	“Implementing Virtualization” White paper, Intel virtualization Technology, 2008
10.	Tulloch, Mitch, Understanding Microsoft virtualization solutions: From the Desktop to Data Center, Microsoft Press.

Detailed Syllabus
Lab-wise Breakup

Course Code	17B1NCI735	Semester Even (Even)	Semester VIII Session 2018 -2019 Month from Jan to July
Course Name	HIGH PERFORMANCE WEB & MOBILE APPLICATIONS		
Credits	3	Contact Hours	4

Faculty (Names)	Coordinator(s)	Prashant Kaushik
	Teacher(s) (Alphabetically)	Prashant Kaushik

COURSE OUTCOMES		COGNITIVE LEVELS
C433-3.1	Analyze differentiating aspects of high performance and regular web applications.	Analyze Level (Level 4)
C433-3.2	Explain the design goals of high performance web & mobile applications.	Understand Level (Level 2)
C433-3.3	Design and develop Server and mobile applications for Multi threaded environment	Create Level (Level 6)
C433-3.4	Build the performance metrics for evaluating the application load.	Evaluate Level (Level 6)
C433-3.5	Make use application testing suite for performance testing	Apply Level (Level 3)
C433-3.6	Analyze the crash reports for various types of crashes due to multiple platforms of mobile devices in a consolidated manner.	Apply Level (Level 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Intro to HPC	Introduction to HPC systems and web and its mobile variants	01
2.	MQTT	MQTT, other high performance protocols	04
3.	MQTT programming	Programming of MQTT protocols	04
4.	MQTT Testing	Testing the MQTT with loading	04
5.	DB replication	Replication of web servers and databases	04
6.	HPC comparision	Comparisons of web servers with new and old	06
7.	Replication Testing	Testing the replication system with various metrics and load	06
8.	Load generator	Mobile app simulator for load of mobile devices	06

9.	MQTT Server	Server with mqtt and high performance outputs	04
10.	Hackathon	Live Hackathon for creating High performance protocols	03
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.	Hands-On Mqtt Programming with Python By Gaston C Hillar
2.	MQTT A Concise and Practical Tutorial By Gerard Blokdyk

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12CS411	Semester Even (specify Odd/Even)	Semester VIII Session 2018 -2019 Month from January to May
Course Name	Geoinformatics		
Credits	3	Contact Hours	3L+1T

Faculty (Names)	Coordinator(s)	Ankita
	Teacher(s) (Alphabetically)	Ankita

COURSE OUTCOMES		COGNITIVE LEVELS
C433-4.1	Illustrate Geoinformatics concepts , branches, techniques and real world applications.	Understanding Level (C2)
C433-4.2	Apply appropriate vector and raster data structures like k-d tree, quad tree, geotree etc to different applications.	Apply Level (C3)
C433-4.3	Sketch maps using the basics of data capture, storage, analysis, and output in QGIS tool.	Apply Level (C3)
C433-4.4	Apply various spatial statistical methods like Local indicators of spatial association for point pattern analysis in numerous Geoinformatics applications.	Apply Level (C3)
C433-4.5	Compare and contrast different spatial data mining techniques to select the appropriate one for discovering useful information from spatial data belonging to different domains.	Analyze Level (C4)
C433-4.6	Implement different algorithms for detection of hotspots of different shapes in spatial and spatio-temporal data.	Apply Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Geoinformatics	Definition, branches, case studies. GIS components, map scales, georeferencing, projections, and time zones.	03
2.	Spatial data models	Vector and Raster data models. Spatial data Acquisition: topographical & thematic mapping, Geocoding. Non spatial attributes	04
3.	Data Structures for spatial data	k-d tree, Quadtree: region quadtree, point quadtree, point region quadtree, Geo-tree. Insertion, deletion and k nearest neighbor queries.	08
4.	Spatial data mining	Basic concepts, spatial databases. Preprocessing spatial data: data cleaning, conversions of georeferencing systems, spatial interpolation using Voronoi diagrams.	04
5.	Families of SDM patterns	Spatial collocation and association patterns, spatial clustering for large data, decision trees for spatial analysis,	08

		outlier detection. Applications and case studies in criminology, epidemiology, earth sciences.	
6.	Point pattern analysis	Spatial processes, Spatial statistical methods for point pattern analysis: LISA, kernel density functions, heat maps.	05
7.	Spatial and Spatio temporal hotspot detection	Scan statistics based techniques for spatial and spatio temporal detection of various shapes hotspots.	06
8.	QGIS tool	Layering, vector, raster and spatialite files, attribute tables, styling, labeling etc. Basic map making operations. Analysis using Voronoi diagram and buffering.	04
Total number of Lectures			42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (mini project, class performance, 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.	Francis Harvey, A Primer of GIS, Fundamental Geographic and Cartographic Concepts, <i>Second Edition</i> , THE GUILFORD PRESS, London, 2008.
2.	Paul, J.C. Geographical Information Systems and computer Cartography, Longman, 2005.
3.	Karen K. Kemp, Encyclopedia of geographic information , SAGE Publications, 2008.
4.	A. Stewart Fotheringham and Peter A. Rogerson, The SAGE handbook of spatial analysis, SAGE publications, 2009.
5.	Shellito, Bradley, Introduction to geospatial technologies, fourth edition, Freeman publications, 2018.
6.	https://mgimond.github.io/Spatial/introGIS.html
7.	https://www.qgis.org/en/docs/index.html

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12CS413	Semester (Even)	Semester VIII Session 2018 -2019 Month from January-June
Course Name	Bitcoin and Cryptocurrency Technologies		
Credits	03	Contact Hours	(L+T) (3+1)

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

COURSE OUTCOMES		COGNITIVE LEVELS
C434-1.1	Understand cryptographic primitives used for cryptocurrency.	Remember Level (Level 1)
C434-1.2	Understand and describe implementation of crypto currency using Blockchain.	Understand Level (Level 2)
C434-1.3	Identify and analyse the real world problems that the cryptocurrency is trying to solve.	Apply Level (Level 3)
C434-1.4	Examine and implement tools and techniques to build a cryptocurrency and blockchain application.	Analyze Level (Level 4)
C434-1.5	Explore the platforms such as Bitcoin, Ethereum, and Hyperledger to create and evaluate the cryptocurrency implementation.	Evaluate Level (Level 5)
C434-1.6	Build, compose and test the concepts, policies and strategies of specified crypto currency implementation.	Create Level (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction to Cryptography and Cryptocurrencies – Introduction to cryptographic hash functions; Hash pointers and data structures; Digital signatures; Public keys as identities; A simple cryptocurrency.	3
2.	Bitcoin	How Bitcoin achieves decentralization; Distributed consensus; Consensus without identity using Blockchain; Incentives and Proof of Work (PoW); Attacks on PoW; Advantages and Limitations of PoW; Bitcoin – NG.	3
3.	Mechanics of Bitcoin	Bitcoin transactions; Bitcoin scripts; Applications of Bitcoin scripts; Bitcoin blocks; Bitcoin network; Limitations and improvements	3
4.	Storing and Using Bitcoins	Simple local storage; Hot and cold storage; Splitting and Sharing Keys; Online wallets and exchanges; Payment services; Transaction Fee; Currency Exchange Markets	3
5.	Bitcoin as platform	Bitcoin as append only log; Bitcoin as smart property; Secure Multi party lotteries in Bitcoin; Bitcoin as public	3

		randomness source; Predication markets and real world data feeds	
6.	Bitcoin Mining	Task of Bitcoin miners; Mining Hardware; Energy consumption and Ecology; Mining pools; Mining Incentives and strategies.	3
7.	Bitcoin and Anonymity	Anonymity basics; De-Anonymizing Bitcoin; Mixing – Decentralized Mixing; Zero coin and Zero hash	3
8.	Community, Politics, and Regulations	Consensus in Bitcoin; Bitcoin software; Stakeholders; Roots of Bitcoin; Governments and Bitcoin; Anti-money laundering; Regulation; New York's Bitcoin License proposal	3
9.	Alternative mining puzzles	Essential puzzle requirements; ASIC- resistant puzzles; Proof of Useful Work; Non-out-sourceable puzzles; Proof of Stake and virtual mining.	3
10.	Decentralized institutions	Future of Bitcoin; Blockchain as vehicle for decentralization; Routes to blockchain integration; Templates for decentralization; Decentralization implementation requirements.	3
11.	Creating a Cryptocurrency	Solidity basics; Meta mask framework; Remix IDE; Ethereum and Truffle IDE; A working example.	8
12.	Altcoins and the Cryptocurrency eco system	Altcoins history and motivation; Few Altcoins in detail; Relation between Bitcoin and Altcoin; Merge mining; Atomic cross chain swaps; Bitcoin backed Altcoins; Ethereum and Smart contracts	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.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.
2.	Antonopoulos, Andreas M. "Mastering Bitcoin: unlocking digital cryptocurrencies", O'Reilly Media, Inc., 2014.
3.	Dannen, Chris. "Introducing Ethereum and Solidity", Berkeley: Apress, 2017.
4.	Prusty, Narayan. "Building Blockchain Projects", Packt Publishing Ltd, 2017.
5.	S Nakamoto, "Bitcoin: A peer-to-peer cash system", 2009. https://bitcoin.org/bitcoin.pdf
6.	Conti, Mauro, Sandeep Kumar, Chhagan Lal, and Sushmita Ruj. "A survey on security and privacy issues of bitcoin." IEEE Communications Surveys & Tutorials (2018).

7.	Khalilov, Merve Can Kus, and Albert Levi. "A Survey on Anonymity and Privacy in Bitcoin-like Digital Cash Systems." IEEE Communications Surveys & Tutorials (2018).
8.	Clark, Joseph Bonneau Andrew Miller Jeremy, Arvind Narayanan Joshua A. Kroll Edward, and W. Felten. "Research Perspectives and Challenges for Bitcoin and Cryptocurrencies." url: https://eprint.iacr.org/2015/261.pdf (2015).

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12CS415	Semester EVEN (specify Odd/Even)	Semester VIII Session 2018 -2019 Month from January 2019 – June 2019
Course Name	Search-Based Software Engineering (SBSE)		
Credits	3-1-0	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Amarjeet Prajapati
	Teacher(s) (Alphabetically)	...

COURSE OUTCOMES		COGNITIVE LEVELS
C434-2.1	Define the various types of optimization problems in context of software engineering.	Remember Level (Level 1)
C434-2.2	Explain and demonstrate various software engineering activities/tasks as search-based optimization problem.	Understand Level (Level 2)
C434-2.3	Design and develop methods for finding optimal solutions using search-based meta-heuristic techniques.	Create Level (Level 6)
C434-2.4	Apply and Implement different optimization techniques on various forms of software optimization problems.	Apply Level (Level 3)
C434-2.5	Analyze the behavior of different optimization techniques corresponding to different forms of software optimization problems.	Analyze Level (Level 4)
CO6	Evaluate the performance of different single and multi-objective optimization techniques using different quality indicators.	Evaluate Level (Level 5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction	Search-based Software Engineering (SBSE), why SBSE, architecture of SBSE, commonly used search techniques, Optimization Problems, Metaheuristic Algorithms, software engineering problem as a search-based optimization problem	6
2.	Optimization	Various types of optimization problems (e.g., linear and non-linear, convex and non-convex, single and multi-objective, etc.) in the context of software engineering	6
3	Problem Formulation	Define and formulate various software engineering activities/tasks e.g., requirement analysis, software design and software restructuring as search-	4

		based optimization problem	
4.	Meta-heuristics	Tailoring various optimization methods and algorithms such as Harmony Search (HS), Artificial Bee Colony (ABC), Particle Swarm Optimization (PSO), etc., according to their suitability with respect to various classes of software engineering problems	6
5.	Application to software engineering problem	Apply and Implement different optimization techniques on various forms of software optimization problems e.g., software architecture recovery, software refactoring, and software remodularization	6
6.	Statistical Analysis	Statistical hypothesis testing, parametric and nonparametric statistical tests	6
7.	Evaluation	Evaluate the performance of different single and multi-objective optimization techniques using different quality indicators such as Generational Distance (GD), Inverted Generational Distance (IGD), hyper-volume (HV), Error Ratio, Set Coverage Metric, Spacing and Spread	8
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (To be mapped from Class Test 1,2,3)	
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.	Nature-Inspired Optimization Algorithms, by Xin-She Yang Publisher: Elsevier <i>Release Date: February 2014</i> , ISBN: 9780124167438
2.	Practical Optimization, Book by Philip E. Gill
3.	Practical Methods of Optimization, Book by R. Fletcher
4.	Object-Oriented Modeling and Design with UML (2nd Edition) Michael R. Blaha; James R Rumbaugh
5.	Head First Object-Oriented Analysis and Design A Brain Friendly Guide to OOA&D By Brett McLaughlin, Gary Pollice, David West

6.	OBJECT-ORIENTED ANALYSIS AND DESIGN With applications Third EDITION Grady Booch Rational Santa Clara, California
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Course Description
Detailed Syllabus

Course Code	18B12CS428	Semester : EVEN	Semester : VIII Session 2018 -2019 Month: from Jan- May, 2019
Course Name	Introduction to Deep Learning		
Credits	04	Contact Hours	04

Faculty (Names)	Coordinator(s)	Satish Chandra
	Teacher(s) (Alphabetically)	Himanshu Mittal Satish Chandra

Sr. No.	Description	Cognitive Level (Bloom's Taxonomy)
C434-3.1	Identify and express the motivation behind and need of Deep Learning .	Understanding (Level-2)
C434-3.2	Comprehend the basic theory of learning, probability in learning, error minimization and regularization techniques.	Understanding (Level-2)
C434-3.3	Design and Model Convolution Neural Networks for Image recognition and Computer Vision.	Apply (Level-3)
C434-3.4	Apply Recurrent Neural Networks and LSTM for temporal data	Apply (Level-3)
C434-3.5	Assess the Deep Learning techniques on the basis of performance measures such as training speed, classification error, kappa coefficient, precision, recall and F-Measure.	Evaluate (Level-5)

Lecture Plan:

Sr. No.	Module	Topic	No. of Lectures
1.	Introduction	Course overview: What is deep learning? DL successes; DL versus Shallow Networks	02
2.	Mathematics for Machine Learning	Math review : Gradient descent, logistic regression. Probability, continuous and discrete distributions; maximum likelihood. PAC.	04
3.	Neural Network Fundamentals	Neural networks : cost functions, hypotheses and tasks; training data; maximum likelihood based cost, cross entropy, MSE cost; feed-forward networks; MLP, sigmoid units. Back propagation by Gradient Descent Optimization	04
5.	Deep Neural Network-1	Deep learning strategies: GPU training, regularization, RELU, dropouts etc.	04
6.	Deep Neural Network-2	Convolutional neural networks: HPC in	06

		Deep Learning	
7.	Deep Neural Network-3	CNN Architectures LeNet, AlexNet, VGG Net, GooleNet: a comparative analysis	06
8.	RNN-1	Recurrent neural networks : architecture, application and performance evaluation	06
8.	RNN-2	LSTM and gated networks: architecture, application and performance evaluation	06
9.	Unsupervised Deep learning	Unsupervised deep learning (autoencoders)	04

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.	Nikhil Buduma, Fundamentals of Deep Learning, Shroff Publishers , 2018
2.	Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press , 2017

Detailed Syllabus
Lecture-wise Breakup

Subject Code	18B12CS412	Semester: Even (specify Odd/Even)	Semester VIII Session 2018-2019 Month from Jan19 to June19
Course Name	Autonomous Decision Making		
Credits	4	Contact Hours	3-1-0

Faculty (Names)	Coordinator(s)	Dr. Shikha Jain
	Teacher(s) (Alphabetically)	Dr. Shikha Jain

COURSE OUTCOMES			COGNITIVE LEVEL
C434-4.1	Comprehend and represent the type of agents and environment		Understanding (Level 2)
C434-4.2	Apply various search techniques in partially-observable and dynamic environment and optimizing path.		Applying (Level 3)
C434-4.3	Develop exact and approximate reasoning models for uncertain input and uncertain environment.		Applying (Level 3)
C434-4.4	Construct temporal, utility-based, temporal-utility-based and multi-agents based models for reasoning in uncertain environment.		Applying (Level 3)
C434-4.5	Examine and analyse the application of various techniques in different scenario of uncertain environment.		Analyzing (Level 4)
C434-4.6	Evaluate and compare the performance of different techniques on the basis of complexity.		Evaluating (Level 5)

Module No.	Title of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction	Formulating problem solving as state-space search, Analysis of uninformed search (BFS and DFS)	2
2.	Exploring Roadmaps and Paths	Exploring Roadmaps: configuration space, combinatorial Planning (visibility graph, voronoi diagram, exact cell, approximate cell, fixed cell), Sampling based planning (probabilistic roadmap, rapidly exploring random tree); Exploring paths: informed search	6
3.	Search in Dynamic Environments	Agent centered search (Learning Real-Time A*, Real-Time Adaptive A*), Anytime search (repeated weighted A*,	7

		Anytime Repairing A*), Incremental Search (Lifelong Planning A*), Anytime and incremental search (Anytime D*), Path optimization	
4.	Reasoning in an Uncertain World	Bayes rule, Bayesian Network, Markov Blanket, Utility Theory	2
5.	Probabilistic Reasoning	Probabilistic Reasoning using uncertain evidence, unreliable evidence; Exact inference in uncertain environment using BN by enumeration and variable elimination; Approximate Inference in uncertain environment using BN by direct sampling, rejection sampling, Likelihood weighting and Markov Chain Monte Carlo algorithm	7
6.	Simple decision making	Simple decision making considering belief and desire in uncertain environment, utility based agent, decision network.	2
7.	Inference in temporal Model	Markov Model; Reasoning over time using Hidden Markov Model (HMM); Exact and approximate inferencing using Dynamic Bayesian network;	5
8.	Complex decision making	Complex decision making for a temporal utility based agent in uncertain environment using MDP and POMDP	5
9.	Multi-agent and Reinforcement Learning	Decision making multi-agent environment in game theory, Nash equilibrium; Reinforcement Learning	4
10.	Handling uncertain input	Handling uncertain input using fuzzy systems.	2
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.	Russell, Stuart J., and Peter Norvig. Artificial intelligence: a modern approach. Malaysia; Pearson Education Limited., 2016
2.	Barber, David. Bayesian reasoning and machine learning. Cambridge University Press, 2012.
3.	Durrett, Rick. Probability: theory and examples. Vol. 49. Cambridge university press, 2019.

4.	Shi, Zhongzhi. Advanced artificial intelligence. Vol. 1. World Scientific, 2011.
5.	Maxim Likhachev, Dave Ferguson, Geoff Gordon, Anthony Stentz, and Sebastian Thrun, "Anytime search in dynamic graphs", September 2008.

Lab-wise Breakup

Course Code	15B19CI891	Semester Even (specify Odd/Even)	Semester VIII Session 2018 -2019 Month from Jan to June 2019
Course Name	Project Part – 2 (CSE)		
Credits	12	Contact Hours	...

Faculty (Names)	Coordinator(s)	Dr. Manish Kumar Thakur
	Teacher(s) (Alphabetically)	Entire Department

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	Create Level (Level 3)
C450 .4	Evaluate the performance of the developed solution	Evaluate Level (Level 5)
C450 .5	Compile the results and findings of the project in written and verbal formats	Create Level (Level 6)

Evaluation Criteria	
Components	Maximum Marks
Mid Semester Viva	20
Final Viva	30
Project Report	20
Day to Day Work	30
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)

Detailed Syllabus
Lecture-wise Breakup

Subject Code	18B12CS429	Semester EVEN (specify Odd/Even)	Semester –VIII : Even 2019 Month from Jan to May
Subject Name	Advanced Computer Networks		
Credits	4 (3-1-0)	Contact Hours	4

Faculty (Names)	Coordinator(s)	Gaurav Kumar Nigam
	Teacher(s)	Gaurav Kumar Nigam

COURSE OUTCOMES		COGNITIVE LEVELS
C434-6.1	Demonstrate the concepts of Circuit Switching, Packet switching , TCP/IP, IP addressing, Frame relay, ATM, ISDN, Traffic management in ATM.	Understanding Level (Level 2)
C434-6.2	Apply various concepts related to LAN Ethernet, fast Ethernet, gigabit Ethernet, FDDI, DSL, ADSL to develop a Network model for a given real time scenario.	Creation Level (Level 6)
C434-6.3	Examine various issues and challenges for Wireless Networks and categorize key protocols and standards according to quality requirements.	Analysis Level (Level 4)
C434-6.4	Analyze Wireless Networks, Wireless channels.	Analysis Level (Level 4)
C434-6.5	Evaluate network performance using queuing theory.	Evaluating Level (Level 5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	TCP/IP Protocol	Layered protocols, internet Addressing, mapping internet address to physical address, internet protocol, OSPF, RIP,RARP,	8

		BOOTP, DHCP, BGP, ARP, IP, Ipv6, ICMP Transport protocols: UDP, TCP and SNMP	
2.	Connection oriented networks	Frame relay, B-ISDN, ATM protocol stack, ATM switching, internetworking with ATM Networks, traffic management in ATM.	8
3.	High Speed LAN	LAN Ethernet, fast Ethernet, gigabit Ethernet, FDDI, DSL, ADSL and its working	9
4.	Wireless Communication	Wireless networks, wireless channels, channel access, network architecture, IEEE 802.11, Bluetooth	9
5.	Network Analysis and Modeling	Queuing theory, modeling network as a graph, network management system and standard	8
Total number of Lectures			42

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

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc)	
1.	High performance communication networks by: J. Walrand & Pravin Varaiya , Morgan Kaufman, 1999.
2.	Internetworking with TCP/IP Vol.1: Principles, Protocols, and Architecture (4th Edition) by Douglas E. Comer
3.	ATM networks: Concepts, Protocols, Applications by: Handel, Addison Wesseley.
4.	Computer network protocol standard and interface Uyles, Black

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12CS427	Semester Even (specify Odd/Even)	Semester VIII Session 2018 -2019 Month from January to May
Course Name	NLP and Semantic Technologies		
Credits	4	Contact Hours	3-1-0 (L-T-P)

Faculty (Names)	Coordinator(s)	Dr. Arti Jain
	Teacher(s) (Alphabetically)	Dr. Arti Jain

COURSE OUTCOMES		COGNITIVE LEVELS
C433-6.1	Understanding, preprocessing and handling of structured, unstructured web data using NLP and Semantic Technologies	Understand Level (C2)
C433-6.2	Identify and apply Semantic Technology Standards to distinguished functional domains	Apply Level (C3)
C433-6.3	Examine the impact on Semantic Web applications of NLP	Analyze Level (C4)
C433-6.4	Estimate the amount of efforts required for selecting appropriate semantic web technique	Evaluate Level (C5)
C433-6.5	Develop different NLP and Semantic formalisms for varying data formats	Create Level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to NLP and Semantic Technology	NLP, Semantic web, Semantic technology, and Semantic web technology. Explore how they relate to one another. Some examples of existing semantic technologies.	2
2.	Pre-processing of data	Pre-processing techniques like: Tokenization, Lemmatization etc.	2
3.	Semantic and Text-based Classification	NLP and Semantic technology for unstructured text content, Extraction of entities- names, dates, organization, events.	3
4.	Semantic Technology Standards	Flexible data model (RDF), Schema and Ontology language for describing concepts and relationships (RDFS and OWL), Query language (SPARQL), Rules language (RIF), language for marking up data inside Web pages (RDFa)	10
5.	Data Mining Technology	Pattern matching algorithms, Trends and correlations within large datasets, Example case study: Fraud trading behaviour in large databases of financial transactions.	7
6.	Expert System and Classification Technology	Reasoning models, Heuristics and rules to tag data, Machine learning algorithms to improve decision-making capabilities	5
7.	Semantic Search	Context based information search instead of syntactic	6

	Technology	search to distinguish between search for people, location or organization	
8.	Applications	Information Monitoring, Sentiment Analysis, Auto-Categorization, Control Access to Confidential Information, Summarize & Annotate Documents.	6
Total number of Lectures			41
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.	Frawley, William, Linguistic Semantics, Hillsdale, NJ: Lawrence Erlbaum Associates. 1992.
2.	Hinrich Schtze, Christopher D. Manning, Foundations of Statistical Natural Language Processing, MIT Press. Cambridge, 1999.
3.	Saeed, John I. Semantics, Oxford, UK: Blackwell, 2003.
4.	Chierchia, Gennaro & McConnell-Ginet, Sally, Meaning and Grammar, Cambridge, MA: MIT Press, 1990.
5.	Clark, Herbert H. Using Language, Cambridge, UK: Cambridge University Press, 1996.
6.	Fauconnier, Gilles, Mappings in Thought and Language, Cambridge, UK: Cambridge University Press, 1997.
7.	Löbner, Sebastian, Understanding Semantics, London, UK: Arnold Publishers, 2002.
8.	Grant S. Ingersoll, Thomas S. Morton, Andrew L. Farris, Taming Text: How to Find, Organize, and Manipulate It, Manning Publications, 2013.
9.	IEEE/ACM Transactions on Audio, Speech and Language Processing
10.	Tier-1 Conferences: ACL, AAIL, SIGKDD, UAI, COLT, IJCAI, ICML, NIPS

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12BT415	Semester Even (specify Odd/Even)	Semester VIII Session 2018 -2019 Month from January-June
Course Name	Intellectual Property Rights and Bioethics		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	1. Prof. S Krishna Sundari
	Teacher(s) (Alphabetically)	1. Prof. S Krishna Sundari

COURSE OUTCOMES		COGNITIVE LEVELS
C402-14.1	Recall National and International IP rules and Agreements	Remember Level(C1)
C402-14.2	Summarize various aspects of Intellectual Property Rights in context with technological advancements	Understand Level(C2)
C402-14.3	Utilize different patent search engines and search patent literature in speciality domains	Apply Level(C3)
C402-14.4	Identify appropriate guidelines related to engineering, professional, and biotechnology research ethics	Apply Level(C3)
C402-14.5	Survey and classify patents, make a report and present the IPR status in different fields.	Analyze Level(C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Intellectual Property Rights	Different forms of Intellectual Property Rights - their Relevance, Importance to Industry, Academia, Role of IPRs in biotechnology, Patent Terminology: Patents, Trademarks, Copyrights, Industrial Designs, Geographical Indications, Trade secrets, non-disclosure agreements, Patent Life and Geographical Boundaries	4
2.	International organizations & IPR	Overview of WTO, TRIPS, WIPO, GATT, International conventions, Trade agreements, Implication of TRIPS for developing countries	3
3.	Process involved in Patenting, Patent Search	Procedural steps in patenting, Process of filing, PCT application, pre-grant & post-grant opposition, PCT and Patent harmonization including Sui-generis system, Patent Search methods, Patent Databases & Libraries, online tools, Country-wise patent searches (USPTO, EPO, India etc.), patent mapping	4

4.	IPR in Agriculture Technology & Biotechnology	Basic features of Indian Plant Varieties Protection & Farmer's Rights Act, UPOV, Invention/ Discovery, Patentable subject matter, Generics, Compulsory Licensing, Exclusive Marketing Rights (EMR), Bolar provision, Bayh-Dole act, Second medical use	4
5.	Traditional Knowledge and Intellectual Property Rights	The importance of Traditional Knowledge (TK) for developing nations, protecting TK, The local, national and global dimensions of the issues in TK and IPRs, Traditional Medicine & IP Protection, Folklore, Patenting of Health Foods: Case studies	3
6.	Introduction to Bioethics	Need of bioethics, applications and issues related to Bioethics, Social and cultural issues	2
7.	Bioethics & Biodiversity	Conserving natural Biodiversity, convention on protecting Biodiversity, Protocols in exchanging Biological material across borders	2
8.	Bioethics & GMO's	Issues and concerns pertaining to Genetically modified foods & food crops, Organisms and their possible health implications and mixing up with the gene-pool	3
9.	Bioethics in Medicine	Protocols of ethical concerns related to prenatal diagnosis, gene therapy, Organ transplantation, Xenotransplantation, ethics in patient care, Informed consent	7
10.	Bioethics & Cloning	Permissions and Procedures in Animal Cloning, Human cloning, Risks and hopes	3
11.	Bioethics in Research	Stem cell research, Human Genome Project, Use of animals in research, human volunteers for Clinical research, Studies on Ethnic races	5
12.	Ethics in Profession	Ethics related to professional streams , engineering	2
Total number of Lectures			42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, 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.	"Bioethics & Biosafety" by Sateesh MK, IK International publications, 2008
2.	USPTO Web Patent Databases at: www.uspto.gov/patft
3.	Government of India's Patents Website: patinfo.nic.in
4.	Intellectual property India: www.ipindia.nic.in

5.	“Indian Patent Law : Legal and Business Implications” by AjitParulekar, Sarita D'Souza Macmillan India publication, 2006
6.	“Agriculture and Intellectual Property Rights”, edited by: Santaniello,V., Evenson, R.E., Zilberman, D. and Carlson, G.A. University Press publication, 2003
7.	Research papers and Reports provided from time to time

Detailed Syllabus
Lecture-wise Breakup

Subject Code	17B2NCI744	Semester: EVEN	Semester VIII Session 2018-19
Subject Name	Real Time Systems		
Credits	4	Contact Hours	3-1-0

Faculty (Names)	Coordinator(s)	Bansidhar Joshi
	Teacher(s) (Alphabetically)	Bansidhar Joshi

COURSE OUTCOMES		COGNITIVE LEVEL
C434-5.1	Outline the prime characteristics of a real-time system	Understand Level (Level 2)
C434-5.2	Identify various scheduling algorithms over periodic/aperiodic tasks set and determine their optimality in Uni/multi-processor and overloading environment	Applying Level (Level 3)
C434-5.3	Analyze the consequences of relaxing the conventional properties for real-time Databases	Analyzing Level (Level 4)
C434-5.4	Evaluate the performance of various communication protocols in a real-time traffic scenario.	Evaluate Level (Level 5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction to Real-time computing	Structure of a Real-Time System Characterization of Real-Time Systems and tasks - Performance measures.	4
2.	Task Assignment and Scheduling	Uniprocessor scheduling Algorithms – Periodic and Aperiodic Task scheduling – Resource Access Protocols	14
3.	Issues on Overload	Transient overload conditions, Metrics for performance evaluation & scheduling algorithms under overload	3
4.	Real-Time Communication	Network topologies and Architecture Issues – Protocols– Contention-based, Token-based, polled bus	8
5.	Real-Time Databases	Transaction Priorities and Aborts - Concurrency control Issues	8

		Scheduling Algorithms - Two-phase approach to improve predictability	
6.	Petri Nets	RT Modeling tool, analysis and different variations	3
		Total number of Lectures	40
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.	CM Krishna and Kang G Shin, "Real-Time Systems", International Editions, ISBN-0- 07114243-6, McGraw Hill Companies, Inc., New York, 1997		
2.	Real-time Systems, Jane W.S. Liu, Pearson Education, Inc. ISBN 81-7808-463-5, 2003		
3.	Hard Real-time Computing Systems: Predictable Scheduling Algorithms and Applications, Giorgio C. Buttazzo, , Kluwer Academic Publishers, 2005.		
4.	Real-time Systems and Programming Languages, Alan Burns and Andy Wellings, Addison-Wesley Longman, ISBN 0201729881, 2003		
5.	Petri nets: Properties, Analysis and Applications, Tadao Murata, Proceedings of the IEEE, Vol. 77, No. 4, April 1989.		
6.	Petri nets and Industrial Applications: A Tutorial, R Zurawski, M Zhou, IEEE Trans. on Industrial Electronics, Vol. 41, No. 6, December 1994.		

Detailed Syllabus
Lecture-wise Breakup

Subject Code	18B12CS413	Semester: EVEN	Semester VIII Session 2018-19
Course Name	Performance Analysis of Computing Systems		
Credits	4	Contact Hours	3-1-0 (L-T-P)

Faculty (Names)	Coordinator(s)	Dr. Sanjeev Patel
	Teacher(s) (Alphabetically)	

COURSE OUTCOMES		COGNITIVE LEVELS
C433-5.1	Demonstrate the performance goals for methods and algorithms in computational systems and understand the various random variables with its applications.	Understand Level (C2)
C433-5.2	Inspect and examine the outcome of experiments using various approaches or techniques.	Analyze Level (C4)
C433-5.3	Select and interpret appropriate evaluation techniques, performance metrics and workloads for a system.	Evaluate Level (C5)
C433-5.4	Apply and build Markovian model to develop continuous & discrete-time queuing process by discussing various queuing models.	Apply Level (C3)
C433-5.5	Classify and examine various probability distribution model for a given applications and compare the performance of various techniques or algorithms.	Analyze Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Probability Models and Simulation:	Probability space, Random variables; Discrete and Continuous distribution: uniform, geometric, exponential, normal distribution etc, System Modeling, Measurement techniques, Experimental design, workload design, Simulations, Data analysis and Visualization.	14
2.	Basics of Modeling:	Performance metrics: Bandwidth utilization, throughput, delays, error rate, network reliability etc., Poisson process, Bernoulli splitting, PASTA, and Markov chain theory.	8
3.	Queuing Theory:	Arrival and service processes, Server disciplines, Queuing networks: Open vs. closed networks, Product-form queuing networks, M/M/1, M/M/1/K, M/M/m, M/M/m/m. M/G/1 full analysis;	12
4.	Simulation Analysis and of Computing systems:	Simulations: time averages versus ensemble averages, Asymptotic bounds and limit theorems, confidence intervals, generating random variables for simulation,	6

		Monte-Carlo simulation, Inspection Paradox; Empirical Workload Measurements: heavy-tailed property, Pareto distributions, self-similarity, heavy-tailed distributions;	
5.	Applications of Computing Systems:	Analysis of Scheduling: FCFS,LCFS, SJF etc., analyze the different computing system based on real life application	2
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.	Sheldon M. Ross: Introduction to Probability Models 7th Edition, Academic Press, 2002
2.	R. Jain, The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation and Modeling, John Wiley & sons, 1991.
3.	Kishor S. Trivedi, Probability and Statistics with Reliability, Queueing, and Computer Science Applications, Wiley, 2nd edition, 2008.
4.	Sanjay K. Bose, “An Introduction to Queueing System”, Springer 2002
5.	Bertsekas D. and Gallager R., Data Networks. Englewood Cliffs, NJ: Prentice-Hall, 1992
6.	L. Kleinrock, Queueing Systems, Vol. I: Theory, John Wiley & Sons, Inc., 1975.
7.	Edited by P. Chretienne, E. G. Coffman, J. K. Lenstra and Z. Liu, Scheduling Theory and its Applications, John Wiley and Sons, 1995.
8.	Larry L. Peterson and Bruce S. Davie, “ Computer Networks: A Systems Approach ”, 3 rd Edition, Elsevier Publication, 2003.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12CS417	Semester EVEN (specify Odd/Even)	Semester VIII Session 2018 -2019 Month from Jan 19 to May 19
Course Name	Principle of Software Design and Development		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr Chetna Gupta
	Teacher(s) (Alphabetically)	Dr Chetna Gupta

COURSE OUTCOMES		COGNITIVE LEVELS
C402-21. 1	Demonstrate an understanding of and apply current theories, models, and techniques that provide a basis for software development.	Understand Level (C2)
C402-21. 2	Ability to analyze system requirements, assess and apply appropriate risk, negotiation and prioritization strategies to evaluate the system in terms of quality attributes and possible trade-offs presented within the given problem.	Evaluate Level (C5)
C402-21. 3	Apply basic principles modeling of computer systems using UML for software analysis and design.	Apply Level (C3)
C402-21. 4	Examine project planning activities that accurately forecast project costs, timelines, and quality.	Analyze Level (C4)
C402-21. 5	Develop and apply testing strategies for software applications.	Apply Level (C3)
C402-21. 6	Recommend solutions to optimize performance of system by changing design and code.	Evaluate Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Overview of Software Engineering Process	Software Life-Cycle Models, Agile Software Engineering, The Software Process, Development Teams, Software Engineering Tools	8
2.	Requirement Analysis, Design Principles and Modeling	In depth study of Requirements Engineering (Writing Requirements and Requirements Specifications, Quality Assurance of Requirements, Prioritizing Requirements) and an overview of various modeling techniques applicable to requirements and specification, including UML and formal modeling. Study and analysis of various tools and techniques,	11

		Coupling and cohesion.	
3.	Software Project Planning	Core processes, tools, techniques and fundamentals of project management and metrics	8
4.	Code Optimization and Refactoring	Levels, bottlenecks, types, automated vs manual optimization, optimization techniques, refactoring, code smells, techniques	6
5.	Software Testing and Verification	Theoretical and practical aspects of testing software. Study of all test activities, from analyzing a requirements document for test conditions through executing test cases and writing a test report, types of testing, who should do it, and why it should be done.	9
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

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.	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, The Unified Modeling Language User Guide , 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.	Stallmark, “An Integrated Approach to Software Engineering” Third addition , Springer Press
7.	Stallmark, Introduction to Personal Software Process, Pearson Education.
8.	Stallmark, Introduction to Team Software Process, Pearson Education.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NMA831	Semester Even (specify Odd/Even)	Semester VIII Session 2018-2019 Month from January 2019 to June 2019
Course Name	Optimization Techniques		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Prof. A. K. Aggarwal	
	Teacher(s) (Alphabetically)	Prof. A. K. Aggarwal	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C402-2.1	apply generalized, revised and dual simplex method for linear programming problems (LPP).		Applying Level (C3)
C402-2.2	apply graphical, algebraic and linear programming techniques for pure and mixed strategy problems in game theory.		Applying Level (C3)
C402-2.3	classify and solve the problems on queuing and inventory models.		Analyzing Level (C4)
C402-2.4	solve and analyze the network scheduling and sequencing problems.		Analyzing Level (C4)
C402-2.5	make use of dynamic programming technique to solve complex linear programming problems.		Applying Level (C3)
C402-2.6	determine numerical solution of nonlinear multidimensional problems.		Evaluating Level (C5)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Review of Linear Programming	Convex sets, Linear Programming Problems (LPP), graphical and simplex method, Big-M method, Two phase method, generalized simplex method, revised simplex method, Duality theory, dual simplex method.	08
2.	Game Theory	Rectangular Games, Minmax Theorem, Graphical Solution of $2 \times n$, $3 \times n$, $m \times 2$, $m \times 3$ and $m \times n$ Games, Reduction to Linear Programming Problems.	06
3.	Queuing Theory & Inventory Model:	Introduction, Steady-State Solutions of Markovian Queuing Models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited space, M/G/1, Inventory Models.	06
4.	Sequencing & Scheduling	Processing of Jobs through Machines, CPM and PERT.	06
5.	Dynamic Programming	Discrete and Continuous Dynamic Programming, Simple Illustrations.	06
6.	Nonlinear Programming	Unimodal function, One Dimensional minimization problem, Newton's Method Golden Section, Fibonacci Search, Bisection, Steepest Descent Method, Multidimensional Newton's method.	08

		Total number of Lectures	40
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments)	
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.	Taha H. A., Operations Research: An Introduction, 7th edition, PHI, 2002.		
2.	Rao, S. S. - Engineering Optimization, Theory and Practice, Third Edition, New Age International Publishers, 2010.		
3.	Wagner, H. M., Principles of Operations Research with Applications to Managerial Decisions, Prentice Hall of India Pvt. Ltd., 1975.		
4.	Hillier F. and Lieberman G. J., Introduction to Operations Research, 6th edition, McGraw-Hill, 1995.		

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12MA811	Semester: Even	Semester VIII Session 2018 -2019 Month from: January 2019- June 2019
Course Name	Mathematics in Finance		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Dinesh C. S. Bisht
	Teacher(s) (Alphabetically)	Dr. Dinesh C. S. Bisht

COURSE OUTCOMES		COGNITIVE LEVELS
CO403-22.1	Explain the basics of one period model and representation of securities by vectors and matrices.	Understanding Level (C2)
CO403-22.2	Apply the complete hedging formula for portfolio selection and replicating portfolios.	Applying Level (C3)
CO403-22.3	Understand the concept of arbitrage and pricing in one period model and apply the arbitrage theorem for incomplete market.	Applying Level (C3)
CO403-22.4	Apply numerical techniques for optimal portfolio selection in incomplete markets.	Applying Level (C3)
CO403-22.5	Apply Fourier transform for option pricing and fast Fourier transform for fast pricing.	Applying Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	The Simplest Model of Financial Markets	One-Period Finite State Model , Securities and Their Par-Offs , Securities as Vectors, Operations on Securities, The Matrix as a Collection of Securities ,Matrix Multiplication and portfolios, Systems of Equations and Hedging, Linear Independence and Redundant Securities, The Structure of the Marketed Subspace, The Identity Matrix and Arrow–Debreu Securities, Complete Market Hedging Formula.	12
2.	Arbitrage and Pricing in the One-Period Model	Hedging with Redundant Securities and Incomplete Market, Geometric Interpretation of the Best Hedge, Minimizing the Expected Squared Replication Error, Numerical Stability of Least Squares, Asset Prices, Returns and Portfolio Units, Arbitrage, State Prices and the Arbitrage Theorem, No-Arbitrage Pricing, State Prices and Asset Returns, Asset Pricing Duality.	10
3.	Numerical Techniques	Sensitivity Analysis of Portfolio Decisions with the CRRA Utility, Approximately Optimal Solution, Newton’s Algorithm for Optimal Investment with CRRA Utility,	10

		Optimal CRRA Investment Using Empirical Return Distribution	
4.	Fast Fourier Transform	Introduction to Complex Numbers and the Fourier Transform, Discrete Fourier Transform (DFT), Fast Pricing via the Fast Fourier Transform (FFT).	10
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz and Assignments)	
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.	Cerny, A. , Mathematical Techniques in Finance: Tools for Incomplete Markets, Princeton University Press.2009.
2.	Pliska, S. R. , Introduction to Mathematical Finance: Discrete Time Models, Blackwell Publishers Inc. 2002.
3.	Chakravarty, S. K. , Financial Mathematics. New Age International Pub. 2011.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12MA811	Semester Even	Semester VIII Session 2018 -2019 Month from Jan 2019 to June 2019
Course Name	FUZZY OPTIMIZATION AND DECISION MAKING		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. AMIT SRIVASTAVA	
	Teacher(s) (Alphabetically)	Dr. AMIT SRIVASTAVA	
COURSE OUTCOMES			COGNITIVE LEVELS
C402-24.1	Explain the concept of fuzzy sets and fuzzy numbers.		Understanding level(C2)
C402-24.2	Explain various fuzzy and generalized fuzzy operations.		Understanding level(C2)
C402-24.3	Apply the concept of fuzzy relations and approximate reasoning.		Apply level(C3)
C402-24.4	Apply the concept of fuzzy sets and their generalizations in various decision making processes.		Evaluate level(C5)
C402-24.5	Apply various ranking techniques in solving fuzzy transportation problems.		Apply level(C3)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Fuzzy sets and fuzzy numbers.	Definition of Fuzzy Set, Operations with fuzzy numbers. Triangular Fuzzy Numbers, Bell Shaped Fuzzy Numbers, Fuzzy Numbers with a Flat, Trapezoidal fuzzy Numbers, Piecewise – Quadratic Fuzzy Numbers with a Flat.	7
2.	Fuzzy and generalized fuzzy operations.	Addition and Subtraction of Fuzzy Numbers, Multiplication of Fuzzy numbers, Distance between Triangular Fuzzy Numbers, Fuzzy Operations in the set of integers , Distance between Triangular Fuzzy Numbers, Fuzzy Numbers with a Maximum, Fuzzy Numbers in the set of Integers, Fuzzy Numbers of Dimension Two, Definition of Fuzzy Set, Basic Operations of Fuzzy Sets.	7
3.	Fuzzy relations and approximate reasoning.	Fuzzy Relations, Operations in Fuzzy Relations, Direct Product, Projections of Fuzzy Relation, Max-Min and Min-Max Compositions, Properties of Fuzzy Relations, Fuzzy Relations and Approximate reasoning.	8
4.	Decision making in fuzzy environment.	Decision making in a Fuzzy Environment, Individual Decision Making, Multiperson Decision Making, Multicriteria decision Making, Multistage decision making, Fuzzy Zero-Based Budgeting, Fuzzy Averaging for Decision Making.	10
5.	Ranking techniques in fuzzy	Fuzzy Ranking methods, Fuzzy Linear Programming, Fuzzy Transportation, Basic Definitions Associated with	10

	transportation problems.	Fuzzy Transportation, Solution of Fuzzy Transportation Problem.	
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.	Bhargava, A. K., Fuzzy Set Theory, Fuzzy Logic and Their Applications, S. Chand & Company Pvt. Ltd., 2013.		
2.	Zimmermann, H. J., Fuzzy Set Theory and its Applications, 4 th Edition, Allied Publishers, New Delhi, 1991.		
3.	Ross, T.J., Fuzzy logic with engineering applications, 2 nd Edition, John Wiley and Sons, Ltd, 2004.		
4.	Baczynski, M. and Jayaram, B., Fuzzy Implications, Springer Verlag, Heidelberg, 2008.		
5.	Klir, G. J. & Yuan, B., Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall NJ, 1995.		

Detailed Syllabus
Lecture-wise Breakup

Subject Code	15B1NPH831	Semester: Even	Semester VIII Session 2018-19 Month from January to June
Subject Name	Integrated Optics and Applications		
Credits	3	Contact Hours	3
Faculty (Names)	Coordinator(s)	Dr Amit Verma	
	Teacher(s) (Alphabetically)	Dr Amit Verma	
COURSE OUTCOMES			COGNITIVE LEVELS
C402-26.1	Recall Integrated optical circuits and their applications in communication and photonics.		Remembering (C1)
C402-26.2	Explain Elements of optics, ray transformation, optical sources, detectors, waveguides and their applications in photonics and communications.		Understanding (C2)
C402-26.3	Demonstrate the use of Matrix optics and Fourier transform in solving various problems related to waveguides and optical integrated circuits.		Applying (C3)
C402-26.4	Prove and estimate solution of numerical problems using physical and mathematical concepts involved with various optical circuits and switches.		Evaluating (C5)
C402-26.5	Design of optical circuits of desired output for communication applications.		Creating (C6)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Matrix Optics	Introduction, Postulates of Ray Optics, Matrix optics; The ray transfer Matrix, Matrices of some simple, cascaded optical components and Periodic optical systems (Light Guides).	7
2.	Fourier Optics	Fourier series and analysis of periodic functions, Exponential form of Fourier series and Fourier transform Convolution and applications in image processing; frequency filtering, low pass, high pass and band pass filters.	7
3.	Lasers	Lasers; threshold condition, resonator wave guides and Types of Lasers, Laser diodes; Fabry-Perot lasers. DFB, DBR lasers, ultrafast optics and Applications.	7
4.	Optical waveguides	Optical waveguides and fibers, Planar and strip waveguides, Amplifiers (EDFA), Directional couplers, Diffraction Grating couplers, Grating-assisted optical components. Fiber sensors, fiber optic network and	7

		communication,	
5.	Micro and nano lithography	Lithography. Etching, Metallization, Packaging, Nanoscale waveguide, micro-ring resonator, micro-disk resonator and applications.	4
6.	Photonic integrated circuits	Integrated optical Devices; Design and Processing Technology Photonic switches, PIC (Photonic Integrated Circuits), Photonic crystal cavity, plasmonic waveguide based devices, NRI (negative refractive index) Optics, perfect lens, near-field scanning optical microscope (NSOM) and Applications.	8
Total number of Lectures			40
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]	
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. P. Khare, <i>Fiber Optics and Optoelectronics</i> , Oxford University Press.		
2.	A. K. Ghatak and K. Thyagarajan, <i>Optical Electronics</i> , Cambridge university Press.		
3.	A. K. Ghatak and K. Thyagarajan, <i>An Introduction to Fiber Optics</i> , Cambridge university Press.		
4.	B. B. Laud, <i>Lasers and Nonlinear Optics</i> , New Age International.		

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH812	Semester: Even	Semester: VIII Session : 2018 -2019 Month from: January to June
Course Name	Astrophysics		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Prof.Anirban Pathak and Dr. Sandeep Chhoker
	Teacher(s) (Alphabetically)	Anirban Pathak and Sandeep Chokker

COURSE OUTCOMES		COGNITIVE LEVELS
C402-4.1	Relate historical development of astrophysics with the modern concepts and recall the mathematical techniques used & definition of different units	Remembering (C1)
C402-4.2	Explain the models of universe, ideas of stellar astrophysics, life cycles of stars, physical principles that rules galaxies, and general theory of relativity	Understanding (C2)
C402-4.3	Apply mathematical principles and laws of physics to solve problems related to astrophysical systems	Applying (C3)
C402-4.4	Compare different models of universe and decide which one is logically acceptable and why	Analyzing (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1	Introduction to Astrophysics	Historical development of astrophysics (from mythology to contemporary astrophysics), Mass, length and time scales in astrophysics, sources of astronomical information (effect of discovery of spectroscopes and photography), astronomy in different bands of electromagnetic radiation (e.g. Optical astronomy, infra-red astronomy radio astronomy, X-ray astronomy. Gamma-ray astronomy etc. with specific mention of Hubble space telescope). Kirchoff's law, Doppler effect and Hubble's law.	8
2.	Stellar Astrophysics	Classification and nomenclature of stars. Basic equations of stellar structure, main sequence, red giants and white dwarfs, HR diagram, stellar evolution, supernovae, extra solar planets.	8
3.	Death of a star	End states of stellar collapse: degeneracy pressure of a Fermi gas, structure of white dwarfs, Chandrasekhar mass limit, neutron stars pulsars and black holes.	6

4.	Our galaxy	The shape and size of Milky way and its interstellar mater	2
5.	Extragalactic astrophysics	Normal galaxies, active galaxies, cluster of galaxies, large-scale distribution of galaxies.	6
6.	GTR and Models of Universe	Qualitative idea of general theory of relativity (without using tensor calculus) and its implications. Different models of universe. Specific attention to the ideas related to big bang, cosmological constants, dark matter and dark energy.	6
7.	Astrobiology	Drake equation and related questions.	2
8.	Conclusion	Review of the present status of Astrophysics and open questions.	2
Total number of Lectures			40
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 [2 Quizes (10 M), Attendance (10 M) and Class performance (5 M)]	
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.	Astrophysics for Physicists, Arnab Rai Choudhuri, Cambridge University Press, Delhi, 2010.
2.	Astrophysics: Stars and Galaxies, K D Abhyankar, University Press, Hyderabad, 2009.
3.	Facts and Speculations in Cosmology, J V Narlikar and G Burbidge, Cambridge University Press, Delhi, 2009.
4.	The Cosmic Century, Malcolm Longair, Cambridge University Press, Cambridge, 2006.
5.	An Introduction to Astrophysics, BaidyanathBasu, Prentice Hall of India, Delhi 1997.
6.	Fundamentals of Equations of State, S. Eliezer, A Ghatak and Heinrich Hora, World Scientific, Singapore, 2002. Only Chapter 15.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12PH811	Semester Even	Semester VIII Session 2018 -2019 Month from January to June
Course Name	Photonics and Applications		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Navneet Kumar Sharma and Anshu Varshney
	Teacher(s) (Alphabetically)	Navneet Kumar Sharma and Anshu Varshney

COURSE OUTCOMES		COGNITIVE LEVELS
C402-3.1	Recall the fundamental properties of light and the processes involved in the generation of light	Remembering (C1)
C402-3.2	Interpret the theory of fiber optics	Understanding (C2)
C402-3.3	Apply the fundamentals of various nonlinear optical effects in technology; make use of holography and its applications	Applying (C3)
C402-3.4	Compare the operational principles, characteristics and trade-offs of optical detectors and modulators of light	Analyzing (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Lasers	Review of different types of laser systems. LEDs, Semiconductor lasers, Quantum well lasers, Q-switching and Mode locking in lasers.	8
2.	Fiber Optics	Numerical aperture, Step and graded index multimode fibers, attenuation and dispersion, modes in optical fibers. Single mode fiber, mode cutoff and mode field diameter. Connector and splice losses, Erbium doped fiber amplifier and Characterization techniques including OTDR.	10
3.	Photo detectors	Semiconductor photo detectors.	5
4.	Optical Electronics	Wave propagation in anisotropic media, Electro-optic effect: phase and amplitude modulation. Acousto-optic effect: modulators, deflectors and tunable filters, Magneto-optic effect: modulators.	4
5.	Optical devices	Electro-optical device, Acousto-optical device, Magneto-optical device, Optical Communication.	2
6.	Nonlinear Optics	SHG, Sum and Difference frequency generation, parametric amplification, wavelength converters, Self focusing with lasers.	6

7.	Holography	Recording and Reproduction of Hologram, Applications of holography.	4
8.	Applications of Photons in Memory devices	CD, VCD, DVD.	1
Total number of Lectures			40
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]	
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. P. Khare, <i>Fiber Optics and Optoelectronics</i> , Oxford University Press.
2.	A. K. Ghatak and K. Thyagarajan, <i>Optical Electronics</i> , Cambridge university Press.
3.	A. K. Ghatak and K. Thyagarajan, <i>An Introduction to Fiber Optics</i> , Cambridge university Press.
4.	B. B. Laud, <i>Lasers and Nonlinear Optics</i> , New Age International.

Detailed Syllabus

Course Code	19B16CS313	Semester : Even	Semester VIII Session 2018 -2019 Month from Jan 19 to May 19
Course Name	Spatial Data Mining		
Credits	0	Contact Hours	1-0-2 (3 hrs per week)

Faculty (Names)	Coordinator(s)	Mahendra Kumar Gurve
	Teacher(s) (Alphabetically)	Ankita Wadawa

COURSE OUTCOMES		COGNITIVE LEVELS
C305-12.1	Illustrate spatial data mining concepts, techniques and real world applications.	Understand Level (Level 2)
C305-12.2	Create maps using the basics of data capture, storage, analysis, and output procedure in open source spatial data mining (QGIS) tool.	Apply Level (Level 3)
C305-12.3	Apply spatial clustering and classification algorithms to discover interesting and useful patterns in spatial data.	Apply Level (Level 3)
C305-12.4	Identify and evaluate the best spatial data mining technique for predictive Modeling and suitability analysis.	Analyse Level (Level 4)
C305-12.5	Develop a project using spatial data mining technique to solve the real world problems like finding accident prone area, recommend best place/site for ATM/schools/industries etc.	Create Level (Level 6)

Module No.	Title of the Module	List of Experiments	No. of Lectures for the module
1.	Course overview:	Course overview: What Spatial Motivated Data Mining? Why Is It Important? Spatial Data Mining vs Classical Data Mining ? Data Mining Functionalities—What Kinds of Spatial Patterns Can Be Mined? Are All of the Patterns Interesting? Data mining process, Types of datasets and attributes, Major Issues in Spatial Data Mining.	06
2.	Data Preprocessing :	Data Preprocessing : Getting To know your data, Types of spatial data , Raster data, Vector data, , Spatial Data collection methods , Data extraction, online sources of spatial data	03
3.	QGIS,	Installation and Launching QGIS, introduction to QGIS GUI, visualization and export spatial data into QGIS, Load raster and vector layers, Create, edit, manage and export data, Working with Projections, Working with Vector Data, Working with Raster Data, Extension of QGIS functionality through plugins, Python Console for QGIS.	10

4.	Classification Algorithms :	Classification Algorithms : Issues Regarding classical Classification methods , Spatial Classification Algorithms like spatial Decision Tree based algorithm, spatial entropy etc.	07
5.	Clustering Algorithms:	Clustering Algorithms: Types of Data in Cluster Analysis, Similarity Measures, Usability and Complexity Analysis of major Clustering Methods in spatial data mining. k-means, Density-based spatial clustering of applications with noise (DBSCAN), Ordering points to identify the clustering structure (OPTICS), SATCAN , Applications of clustering in spatial data mining.	08
6	Spatial Rule mining:	Spatial Rule mining: Usability and Complexity Analysis of Apriori Algorithm using multiple minimum supports for spatial rule mining.	04
7	Suitability analysis	Case studies and application of spatial data mining technique to solve the real world problems like prediction of accident prone area, crime hotspot analysis , recommend best place/site for ATM/schools/industries etc	06
			42
Evaluation Criteria			
Components		Maximum Marks	
Lab Test1		30	
End Semester Examination		40	
TA		30 (Quiz + Evaluative Assignment + Class Test + Attendance)	
Total		100	

Detailed Syllabus
Lecture-wise Breakup

Course Code	13B1NHS831	Semester Even	Semester VIII Session 2018 -2019 Month from Jan 2019 to June2019
Course Name	ORGANIZATIONAL PSYCHOLOGY		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr Nilu Choudhary
	Teacher(s) (Alphabetically)	Dr Nilu Choudhary

COURSE OUTCOMES		COGNITIVE LEVELS
C402-29.1	Demonstrate advanced knowledge in organizational psychology, including a discussion of its historical origins and development.	Understanding Level(C2)
C402-29.2	Explain the psychological principles underlying job analysis, selection process, and performance appraisal.	Understanding Level(C2)
C402-29.3	Evaluate critically the nature of leadership and its role and development within organizations	Evaluating Level(C5)
C402-29.4	Analyze the impact of social, ethical, cultural economic and political influences on organizational behavior in local, national and global communities	Analyzing level(C4)
C402-29.5	Analyze critically the conceptual and theoretical frameworks relating to organizational psychology.	Analyzing Level(C4)
C402-29.6	Creates a learning environment that promotes respect, collaboration, productive group interaction and creates new opportunities for development and exploration.	Creating Level(C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Meaning and Scope of Organizational Psychology	2
2.	Origins of Organizational Psychology	Scientific Management, The Hawthorne Studies and the Human Relations Approach to Management and Ergonomics	7
3.	Job Analysis and Job Evaluation	Business ethics & Organizing and describing the tasks involved in a job and determining the position's monetary value,	4
4.	Personnel Selection	Matching the best person to each job using, KASo's testing, interviews , work sample exercises	4
5.	Training ,	On the job, Off the job training, Orientation, formal training, and mentoring.	3
6.	Performance Appraisal	Objective and subjective measures, Sources of Bias in Performance Ratings, 360-Degree Feedback, The	4

		Importance of Fairness, Other Performance Measures: Thinking Outside the Box and Organizational Citizenship Behaviour (OCB)	
7.	Motivation, Approaches to Management:, Leadership	The “Japanese” Management Style, Theory X and Theory Y, Strengths-Based Management	6
8	Learning Organization	Traditional and learning Organization, Employee Commitment, The Meaning of Work	4
9	Organizational Culture	Types Organizational Culture, Factors Contributing to Positive Organizational Culture, Toxic Factors in the Workplace,	4
10	Modern Organization Design	Organizational Design, Hollow, Modular, network design	2
11	Stress at Work	Job Stress at Work, Managing Job Stress	2
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignments, 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.	Blum, N.L., & Naylor, J.C. “Industrial Psychology – its theoretical and social foundation”, Cbs, 2004
2.	Dunnette, M. D., & Hough, L. M. “Handbook of Industrial and Organizational Psychology”, Consulting Psychology Press, 1992
3.	Griffin, R. W. & Moorhead G. “Organizational Behaviour: Managing People and Organizations”, South-Western Cengage Learning, 2009
4.	Luthans, F. “Organizational Behaviour”, McGraw-Hill/Irwin, 2011
5	Robbins, S. P. “Organizational Behaviour”, Prentice Hall, 2009
6	Schultz, D. P., & Schultz, S. P. “Psychology and Industry Today: An Introduction to Industrial and Organizational Psychology”, MacMillan Co., 1992
7	Journal of Occupational and Organizational Psychology, The British Psychological Society
8	International Journal of Organization Theory & Behavior, Pracedemics Press
9	Work & Stress: An International Journal of Work, Health and Organizations, Routledge

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12HS814	Semester Even	Semester VIII Session 2018 -2019 Month from Jan 2019 to June 2019
Course Name	KNOWLEDGE MANAGEMENT		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Anshu Banwari	
	Teacher(s) (Alphabetically)	Dr. Anshu Banwari	

COURSE OUTCOMES		COGNITIVE LEVELS
C402-30.1	Demonstrate the way knowledge is embedded in today's organization and behavioral aspects involved in managing it	Understanding Level (C2)
C402-30.2	Compare and contrast different methods to preserve, nurture, share and manage knowledge	Understanding Level (C2)
C402-30.3	Identify appropriate methods for knowledge integration to gain competitive advantage	Applying Level (C3)
C402-30.4	Identify the legal ramifications arising from knowledge sharing and an insight into the ethical concerns faced by individuals and organizations	Applying Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Knowledge Management	Cognition and Knowledge Management, Data, Information and Knowledge, Types of Knowledge, Reasoning and Heuristics, Expert Knowledge, Human thinking and Learning, Knowledge Management myths	4
2.	Life Cycle of a knowledge Management System	Challenges in building Knowledge Management Systems, Conventional V/S Knowledge Management System Lifecycle, Knowledge Management System Life Cycle, System Justification, Role of Rapid Prototyping, Selecting an expert, Role of Knowledge developer	6
3.	Knowledge Creation and Knowledge Architecture	Models of Knowledge Creation and Transformation, Knowledge Architecture, The people Core, Identifying Knowledge centers, The technical core	5
4.	Capturing Tacit Knowledge	Evaluating the expert, Developing a Relationship with expert, Fuzzy reasoning and the quality of Knowledge capture, Interview as a tool, Knowledge capture techniques	6
5.	Knowledge	Codification Tools and Procedures, The knowledge	6

	Codification and System Implementation	Developer’s Skill set, Quality assurance, Approaches to Logical testing and Acceptance testing, Issues related to deployment	
6.	Knowledge Transfer and Knowledge Sharing	Transfer strategies, Inhibitors of Knowledge transfer, Role of Internet in Knowledge Transfer	5
7.	Managing Knowledge Workers	Business Roles in the Learning Organizations, Work adjustment and the Knowledge Worker, Technology and the Knowledge worker, Role of the CKO, Managing Considerations, Managing Knowledge Projects	5
8.	Ethical, Legal and Managerial Issues	Knowledge Owners, Legal Issues, Ethical Decision cycle, Major threats to Ethics, The Privacy factor	5
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Project, Oral questions, 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	D. Hislop , Knowledge Management in Organizations, Oxford University Press, 2013
2.	E. M. Awad and H. M. Ghaziri , Knowledge Management, Pearson Education, 2007
3.	S. Warier , Knowledge Management, Vikas Publishing House, 2011

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12HS814	Semester (specify Odd/Even):Even	Semester: 8th Session: 2018 -2019 Month from: January 18 –June18
Course Name	Digital Transformation in Financial Services		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr.Sakshi Varshney
	Teacher(s) (Alphabetically)	Dr.Sakshi Varshney

COURSE OUTCOMES		COGNITIVE LEVELS
C402-31.1	Outline the changes that influence the financial sector in digital age	Understand (Level 2)
C402-31.2	Evaluate the key differences between traditional business management and technology management and the impact it has on business models	Evaluating (Level 5)
C402-31.3	Analyze the new developments in Financial Technology in banking sector.	Analyzing (Level 4)
C402-31.4	Analyze Consumer Behaviors & digital disruptions in Insurance	Analyzing (Level 4)
C402-31.5	Evaluate the limits, risks and broader policy and social implications of digital technology.	Evaluating (Level 5)
C402-31.6	Organising for Digital Innovation and Apply the knowledge of income tax by digital filing of income tax.	Applying (Level3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Financial services, Digitization, Digitalization, Digital Transformation, digital tools in finance, importance and risks. CASE STUDY OF BNP Paribas	04
2.	Digital Payment System	Electronic commerce, Advantages & Disadvantages of e commerce, Categories of e commerce, E payment systems, Electronic wallets, Smart Cards, credit cards, debit cards, Advantages and Disadvantages	04
3.	Digitization in Banking	Banking: its types, evolution of e banking ,otp, payment mechanisms, RTGS,NEFT, AEPS, UPI, POS, Digital wallets.	06
4.	Business Models for Digital Financial Services	Revenue stream Distribution strategy Partnership strategy technology Implementation	05
5.	Consumer Behaviors in	Analysis of behavior of financial service user, financial service provider, Principles of behavioral finance,	05

	Digital Economy		
6.	Digital Disruptions in Insurance	Digital Changes in Life Insurance, Health & Other Insurance	06
7.	Digital Financial Services Risk and its Management	Strategic Risk, Regulatory, Operational Risk, Technology, Financial , Political Risk, Fraud risk, Agent Management Risk, Reputational Risk, Partnership Risk, Risk Management	08
8.	Digital/E-Income Tax Filing	Income tax filing, Issues related and suggestions & Organising for digital Innovation	04
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Project, 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.	Scardovi C., Transformation in Investment Management. In: Digital Transformation in Financial Services. Springer, Cham ,2017		
2.	OECD (2018), Financial Markets, Insurance and Private Pensions: Digitalisation and Finance		
3.	Digital Financial Services and Risk Management, International Financial Corporation, World Bank, Africa, 2019. Accessed on 2019(Online).Available: https://www.ifc.org/wps/wcm/connect/region__ext_content/ifc_external_corporate_site/sub-saharan+africa/resources/handbook-dfs-rm		

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B1NHS812	Semester- Even	Semester 8th Session 2018 -2019 Month from January 2019 to June 2019
Course Name	International Finance		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Mukta Mani
	Teacher(s) (Alphabetically)	Dr. Mukta Mani

COURSE OUTCOMES		COGNITIVE LEVELS
C402-12.1	Explain the global market scenario, its imperfections and risks which affect the multinational businesses trade.	Understanding level (C2)
C402-12.2	Analyze the international transactions of balance of payments and understand their relationship with key macroeconomic indicators	Analyzing level (C4)
C402-12.3	Apply the concepts of foreign exchange market and currency derivatives for making transactions in foreign exchange market	Applying level (C3)
C402-12.4	Analyze the role of parity conditions and other factors in exchange rate determination.	Analyzing level (C4)
C402-12.5	Analyze the central bank's intervention in foreign exchange market and evaluate the causes of exchange rate disequilibrium	Evaluating level (C5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction	Financial Globalization and Risk, Global financial Marketplace, Eurocurrency market and LIBOR, Theory of comparative advantage, Globalization process	4
2.	Balance of Payments	BOP transactions, accounting, Accounts of BOP, Capital and Financial Accounts, BOP and key macroeconomic variables	4
3.	Exchange Rates	Foreign Exchange market, functions, participants, types of transactions: spot, forward and swap transactions Methods of stating exchange rates, quotations and changes in exchange rates	6

4.	Foreign Exchange rate determination and forecasting	Exchange rate determination theories, Currency market intervention, disequilibrium, forecasting	6
5.	Forward Exchange	Forward foreign exchange, premiums and discounts, forward rates vs future spot rates, payoff profile, swaps, forward quotations	6
6.	Currency Futures and options market	Foreign currency futures, Currency options, Forwards, futures and options compared	6
7.	International Parity Conditions	Purchasing Power Parity and Interest Parity Prices and Exchange rates, Exchange rate pass-through, Forward rate, Prices, Interest rates and exchange rates in equilibrium	5
8.	Transaction and Translation Exposure	Types of foreign exchange exposure, Hedging, Overview of translation, Translation methods, US translation procedures	5
Total			42

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Class test, Assignment, Class participation)
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.	Eiteman, D K., Stonehill, A.I. and Moffett, M.H., <i>Multinational Business Finance</i> , 14 th Ed., Pearson India Education, 2018.
2.	Levi, M.D., <i>International Finance</i> , 4 th Ed., Routledge Publication, 2009.
3.	Jain, P K., Peyrard, J. and Yadav, S.S., <i>International Financial Management</i> , Macmillan India, 1999.
4.	Desai, M.A., <i>International Finance- A Casebook</i> , Wiley India, 2007.
5.	Shapiro, Alan C., <i>Multinational Financial Management</i> , 7 th Ed., John Wiley and Sons Inc., 2003.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12NHS812	Semester Even (specify Odd/Even)	Semester 8 Session 2018 -2019 Month from Jan 2018 to July 2018
Course Name	Social and Legal Issues		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr Swati Sharma
	Teacher(s) (Alphabetically)	Dr Swati Sharma

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C402-10.1	Demonstrate an understanding of social science and business law to individuals and businesses.	Understanding Level (C2)
C402-10.2	Critically evaluate how information technology, contractual agreements, rights and obligations affects business and society	Evaluating Level (C5)
C402-10.3	Analyse legal implications of societal laws.	Analyzing Level (C4)
C402-10.4	Develop acceptable attitudes with respect to ethical cultural and social issues related to technology, system, information	Applying Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction to Social and Legal Issues	1
2.	Social Structure and Impact	Social Structure Social Impact on Information system and Technology Corporate Social Responsibility	6
3.	Ethics	Business Ethics & Values, Professional Conduct, Code of ethics for an Engineer, Ethics in Bio-Tech.	6
4.	Societal Laws	Introduction to Constitution, Right to information, Consumer Protection Act,	8
5.	Business Laws	Contract Act, Company Act, Negotiable Instruments Acts	8
6.	Intellectual Property & Cyberspace	Intellectual Property Issues:(What is Intellectual Property , Copyright Law, Trademark and Law of Patent	5
7.	Cyber Crime, Laws and IT Act	Computer Crimes(Fraud and Embezzlement, Sabotage & Information Theft, Intruders, Hacking&	8

		Cracking), Computer Crime Laws, Digital Forgery, Cyber Terrorism, Wiretapping, IT Act	
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignment and Oral 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.	Albuquerque D, Business Ethics Principles and Practices, 1 st edition, Oxford University Press,2010
2.	Baase,S, A Gift Of Fire Social, Legal, & Ethical Issues in Computing and Internet,2 nd edition Prentice Hall, US, 2006
3.	Diwan,P. & Kapoor,S, Cyber And E-Commerce Laws with information Technology Act, & Rules,2 nd edition, Prakesh Publication House,Jaipur , 2000
4	Gogna,P.P.S., A Text book of Business Law, 1 st ed, , S Chand & Company LTD.2000
5	Ghosh,B., Ethics in Management and Indian Ethos, 2 nd Edition, Vikas Publishing house,New Delhi, 2006

Detailed Syllabus

Course Code	15B1NHS832	Semester Even (specify Odd/Even)	Semester VIII Session 2018 -2019 Month from Jan - July
Course Name	International Studies		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Monica Chaudhary
	Teacher(s) (Alphabetically)	Dr. Monica Chaudhary

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C402-8.1	Interpret the major security issues in the Eurasia Region.	Understanding (C2)
C402-8.2	Compare the developed and developing economies along with other major international economic concepts and institutions.	Applying (C3)
C402-8.3	Analyze the major historic, economic, political, socio-cultural and technological issues from a global perspective.	Analyzing (C4)
C402-8.4	Discuss India's relations with USA, Russia and China.	Understanding (C2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction	1
2.	Historical Aspects	<ul style="list-style-type: none"> Feudalism, Socialism, communism, Capitalism, World War I World War II: Allies & the world Current Power Centers 	12
3.	Global Markets	<ul style="list-style-type: none"> The politics of trade Liberal market economies—The United States The rise of emerging markets—reaching where? WTO, Trading blocks, International treaties 	6
4.	Social-cultural	<ul style="list-style-type: none"> Global Population, Migration Human Rights – Amnesty, UNO, Geneva Convention Environmental and Ethical Issues Communication & Culture 	4
5.	Political	<ul style="list-style-type: none"> International Relations: Terrorism, United Nations Current Issues in International Politics: China & Sea Water, Israel – Palestine, Ukraine, European Union 	8

		<ul style="list-style-type: none"> Warfare in the Modern World 	
6.	Emerging Technologies	<ul style="list-style-type: none"> Top 10 emerging technologies by World Economic Forum 2018 Emerging health technologies by WHO Emerging technologies: options for the future 	5
7.	India	<ul style="list-style-type: none"> India's Relation with China, US, Russia Great Indians Diaspora and their contributions India: Futuristic View 	8

Total number of Lectures			42
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Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz 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.	M. Friedman, Chapters 1–3, 6, 10, and 12–13 in <i>Capitalism and Freedom: 40th Anniversary Edition</i> . University of Chicago Press, 2002.
2.	T. Oatley, International Political Economy (4th Edition) (Paperback). New York: Longman, 2010.
3.	J. Keegan, A History of Warfare , Vintage Books, New York, 1994.
4.	A. Sen, Development as Freedom, Anchor Books, New York, 1999.
5.	J.B. Stewart, "A Reporter at Large: Eight Days." <i>The New Yorker</i> , September 21, 2009.
6.	Top 5 Futuristic Technologies That Exist Today! https://www.youtube.com/watch?v=VUncbfJaf8Q
7.	A. Rawi, L. Alfaro, et al. "Bombardier: Canada vs. Brazil at The WTO." Harvard Business School Case. Harvard Business School Publishing. Case: 9-703-022, February 20, 2003.
8.	http://www.forbes.com/sites/carolkinseygoman/2011/11/28/how-culture-controls-communication/