Value Added Courses

1. **20B16CS323 Problem Solving using C and C++ [1-0-2], 2 credits**

    1. **Brief Description:** Review and practice problems on Functions in C/C++ (1 hr Theory, 2 hrs Lab), Practice problems on Arrays and Pointers and Indirections (1 hrs Theory, 2 hrs Lab), Programming using Dynamic Memory Allocation Model (1 hrs Theory, 2 hrs Lab), Applications with Disk Files and other I/O (1 hrs Theory, 2 hrs Lab), Generic Programming with Templates (2 hrs Theory, 4 hrs Lab), Practice problems on Exception Handing and Assertions(1 hrs Theory, 2 hrs Lab), Working with Standard Template Library (2 hrs Theory, 4 hrs Lab), String Localization and Regular Expression (1 hr Theory, 2 hrs Lab), Practice problems on Data Management using Sorts, Lists, and Indexes(1 hr Theory, 2 hrs Lab), Secure Coding practices in C/C++ (1 hr Theory, 2 hrs Lab), Problems on Concurrency in Programming (1 hr Theory, 2 hrs Lab)

(Total - 14 hrs Theory, 28 hrs Lab)

Detailed Syllabus

Course Code	**20B16CS323**	**Semester** Even **(specify Odd/Even)**	**Semester** VI **Session** 2019 -2020 Month from January to June
Course Name	Problem Solving using C and C++		
Credits	2	**Contact Hours**	[1- 0 - 2]

Faculty (Names)	**Coordinator(s)**	Dr. Dharmveer Singh Rajpoot
	Teacher(s) (Alphabetically)	Dr. Dharmveer Singh Rajpoot

COURSE OUTCOMES [NBA Code: C305-9] At the completion of the course, Students will be able to		**COGNITIVE LEVELS**
C305-9.1	Apply and use library functions, pointer arithmetic, arrays, and regular expressions and secure coding practices in programs.	Apply Level (C3)
C305-9.2	Use critical thinking skills and creativity to choose the appropriate containers, iterators and algorithms for a given problem.	Apply Level (C3)
C305-9.3	Demonstrate the use of concurrency principles, input and output streams and defensive techniques in programs.	Apply Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Review and practice problems on Functions in C/ C++	Functions, Alt function syntax, Function return type deduction, static, const and inline functions, default parameters, overloaded functions- operator and members, friends, overriding functions.	**1**
2.	Practice problems on Arrays and Pointers and Indirections	Smart pointers, pointers and dynamic memory allocation, type inference, array and pointers and their arithmetic and indirections	**2**
3.	Secure Coding practices in C/C++	Common String, Integer and dynamic memory allocation Errors, Integer and dynamic memory allocation and String vulnerabilities their mitigation strategies.	**2**
4.	String Localization and Regular Expression	Localization and working with regular expression, Programming with Regex library	**1**
5.	Practice problems	Errors and Exceptions, Exception Mechanisms,	**1**

	on Exception Handing and Assertions	Exceptions and Polymorphism, Stack unwinding and Cleanup, Common error handling issues	
6.	Applications with Disk Files and other I/O	Using streams, Input and Output with Streams, String Streams, File Streams and Bidirectional I/O	**1**
7.	Generic Programming with Templates	Class templates, Function templates, variable templates, Template parameters, Specialization of templates, template recursion, variadic templates, Meta-programming	**2**
8.	Working with Standard Template Library	Understanding and working with containers, container adapters and iterators, Lambda expressions, Function objects, STL algorithms, Customize and extend STL	**2**
9.	Programming using Dynamic Memory Allocation Model	Working with dynamic memory, array-pointer duality, low level memory operations, smart pointers and common memory pitfalls	**1**
10.	Problems on Concurrency in Programming	Introduction, Threads, Atomic operations library, Mutual Exclusion, Conditional variables	**1**
			14

Evaluation Criteria

Components	**Maximum Marks**
Mid Tern Evaluation	30
End Semester Examination	40
TA	30
Total	**100**

Recommended Reading material:

1.	C++: The Complete Reference, 4th Edition H. Schildt Tata MacGrawhill
2.	Object-Oriented Programming in C++, Fourth Edition Robert Lafore
3.	C++ How to Program Dietel and Dietel
4.	Advanced C Peter D. Hipson.
5.	Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
6.	Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
7.	Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education
8.	Secure C and C++ Robert C. Seacord

Detailed Syllabus

Course Code	20B16CS324	Semester Even (specify Odd/Even)	Semester VI Session 2019 -2020 Month from Jan 2020 to Jun 2020
Course Name	Non-linear Data Structures & problem solving		
Credits	2	Contact Hours	1- 0 - 2

Faculty (Names)	Coordinator(s)	Dr. Mohit Kumar
	Teacher(s) (Alphabetically)	Dr. Amarjeet Prajapati, Ankita Wadhwa, Dr. Mohit Kumar, Dr. Pawan Singh Mehra, Vikas Hassija

COURSE OUTCOMES At the completion of the course, Students will be able to		COGNITIVE LEVELS
C305-10.1	Demonstrate operations on different data structures.	Understand Level (C2)
C305-10.2	Use critical thinking skills and creativity to choose the appropriate data structure and solve the given problem.	Apply Level (C3)
C305-10.3	Identify the correctness and efficiency of the solution by constructing different test cases.	Apply Level (C3)
C305-10.4	Develop solutions to real world problems by incorporating the knowledge of data structures	Create Level (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Review of Problem Solving and Data Structures	Concepts of Problem Solving, Performance metrics for Algorithm Analysis, Why study Data structures and Abstract Data Types. Practice problems on Sparse Matrix	1
2.	Practice problems on advanced list structures	Multi-list, skip list, XOR linked list, self organizing list, unrolled linked list	2
3.	Practice problems on point and range queries using tree structures	Suffix array and suffix tree, Trie and persistent trie, Segment tree and persistent segment tree, Interval tree, K dimensional tree, Binary indexed tree, Splay tree, Treap (randomized BST), Order statistics tree	4
4.	Practice problems on optimization problems using tree	Tournament tree, Decision tree, Cartesian tree	2

	structures.		
5.	Practice problems on heaps and sets	Sparse set, Disjoint set, Leftist heap, K-ary heap	**2**
6.	Problem solving using graphs	Social graphs, Transportation system graphs, Resource allocation graphs	**3**
		Total number of Lectures	**14**

Evaluation Criteria

Components	**Maximum Marks**
Mid Tern Evaluation	30
End Semester Examination	40
TA	30 (Attendance – 10, Mini Project – 20)
Total	**100**

Recommended Reading material:

Text Books

1.	Data structures and Algorithm Analysis in C++, Mark Allen Weiss, Pearson Education. Ltd., Fourth Edition.
2.	Handbook of Data Structures and Applications, 2nd Edition by Sartaj Sahni, Dinesh P. Mehta, CRC Press

References

3.	Data structures and Algorithms in C++, Michael T.Goodrich, R.Tamassia and .Mount, Wiley student edition, John Wiley and Sons.
4.	Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd.
5.	Data structures and algorithms in C++, 3rd Edition, Adam Drozdek, Thomson
6.	Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
7.	Problem solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education

Detailed Syllabus
Lecture-wise Breakup

Course Code	**20B16CS326**	**Semester EVEN**	**Semester** VI **Session** 2019 -2020 **Month from JAN-JUN**
Course Name	Front End Programming		
Credits		**Contact Hours**	1-0-2 (3 hrs per week)

Faculty (Names)	**Coordinator(s)**	Dr. Megha Rathi, Dr. Shailesh Kumar
	Teacher(s) (Alphabetically)	Dr. Megha Rathi, Mr. Prashant Kaushik , Ms. Sonal, Dr. Suma Dawn, Dr. Raju Pal, Mr. Rupesh, Dr. Shailesh Kumar

COURSE OUTCOMES		**COGNITIVE LEVELS**
C305-11.1	Demonstrate new technologies by applying foundation paradigms	Understanding [Level 2]
C305-11.2	Build strong foundations for basic front end tools & technologies thereby making them understand the application development lifecycle.	Apply [Level 3]
C305-11.3	Develop elegant and responsive Front-end by leveraging latest technologies	Apply [Level 3]
C305-11.4	Explain activity creation and Android UI designing	Understanding [Level 2]
C305-11.5	Develop an integrated mobile application to solve any complex real time problem	Create [Level 6]

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Object Oriented Programming Concepts	Objects, Classes, Abstraction, Encapsulation, Inheritance, Polymorphism	1
2.	Introduction to basic front end techniques	HTML 5, CSS 3, Javascript, jquery, bootstrap	3
3.	Java Fundamentals	Decision Making, Loop Control, Operators, Array, String, Overloading, Inheritance, Encapsulation, Polymorphism, Abstraction	2
4.	Advanced Front End Programming Concepts	Storing and retrieving data, Python Programming Concepts, Python for developing Android Application.	2
5.	Designing Android Application	Android development lifecycle, Learning UI and layout, controller, component, Directives, Services & views.	3
6.	Android with Database	Data base Application Development	2
7.	Privacy & Security Issues	Security Issues with Android Platform	1
		Total number of Lectures	**14**

Evaluation Criteria

Components	**Maximum Marks**
Mid Semester Examination	30
End Semester Examination	40
TA	30 (**Attendance-07, Class Test/ Quizze-07, Internal assessment-05, Assignments-06, LAB Record-05**)
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)

Reference Books:

1.	Schildt, H. (2014). Java: The Complete Reference. McGraw-Hill Education Group.
2.	Mughal, K. A., & Rasmussen, R. W. (2016). A Programmer's Guide to Java SE 8 Oracle Certified Associate (OCA). Addison-Wesley Professional.
3.	Gaddis, T., Bhattacharjee, A. K., & Mukherjee, S. (2015). Starting out with Java: early objects. Pearson.

Text Books:

4.	Duckett, J. (2014). Web Design with HTML, CSS, JavaScript and jQuery Set. Wiley Publishing.
5.	Shenoy, A., & Sossou, U. (2014). Learning Bootstrap. Packt Publishing Ltd.
6.	Lee, W. M. (2012). Beginning android for application Development. John Wiley & Sons.
7.	Hardy, B., & Phillips, B. (2013). Android Programming: The Big Nerd Ranch Guide. Addison-Wesley Professional.

Detailed Syllabus

Lecture-wise Breakup

Subject Code	18B12MA612	**Semester** Even	**Semester** VI **Session** 2019-2020 **Month from** Jan 2020 to June 2020
Subject Name	Applied Mathematical Methods		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names) **Coordinator(s)** Dr. Puneet Rana

Teacher(s) (Alphabetically) Dr. Puneet Rana, Dr. Neha Ahlawat

COURSE OUTCOMES

After pursuing the above mentioned course, the students will be able to:

		COGNITIVE LEVELS
C302-4.1	explain the functional and its variations required to optimize the physical problem.	Understanding Level (C2)
C302-4.2	apply different forms of Euler–Lagrange equation on the various variational problems with fixed boundaries.	Applying Level (C3)
C302-4.3	explain different types of integral equations including their conversions from IVP and BVP.	Understanding Level (C2)
C302-4.4	solve Volterra and Fredholm integral equations using various analytical methods.	Applying Level (C3)
C302-4.5	explain various numerical methods along with their stability analysis.	Understanding Level (C2)
C302-4.6	apply different numerical methods for solving differential equations.	Applying Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Functional and its Variation	Introduction, problem of brachistochrone, problem of geodesics, isoperimetric problem, variation and its properties, comparison between the notion of extrema of a function and a functional.	8
2.	Variational Problems with Fixed Boundaries	Euler's equation, the fundamental lemma of the calculus of variations, examples, functionals in the form of integrals, special cases contaning only some of the variables, examples, functionals involving more than one dependent variables and their first derivatives, the system of Euler's equations,	5
3.	Variational Problems (continued)	Functionals depending on the higher derivatives of the dependent variables, Euler- Poisson equation, functionals containing several independent variables, Ostrogradsky equation, Variational problems in parametric form, applications to differential equations.	5
4.	Fredholm and Volterra Integral Equations	Introduction and basic examples, Classification, Conversion of Volterra Equation to ODE, Conversion of IVP and BVP to integral equation, decomposition, direct computation, successive	8

		approximation, successive substitution methods for Fredholm and Volterra integral equations.	
5.	Numerical Methods I	Classification of PDEs, Finite difference approximations to partial derivatives. Solution of one dimensional heat conduction equation by Explicit and Implicit schemes (Schmidt and Crank Nicolson methods), stability and convergence criteria.	8
6.	Numerical Methods II	Laplace equation using standard five point formula and diagonal five point formula, Poisson equation, Iterative methods for solving the linear systems. Hyperbolic equation, explicit / implicit schemes, method of characteristics. Solution of wave equation. Solution of I order Hyperbolic equation. Von Neumann stability.	8
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. **Hilderbrand, F.B.,** Methods of Applied Mathematics, 2ndEdition, Prentice Hall, 1969.
2. **Gupta, A.S.,** Calculus of Variations with Applications, Prentice Hall of India, 2003.
3. **Gelfand, I.M.,** Fomin, S.V. Calculus of Variations, Prentice Hall, 1963.
4. **Elsgolts, L.,** Differential Equations and the Calculus of Variations, Mir Publishers, Moscow, 1973.
5. **Petrovsky, I.G.,** Lectures on the Theory of Integral Equations, Mir Publishers, Moscow, 1971.
6. **Smith, G. D.**., Numerical solution of partial differential equations: finite difference methods. Oxford University Press, 1985

Detailed Syllabus

Lecture-wise Breakup

Course Code	**18B13HS612**	**Semester Even (specify Odd/Even)**	**Semester VI Session 2019 -2020 Month from Jan-June**
Course Name	**Effective tools for Career Management and Development**		
Credits	**2**	**Contact Hours**	**1-0-2**

Faculty (Names)	**Coordinator(s)**	Dr Kanupriya Misra Bakhru
	Teacher(s) (Alphabetically)	Dr Kanupriya Misra Bakhru

COURSE OUTCOMES		**COGNITIVE LEVELS**
C305-2.1	Assess ones personal priorities, skills, interests, strengths, and values using a variety of contemporary assessment tools and reflection activities.	Evaluate Level (C 5)
C305-2.2	Apply knowledge of all the Career Stages in making informed career decisions.	Apply Level (C 3)
C305-2.3	Develop and maximize ones potential for achieving the desired career option.	Create Level (C6)
C305-2.4	Analyze the processes involved in securing and managing career by employees of different organizations.	Analyze Level (C 4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures and Tutorial for the module**
1.	Introduction to Career Life cycle	Introduction to Career Life Cycle of an individual-Role and importance of human resource in an organization, Evolution of Strategic Human Resource Management.	3
2.	Self Branding and strategies to do well in Recruitment and Selection	Introduction to complete cycle of Recruitment and Selection, Introduction to various tools used for assessment and testing candidates-aptitude test, personality test, graphology test etc. Introduction to Workforce planning, Importance and practical application of Job Analysis, Job Description and Job Specification.	3
3.	Personnel Development and your career	Introduction to various learning and development, Introduction to various techniques used for learning and development, measure of training effectiveness, Training techniques / delivery, Kirkpatrick Model, Introduction to Succession Planning, Transactional Analysis.	3
4.	Human Resource Evaluation and Compensation	Performance Management: Measurement Approach, Developing Job Descriptions, Key Result Areas, Key Performance Indicators, Assessment Centre, 360 Degree feedback, Balanced Scorecard, Effective Performance Metrics. Compensation Strategy and trends- Compensation package, ESOPs, Performance based pay, Recognition, Retrial benefits, Reward management, Team rewards.	3
5.	Human Resource	Human Resources Audit, The Human Resource Information	2

	Control and special topics	System (HRIS), Human Resources Accounting, Competency Management, Human Resource Management Practices in India, Internationalization of Human Resource Management Commonly Used Jargons.	
		Total number of Lectures	**14**

Module No.	Title of the Module	List of Experiments/Activities	CO
1.	Introduction to Career Life cycle	Practical Sessions on Resume and Cover Letter Writing	CO1, CO2
2.	Self Branding and strategies to do well in Recruitment and Selection	Practical Sessions on Job Description, Job Specification and Self-Branding, Psychometric self-reflection tools on Personal Orientation and behavior-Personal Efficacy, Personal effectiveness, Locus of Control, Emotional Intelligence and Assertiveness.	CO3, CO4
3.	Personnel Development and your career	Practical Sessions on Johari Window-Knowing Thyself, Transaction Analysis-Parent, Child, Adult Ego State for effective interpersonal communication.	CO1, CO3
4.	Human Resource Evaluation and Compensation	Practical Sessions on HR Interview and Mock HR Interview	CO2, CO4
5.	Human Resource Control and special topics	Practical Sessions on Group Discussions and Mock Group Discussions	CO2, CO4

Evaluation Criteria	
Components	**Maximum Marks**
Mid Term	30 (Project)
End Term	40 (Written)
TA	30 (Class Mock Activities, Assignment, 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.	Mathur, Mastering interviews and group discussions, CBS Publishers& Distributors Pvt. Ltd., New Delhi, 2018
2.	Mitra, Personality Development and soft skills, Oxford University Press, New Delhi, 2011
3.	Pareek and Purohit, Training Instruments in HRD and OD, Sage Publications India Pvt. Ltd., 2018
4.	Pande and Basak, Human Resource Management- Text and Cases, Pearson, 2012
5.	Dessler and Varkkey, Human Resource Management, Pearson, 2011

Detailed Syllabus
Lecture-wise Breakup

Subject Code	**(19B12CS311)**	**Semester (Even)**	**Semester** Even **Session** 2019 - 20 **Month from** January **to** May
Subject Name	**IoT and IoT Security**		
Credits	**04**	**Contact Hours**	**3 Lectures + 1 Tutorial**

Faculty (Names)	**Coordinator(s)**	Dr. Vivek Kumar Singh (J-62), Dr. Neeraj Jain (J-128)
	Teacher(s) (Alphabetically)	1. Dr. Neeraj Jain, Dr. Vivek Kumar Singh

COURSE OUTCOMES: At the completion of this course, students will be able to

SL NO.	DESCRIPTION	COGNITIVE LEVEL (BLOOMS TAXONOMY)
C330-4.1	Define basic terminologies related to IoT and IoT security.	Remember Level (Level 1)
C330-4.2	Explain IoT reference model, different architectural views and security aspects moving from machine to machine (M2M) technology to Internet of Things.	Understand Level (Level 2)
C330-4.3	Identify infeasibility of hardware and software design constraints due to specific security implementations in real scenarios.	Apply Level (Level 3)
C330-4.4	Analyze the security related challenges at various layers and security mechanisms adapted to address them.	Analyze Level (Level 4)
C330-4.5	Evaluate the performance of various IoT security protocols implemented at different layers.	Evaluate Level (Level 5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	**INTRODUCTION & REFERENCE ARCHITECTURE**	Introduction of Wireless communication, Wireless Sensor Network and IoT IoT-An Architectural Overview–Building architecture, Main design principles and needed capabilities. IoT Architecture-State of the Art – Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference	10

		Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	
2.	**IoT Resource Layer**	M2M and IoT Technology Fundamentals-IoT Devices (sensors and actuators) and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management. Real-World Design Constraints and Technical Design constraints -hardware is popular again, Data representation and visualization, Interaction and remote control.	08
3.	**ANALYSIS OF VARIOUS SECURITY THREATS AT EACH LAYER AND CORRESPONDING SECURITY PROBLEMS**	PHY/MAC layer-Physical capture, Cloning, Impersonation, Denial of service (DoS), Network Layer-Routing, Encryption, Node subversion, Traffic analysis etc, Middleware- Session attack, and data attacks.	03
4.	**IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS AND THEIR SECURITY MECHANISMS**	PHY/MAC Layer (IEEE 802.15), Wireless HART, Z-Wave, Bluetooth Low Energy, Zigbee Smart Energy, Network Layer-IPv4, IPv6, 6LoWPAN, RPL, CORPL, RFID, NFC.	10
5.	**TRANSPORT & SESSION LAYER PROTOCOLS AND THEIR SECURITY MECHANISMS**	Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)- Session Layer- CoAP, XMPP, AMQP, MQTT.	07
6.	**SERVICE LAYER PROTOCOLS AND THEIR SECURITY MECHANISMS**	Service Layer -oneM2M, OMA Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, RPL, TLS, DTLS.	04
		Total number of Lectures	**42**

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

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12CS312	**Semester Even (specify Odd/Even)**	**Semester** VII **Session** 2019 -2020 **Month: from January 2020**
Course Name	Blockchain Technology		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Mukta Goyal/ Vikas Hassija
	Teacher(s) (Alphabetically)	Mukta Goyal(J128) Vikas Hassija(J62)

COURSE OUTCOMES		**COGNITIVE LEVELS**
C331-1.1	Define all the basic terminologies related to blockchain, bitcoin, decentralized applications and smart contracts.	Remember Level (Level 1)
C331-1.2	Understand the pillar security featured in decentralized networks like cryptography, digital signatures, Proof of work and consensus algorithms.	Understand Level (Level 2)
C331-1.3	Identify the feasibility of applying blockchain security features in real world scenarios using different consensus algorithms.	Apply Level (Level 3)
C331-1.4	Analyze various consensus algorithms like PoW, PoS, PoB, Raft consensus, Paxos consensus, BFT etc.	Analyze Level (Level 4)
C331-1.5	Evaluation of blockchain based consensus algorithms namely Byzantine fault tolerance, proof of work etc.	Evaluate Level (Level 5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction of Blockchain	Introduction of blockchain, explaination of structure and operational aspects of Bitcoin blockchain, Comparison of different types of blockchains.	8
2.	Ethereum Blockchain	Discuss the innovation of the Ethereum blockchain, review its protocol, and explore the payment model for code execution.	6
3.	Algorithms & Techniques	Discussion of concept of asymmetric key encryption, defines the concept of hashing, and explain techniques that use algorithms to manage the integrity of transactions and blocks in blockchain.	6
4.	Consensus in Blockchain	Basics, RAFT ,Paxos,, Byzantine fault Tolerance, PBFT, PoW, PoS	8
5.	Smart Contract Basics	Introduction of smart contract and its critical role in transforming blockchain technology from enabling decentralized systems. Exploration of structure and basic concepts of a smart contract through examples, and illustrate Remix (remix.ethereum.org) web IDE for deploying and interacting with a smart contract.	6
6.	Decentralized Applications	Explore the notion of the blockchain server as the foundation for a Decentralized Application. Demonstration	4

	(Dapps)	of installation of blockchain server and establish a peer-to-peer network of nodes. It is a common practice to develop and test a Dapp on a local test network before deploying it on a public network.	
7.	Applications, Current challenges and solutions	Blockchain applications in real world scenarios such as Supply Chain Management and Government . Exploration of some important challenges and solutions that are continuously innovating Blockchain.	4
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance(7) , Assignment(7), PBLmode(7) and Test+Quiz(7))
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.	Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World
2.	Blockchain: Blueprint for a New Economy
3.	The Truth Machine: The Blockchain and the Future of Everything
4.	IEEE Transactions on vehicular technology
5	ACM Transactions on Blockchain
6.	Blockchain for dummies by Tiana Laurence (book)

Lecture-wise Breakup

Course Code	19B12HS611	**Semester : EVEN (specify Odd/Even)**	**Semester** : VI **Session** 2019 -2020 **Month from:** January- June
Course Name	Econometric Analysis		
Credits	2-1-0	**Contact Hours**	03

Faculty (Names)	**Coordinator(s)**	Manas Ranjan Behera
	Teacher(s) (Alphabetically)	Manas Ranjan Behera

COURSE OUTCOMES		**COGNITIVE LEVELS**
C304-2.1	*Demonstrate* the key concepts from basic statistics to understand the properties of a set of data.	Understanding Level - C2
C304-2.2	*Apply* Ordinary Least Square method to undertake econometric studies.	Apply Level - C3
C304-2.3	*Examine* whether the residuals from an OLS regression are well-behaved.	Analyze Level - C4
C304-2.4	*Evaluate* different model selection criteria for forecasting.	Evaluation Level - C5
C304-2.5	*Create* models for prediction from a given set of data.	Creation Level - C6

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Statistical Inference	Point and interval estimation; ;The Z distribution ;The Null and Alternate hypotheses ;The chi-square distribution; The F distribution; The t distribution	3

2.	Regression Analysis	Two variable regression model; The concept of the PRF; Classical assumptions of regression; Derivation of the OLS estimators and their variance; Properties of OLS estimators under classical assumptions; Gauss-Markov Theorem; Tests of Hypothesis, confidence intervals for OLS estimators; Measures of goodness of fit: R square and its limitations; Adjusted R square and its limitations	7
3.	Econometric Model Specification	Identification: Structural and reduced form; Omitted Variables and Bias; Misspecification and Ramsay RESET; Specification test; Endogeneity and Bias	5
4.	Failure of Classical Assumptions	Multi-collinearity and its implications; Auto-correlation: Consequences and Durbin-Watson test ;Heteroskedasticity: Consequences and the Goldfeld -Quandt test	2
5.	Forecasting	Forecasting with a)moving averages b) linear trend c) exponential trend CAGR; Forecasting with linear regression; Classical time series decomposition; Measures of forecast performance: Mean square error and root mean square error; Limitations of econometric forecasts	5
6.	Time Series Analysis	Univariate Time Series Models: Lag Operator, ARMA , ARIMA models, Autoregressive Distributed Lag Relartionship	3
7.	Linear Programming	Linear programming; Dual of a linear programming problem; Simplex method Transportation	3
		Total number of Lectures	**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35

TA	25 (Quiz+ Assignment+Viva -Voce)
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.	Gujarati, D.N. (2002), Basic Econometric (4th ed.), New York: McGraw Hill.
2.	Greene, W.H. (2003), Econometric Analysis, New Jersey: Prentice Hall.
3.	Madala, G.S. (1992), Introduction to Econometrics (2nd ed.), New York: Macmillan.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12HS612	Semester : Even	**Semester** VI **Session** 2019 -2020 **Month from** Jan 2020 to June 2020
Course Name	Social Media and Society		
Credits	3	**Contact Hours**	2-1-0

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

COURSE OUTCOMES		**COGNITIVE LEVELS**
C304-1.1	Infer the implications of digital change, and the concept of social media and e-marketing in the context of the changing marketing landscape	Apply Level(C3)
C304-1.2	Elaborate the implications of cyber branding and digitization on online marketing mix decisions	Create Level (C6)
C304-1.3	Develop specific models related to social media and social media analytics	Create Level (C6)
C304-1.4	Evaluate concepts related to Search Engine Marketing, Customer Centric Web Business models and Web Chain Analysis	Evaluate Level(C5)
C304-1.5	Illustrate the new age marketing practices	Understand Level (C2)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction , Individuals Online and Rules for engagement for social media	What is social media marketing, the importance of social media for influencing target audience, Patterns of internet usage, Internet user demographics, The Behavioural Internet, E-Marketing, The Virtual world, the changing Marketing Landscape, E -Marketing-Strengths and Applications, Online Marketing Domains, Digital Marketing Optimization, The Need for Digital Engagement	4
2.	The Online Marketing Mix	The Online Marketing Mix, Consumer Segmentation, Consumer Traits, Consumers and Online Shopping Issues, E-Product, E-Place, E-Price, E-Promotion, Website Characteristics affecting online purchase decision.	3
3.	The Online Consumer and Social Media	The Digital Ecosystem, Online Consumer Behavior, Cultural Implications of key web characteristics, Models of website visits, Web 2.0 and Marketing, The collaborative web, Network evolution, Network science, Marketing with networks, Metcalfe's law, Netnography, Social Media Model by McKinsey, Social Media Tools-Blogs, Wikis, Online Communities, Facebook, Twitter, You Tube , Flickr, Microblogging.	4
4.	Online Branding and Traffic	Cyber branding, Online brand presence and	4

	Building	enhancement, The Digital Brand Ecosystem, Brand Experience, Brand Customer Centricity, Brands and Emotions, The Diamond Water paradox, Internet Traffic Plan, Search Marketing Methods, Internet Cookies and Traffic Building, Traffic Volume and quality, Traffic Building Goals, Search Engine Marketing, Keyword Advertising, Keyword value, Internet Marketing Metrics, Websites and Internet Marketing.	
5.	Web Business Models ,Social Media Strategy ,Social Media Marketing Plan	The value of a Customer Contact, Customer Centric Business Management, Web Chain of Events, Customer Value Analysis and the Internet, Business Models, Revenue Benefits, Value Uncertainty, Purchase Importance, Define a social media plan, explain the social Media marketing planning cycle, list the 8C's of strategy development.	4
6.	Market Influence analytics in a Digital Ecosystem	Engagement Marketing through Content Management, Online Campaign Management, Consumer Segmentation, Targeting, and Positioning using Online Tools, Market Influence Analytics in a Digital Ecosystem, The Digital Ecosystem, Knowledge as a value proposition, CGM and Consumer behavior, The value of the power of influence, Amplifying Social Media Campaigns.	4
7.	The Contemporary Digital Revolution and its impact on society	Online Communities and Co-creation, The fundamentals of online community management strategies, The World of Facebook, The Future of Social media Marketing—Gamification and Apps, Game based marketing The world of Apps, Apps and the Indian Diaspora	3
8.	Integrating Mobile into Social Media Marketing	Types of Mobile Marketing, Progression of the mobile as a Marketing channel, some Indian mobile marketing campaigns, Impact of Social Media on government, the economy, development, and education	2
Total number of Lectures			**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment , Class Test 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.	Digital Marketing ,Seema Gupta,First Edition ,Mc Graw Hill Education (India) Private Limited ,2018
2.	Social Media Marketing A Strategic Approach, Melissa Barker,Donald Barker,Second Edition Cengage Learning ,2017.
3.	Digital Marketing, Vandana Ahuja, First Edition, Oxford University Press, 2015
4.	Social Media Marketing, Liana "Li" Evans,First Edition , Pearson, 2011.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B13HS611	**Semester**: Even	**Semester: VI Session**: 2019 -2020 **Month From** Jan 2020 to June 2020
Course Name	Morality of Everyday Living and Moral Decision Making		
Credits	2	**Contact Hours**	1-0-2

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

COURSE OUTCOMES		**COGNITIVE LEVELS**
C305-3.1	Apply and Analyze morality in all facets of personal and professional life	Analyze (C4)
C305-3.2	Discover ways to address moral dilemmas by deliberating on the pros and cons to find the best possible outcome	Analyze (C4)
C305-3.3	Justify and Formulate morally correct decisions and stand by them	Evaluate (C5)
C305-3.4	Adapt and develop a character respected by peers and superior alike	Create (C6)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	The Big Questions: Origins of Morality	What is **morality? Universal aspects** of morality, **Evolution** of Morality, **Development** of Morality**, Morality Theories, Everyday Dilemmas and Decision Making**	4
2.	Compassion/ Empathy	**Reason/Emotion**; Where does concern for others come from? **Empathy**—and is more empathy necessarily a good thing? And what can we learn from the study of those who seemingly lack normal moral feelings, such as violent psychopaths?	3
3.	Moral Differences	How does **culture influence our moral thought** and moral action? What role does **religion** play? Why are some of us conservative and others liberal, and how do political differences influence our sense of right and wrong?	2
4.	Moral Circles: Family, Friends, and Strangers	**Moral feelings**: Family, Friends, and allies. Reciprocal Altruism, The Morality of Group Preference, Morality of racial and ethnic bias. **:** Stereotypes, How Do We Treat Strangers	2

5.	Moral Decision Making	Contemporary Everyday Ethical Issues	3
		Total number of Lectures	**14**

Module No.	**Title of the Module**	**List of Experiments/Activities**	**CO**
1.	The Big Questions: Origins of Morality	Experiential Sharing: Morality & its significance to them Case Study: No such thing as free drink.	C305-3.1
2.	The Big Questions: Universal Aspects of Morality	Universal Aspects of Morality: Big Questions: Why be good? Universal Aspects of Morality: Big Questions: Is it permissible to lie? Universal Aspects of Morality: Big Questions: Is it good to gossip??	C305-3.1
3.	The Big Questions: Everyday Dilemmas and Decision Making	UPSC Case Study Ethical Dilemma of a Marketing Manager	C305-3.2 C305-3.3
4.	Evolution & Development of Morality	Ethical Analysis: A young Professor's Career	C305-3.1 C305-3.2 C305-3.3
5.	Compassion/ Empathy: Reason v/s Emotion	Discussion: Can we do better than the Golden Rule Discussion: Obligation to Others/ Is jealousy & Resentment always bad?	C305-3.1 C305-3.4
6	Compassion/ Empathy	EI Assessment Discussion on Reading: What's the matter with Empathy?	C305-3.1 C305-3.4
7	Moral Differences	Case Study: Difference in Morality Experiential Exercise: Country/ Org/ Home Moral Culture	C305-3.4
8	Moral Circles: Family, Friends, and Strangers	Experiential Sharing: Moral Circles and their influence on us Stereotyping in Morality	C305-3.4
9	Moral Decision Making	Contemporary Real World Scenario: Analyzing it through CATWOE	C305-3.1 C305-3.2 C305-3.3 C305-3.4

Evaluation Criteria

Components	Maximum Marks
Mid Term	30 (Project Presentation)
End Semester Examination	40 (End Term Written Paper)
TA	30 (Case Studies, 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.	**Martin, Clancy,** "Moral Decision Making: How to approach everyday Ethics", The Great Courses, USA, 2014
2.	**Shukla T., Yadav A.& Chauhan G.S**., "Human Values & Professional Ethics", Cengage Learning India Pvt Ltd, 2018
3.	**Khanka S.S**., "Business Ethics & Corporate Governance (Principles & Practices)", S. Chand, 2014
4.	**Mruthyunjaya H.C**., "Business Ethics & Value systems", PHI Learning Pvt Ltd, 2013
5.	**Jennings, Marianne M.,** " Cases in Business Ethics", Cengage Learning India Ltd, 2013

Detailed Syllabus

Course Code	20B12HS311	**Semester** Even **(specify Odd/Even)**	**Semester Session** 2020 **Month from** Jan - July
Course Name	Global Politics		
Credits	3(2-1-0)	**Contact Hours**	**3**

Faculty (Names)	**Coordinator(s)**	Dr. Chandrima Chaudhuri
	Teacher(s) (Alphabetically)	Dr. Chandrima Chaudhuri

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C304-9.1	Demonstrate an understanding of the meaning and nature of globalization by addressing its political, economic, cultural and technological dimensions	Understanding (C2)
C304-9.2	Analyzing the significance of contemporary global issues such as the proliferation of nuclear weapons, ecological issues, international terrorism, and human security to global governance.	Analyze (C4)
C304-9.3	Analyze how the global politics shapes domestic politics	Analyze (C4)
C304-9.4	Demonstrate an understanding of the working of the global economy, its anchors and resistances offered by global social movements	Understanding (C2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Globalization: Conceptions and Perspectives	• Political Dimension of globalization • Globalization and Culture • Technological Dimensions • Debates on territoriality and sovereignty	6
2.	Global Economy	• Its Significance and Anchors of Global Political Economy: IMF, WTO, World Bank, TNCs • Global resistances (Global Social Movement and NGOs)	6
3.	Contemporary Global Issues-I	• Ecological Issues: historical overview of international environmental agreements • climate change, global commons debate • Proliferation of Nuclear Weapons	8
4.	Contemporary	• International Terrorism: non-state actors and state	8

	Global Issues-II	terrorism; war on terror • Migration and Human Security	
		Total number of Lectures	**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz/ Test/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.	Baylis, J. and Smith, S. (eds.) (2017). *The Globalization of World Politics: An Introduction to International Relations*. 7th edn. Oxford: Oxford University Press
2.	Gordon, L. & Halperin, S. (2000). Effective Resistance to Corporate Globalisation. in R.O'Brien, A.M. Goetz, J.C. Scholte & M.Williams. *Contesting Global Governance*. Cambridge: Cambridge University Press
3.	Halliday, F. (2004). Terrorism in Historical Perspective. *Open Democracy*. 22 April. [Online] http://www.opendemocracy.net/conflict/article_1865.jsp
4.	Hay, C. (ed.) (2010). *New Directions in Political Science: Responding to the Challenges of an Interdependent World.* UK: Macmillan Education
5.	Held, D. & McGrew, A. (2007). *Globalization/Anti-globalization: Beyond the Great Divide*. Cambridge: Polity Press
6.	Heywood, A. (2014). *Global Politics*. London: Palgrave Foundation
7.	Jindal, N & Kumar. K (2019). *Global Politics Issues and Perspectives*. Delhi:Sage Publications
8.	Lamy, S.L. & Masker, J.S. (2018). *Introduction to Global Politics*. New York: Oxford University Press
9.	Shahrbanou, T. & Chenoy, A. (2007). *Human Security.* London: Routledge
10.	Thomas, C. (2008). Globalization and Development in the South. in J. Ravenhill (ed.) *Global Political Economy*. Oxford: Oxford University Press

Applicational Aspects of Differential Equations (20B12MA311)

Course Code	**20B12MA311**	**Semester** Even **(specify Odd/Even)**	**Semester** VI **Session** 2019 -2020 **Month from** Jan 2020-June 2020
Course Name	Applicational Aspects of Differential Equations		
Credits	**4**	**Contact Hours**	3-1-0
Faculty (Names)	**Coordinator(s)**	Prof. Sanjeev Sharma	
	Teacher(s) (Alphabetically)	Prof. Sanjeev Sharma	

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C302-2.1	solve ordinary differential equations in LCR and mass spring problems.	Applying Level (C3)
C302-2.2	explain orthogonality of functions and apply it to solve Sturm-Liouville boundary value problems.	Applying Level (C3)
C302-2.3	apply matrix algebra to find the solution of system of differential equations.	Applying Level (C3)
C302-2.4	formulate and solve first and second order partial differential equations.	Applying Level (C3)
C302-2.5	evaluate solution of differential equations arises in the field of engineering applications.	Evaluating Level (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Basic Theory of Ordinary Differential Equations	Existence and uniqueness of solutions, applications to ordinary differential equations in LCR and mass spring problem.	10
2.	Sturm-Liouville Boundary Value Problem	Sturm-Liouville problems, orthogonality of characteristic functions, the expansion of a function in a series of orthogonal functions, trigonometric Fourier series.	10
3.	Matrix Methods to solve ODE's	Matrix Method for Homogeneous Linear systems with Constant Coefficients.	4
4.	Basic Theory of Partial Differential	Solution of first order equations: Lagrange's equation, Charpit's	4

	Equations	method, higher order linear equations with constant coefficients.	
5.	Applications of Differential Equations	Fourier integrals, Fourier transforms, solution of partial differential equations by Laplace and Fourier transform methods, applications of differential equations in mechanics.	14
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. **Ross, S.L.,** Differential Equations, 3rd Ed., John Wiley & Sons, 2004.
2. **Jain, R.K. and Iyengar, S.R.K.,** Advanced Engineering Mathematics, 3rd Ed., Narosa Publishing House, 2012
3. **Chandramouli, P.N.,** Continuum Mechanics, Yes Dee Publishing India, 2014.
4. **Kreysizg, E.,** Advanced Engineering Mathematics, 10th Edition, John Wieley & Sons, Inc. 2013.

Java Programming (20B16CS322)

Detailed Syllabus

Course Description with CO

Course Code	**20B16CS322**	**Semester** Even	**Semester** VI **Session** 2019 -2020 Month from Jan to Jun
Course Name	**Java Programming**		
Credits	0	**Contact Hours**	[1- 0 - 2]

Faculty (Names)	**Coordinator(s)**	Dr. Shruti Jaiswal, Mr. Mahendra Kumar Gurve
	Teacher(s) (Alphabetically)	Mr. Mahendra Kumar Gurve, Dr. Shruti Jaiswal

COURSE OUTCOMES At the completion of the course, Students will be able to		**COGNITIVE LEVELS**
C305-8.1	Write basic Java programs using Java constructs – loops, switch-case and arrays.	Understand Level (C2)
C305-8.2	Define all basic concepts related to OOP concepts	Remember Level (C1)
C305-8.3	Develop java programs using Java collection framework	Apply Level (C3)
C305-8.4	Create or design an application based on Java programming constructs	Create Level (C6)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Overview of OOA (Object Oriented Analysis) and Java basics	Classes, Objects, OOPs concept using JAVA, Packages and Interfaces.	**3**
2.	JVM Internals	Memory management, Garbage Collection	**1**
3.	String Handling	Using String and StringBuilder class. String Immutability(toString())	**2**
4.	Exception Handling in JAVA	Fundamentals, Exception types, Java built-in exceptions, Custom Exceptions, Chained Exceptions.	**2**

5.	Collections Framework	Collection Overview, List, Map (hashCode & Equals), Set, Queue & other collections	**4**
6.	Multithreading in Java	Multithreading overview and requirement, Thread state diagram, Java multithreading implementation (Thread/Runnable), Challenges in multithreading/Mutual Exclusion, Java handling of mutual exclusion (synchronization), Communication between threads (wait/notify)	**2**
		Total number of Lectures	**14**

Evaluation Criteria

Components	**Maximum Marks**
Mid Tern Evaluation	30
End Semester Examination	40
TA	30 (Attendance = 07, Quizzes = 08, Internal assessment = 07, Assignments in PBL mode = 08.)
Total	**100**

Recommended Reading material:

Text Books

1. Schildt, H. (2014). *Java: the complete reference*. McGraw-Hill Education Group.
2. Bloch, J. (2016). *Effective java*. Pearson Education India.

Referenc Books

1. Sierra, K., & Bates, B. (2005). Head First Java: A Brain-Friendly Guide. " O'Reilly Media, Inc.".
2. Mughal, K. A., & Rasmussen, R. W. (2003). A programmer's guide to Java certification: a comprehensive primer. Addison-Wesley Professional.

Detailed Syllabus
Lecture-wise Breakup

Course Code	**16B1NHS635**	**Semester: Even**	**Semester: VI Session: 2019 -2020** **Month: Jan 2020 to June 2020**
Course Name	**Organizational Behavior**		
Credits	**3**	**Contact Hours**	**3(2-1-0)**

Faculty (Names)	**Coordinator(s)**	**Ms Puneet Pannu (Sec 62) & Dr Anshu Banwari (Sec 128)**
	Teacher(s) (Alphabetically)	**Dr Anshu Banwari** **Ms Puneet Pannu**

COURSE OUTCOMES		**COGNITIVE LEVELS**
C304-6.1	Identify dynamic human behavior through an insight into relationships between individuals, groups and organizations	Apply (C3)
C304-6.2	Analyze individual management style as it relates to influencing and managing behavior in the organization.	Analyze (C4)
C304-6.3	Decide and justify set of strategies for meeting the special challenges in the 21st century competitive workplace	Evaluate (C5)
C304-6.4	Assess the potential effects of important developments in the external environment on behavior in organizations	Evaluate (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1	Introduction to OB: Challenges and Opportunities	Interdisciplinary Field, Concepts, Approaches, Responding to Globalization; Improving Quality & Productivity; Improving Customer Service; Improving People Skill; Empowering People; Stimulating Innovation & Change; Coping with Temporariness; Positive Organizational Behavior, Working in Networked Organizations; Balancing Work-Life Conflict	3
2	Managing Workforce Diversity	Major forms of Workplace Diversity, Valuing Diversity, Role of Disabilities, Discrimination, Diversity Initiatives, Diversity Awareness and Affirmative Action, Diversity Management and strategies to implement it Competitive Advantage of Diversity Management Generational Workforce	4
3.	Job Design and Flexible Job Environment	Job Design & its uses; Flexible Job Environment; Job Enrichment Model	2
4.	Leadership: Authentic	Inspirational Approach to Leadership: Authentic, Ethical & Servant Leadership Defining Authentic Leadership	6

	Leadership	through Intrapersonal, Interpersonal and Developmental Aspects; Basic Model Of Authentic Leadership; Practical Approach to Authentic Leadership through the research of Terry and Bill George; Authentic Leadership: Trust and Ethics, Dimensions of Trust, Counseling & Mentoring	
5.	Power & Politics	Concept of Power; Sources of Power Contingencies of Power; Power Tactics; Measuring Power Bases: Power Authority Obedience Organizational Politics: Types Factors contributing to Political Behavior; Consequences & Ethics of Politics	5
6.	Employee Engagement	Creating a Culture of Engagement, Models of engagement, Benefits of Employee Engagement, Gallup Study, Methods of engaging employees – from entry to exit, Managers Role in Driving Engagement	2
7.	Organizational Culture & Workplace Spirituality	Creating Organizational Culture Approaches to Organizational Culture; How employees learn culture; Measuring Organizational Culture; Spirituality & Organizational Culture	3
8.	Organizational Change & Development	Organizational Change: Meaning & Types; Technology & Change; Resistance to Change v/s Inviting Change; Approaches to Organizational Change; Planning & Implementing Change; Organizational Development; OD Interventions & Change	3
		Total number of Lectures	**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, 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.	**S. Robbins, T. Judge, S. Sanghi**, *Organizational Behavior*, 13th Ed, Prentice-Hall India, 2001
2.	**P.Subba Rao***, Organizational Behavior: Text Cases & Games*, 2nd Edition, Himalaya Publishing House , 2015
3.	**John R. Schermerhorn, Richard N. Osborne, Mary Uhl-Bien; James G. Hunt**, *Organizational Behavior*, 12th Edition, Wiley India Pvt. Ltd, 2012
4.	**Debra L.Nelson and James C. Quick**, *Organizational Behavior*, Cengage Learning, India Edition, 2009
5.	**Steven L. McShane and Mary Ann Von Glinow**, *Organizational Behavior Essentials*, Tata McGraw Hill Publishing Company Ltd, 2007
6.	**Jerald Greenberg**, *Behavior in Organizations*, 10th Ed, PHI Learning Pvt Ltd

Detailed Syllabus
Lecture-wise Breakup

Course Code	**16B1NHS636**	**Semester : Even**	**Semester VI Session** 2019 -2020 **Month: January 2020 to June 2020**
Course Name	**Literature & Adaption**		
Credits	**3**	**Contact Hours**	**2-1-0**

Faculty (Names)	**Coordinator(s)**	Dr. Monali Bhattacharya (Sector 62) & Dr. Ekta Srivastava (Sector 128)
	Teacher(s) (Alphabetically)	Dr. Ekta Srivastava, Dr. Monali Bhattacharya

COURSE OUTCOMES		**COGNITIVE LEVELS**
C304-3.1	Understand and outline the elements and theories of adaptation and its various forms, and relate with the texts reflecting the cultural, moral and linguistic changes in the contemporary society.	Understanding Level (C2)
C304-3.2	Utilize visual literacy to analyze the language and style adopted in filmed texts and examine them as reflections of Readers' and Audience' values and perceptions in the context of myriad cultures and multidisciplinary settings individually and in groups.	Applying Level (C3)
C304-3.3	Analyze texts and their adaptations beyond the surface level of narrative or character as reflections of value systems of various cultures and times individually and in a team.	Analysing Level (C4)
C304-3.4	Evaluate, interpret and document source texts and adaptations thematically and stylistically to learn the nuances of language, culture and values of the society.	Evaluating Level (C5)
C304-3.5	Compose and make an effective presentation of a literary/non literary piece in any genre and design an ethical adaptation of any literary/non literary piece in another form individually and in groups.	Creating Level (C6)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction Literary Devices	Figures of speech, Character, Plotline, Conflict, Point of View	2
2.	Literature & Adaptation	Understanding Cultural Contexts Forms of Adaption Cinematography & Narratology	4
3.	Framework	Adaptation Theories; Reader Response & Audience Response Theories	7

		Case study of the Classic Fairy Tale The Sleeping and its contemporary adaptation Maleficent	
4.	Play & adaptations	The Pygmalion: George Bernard Shaw Hamlet : William Shakespeare	6
5.	Novel & Adaptations	Pride & Prejudice: Jane Austen The Giver: Lois Lowry The Godfather: Mario Puzo	9
		Total number of Lectures	28

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Seminar/Presentation , Oral Questions)
Total	**100**

Recommended Reading material:

1.	**Linda Hutcheon**, *A Theory of Adaptation*, Routledge, 2006
2.	**Mark William Roche**, *Why Literature matters in the 21st Century*, 1st edition, Yale University Press 2004
3.	**George Bernard Shaw**, *Pygmalion,* Electronic Version, Bartleyby.com, New York, 1999
4.	**Stanley Wills & Gary Taylor**, *The Complete Works. The Oxford Shakespeare* (Compact ed.). Oxford: Clarendon Press. , 1988.
5.	https://www.sparknotes.com/film/sleepingbeauty/
6.	**Jane Austen**, *Pride & Prejudice*, Reprint, Thomas Egerton, 2013
7.	**Mario Puzo,** *The Godfather*, 1st Edition, G. P. Putnam's Sons, USA, 1969
8.	**Lois Lowry,** *The Giver, 1st Edition,* Houghton Mifflin Harcourt Publishing Company, USA, 1993

Detailed Syllabus

Lecture-wise Breakup

Course Code	16B1NMA633	**Semester :** Even	**Semester** VI **Session** 2019 -2020 **Month from** Jan 2020 to June 2020
Course Name	Statistics		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names) **Coordinator(s)** Dr. Himanshu Agarwal

Teacher(s) (Alphabetically) Dr. Anuj Bhardwaj, Dr. Himanshu Agarwal, Dr. Pinkey Chauhan

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C302-1.1	make use of measures of central tendency, dispersion, skewness and, kurtosis for description and visualization of population data.	Applying Level (C3)
C302-1.2	apply correlation and regression in statistical analysis of data.	Applying Level (C3)
C302-1.3	explain sampling theory and its distributions.	Understanding Level (C2)
C302-1.4	explain the concepts and properties of estimation theory.	Understanding Level (C2)
C302-1.5	apply sampling and estimation theory to find the confidence interval.	Applying Level (C3)
C302-1.6	analyze small and large sample data by using the test of hypothesis.	Analyzing Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Descriptive Statistics	Graphical representation such as histogram, frequency polygon, AM, GM, HM, median, mode, measures of dispersion, skewness and kurtosis such as central and non-central moments, population variance, β, γ coefficient, Box and Whisker plot.	8
2.	Correlation and Regression Analysis	Scatter diagram. Karl Pearson's and Spearman's rank correlation coefficient, regression lines, regression coefficient and their properties.	5
3.	Sampling and Sampling Distributions	Populations and Sample, random sample, statistics, sample moments, law of large numbers, central limit theorem, distribution of sample mean and sample variance, MGF, Chi-square distribution, F-distribution, Student's *t* distribution.	7
4.	Parametric Point Estimation	General concept of point estimation, methods of moments and maximum likelihood for finding estimators, unbiasedness, consistency,	10

		efficiency, UMVUE, Cramer-Rao inequality, sufficiency, factorization theorem, completeness, Rao-Blackwell theorem.	
5.	Parametric Interval Estimation	definition of confidence interval, pivotal quantity, confidence interval for mean, variance, difference of means and difference of variances for small and large samples.	5
6.	Hypothesis Testing	The basic idea of significance test. null and alternative hypothesis, type-I and type II errors, testing of small and large samples for mean, variance, difference in means, and difference in variances.	7
Total number of Lectures			**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz, Assignments, Tutprials)
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. **Biswas and Srivastava** , A Textbook, Mathematical Statistics Ist Edition, Narosa Publishing House, New Delhi.
2. **W. Feller**, Introduction to Probability Theory and its Applications Vol. I and II. Wiley Eastern-Ltd, 1971
3. **V. K.Rohatgi**, An Introduction to Probability Theory and Mathematical Statistics Wiley Eastern, 1984
4. **R. V. Hogg, A. T. Craig,** Introduction to Mathematical Statistics, McMillan, 1971
5. **AM. Mood**, **F. A. Graybill, and D. C. Boes**, Introduction to the Theory of Statistics McGraw Hill, 1974
6. **Des Raj & Chandak**, Sampling Theory, Narosa Publishing House, 1998.
7. **Sheldon Ross**, A First Course in Probability, 6th edition, Pearson Education Asia, 2002.
8. **Meyer, P.L**, Introductory Probability and Statistical Applications Addison-Wesley Publishing Company, 1965.

Detailed Syllabus and Evaluation Scheme

Solid State Electronic Devices (16B1NPH632)

Course Code	16B1NPH632	**Semester: Even**	**Semester: VI Session** 2019 -2020 **Month from: January to June**
Course Name	Solid State Electronic Devices (16B1NPH632)		
Credits	4	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	Dr. Sandeep Chhokar & Dr. Dinesh Tripathi
	Teacher(s)	Dr. Sandeep Chhokar & Dr. Dinesh Tripathi

COURSE OUTCOMES: Upon the completion of this subject, students will be able to

S.N.	**DESCRIPTION**	**COGNITIVE LEVEL**
C302-7.1	Define terminology and concepts of semiconductors with solid state electronic devices.	Remembering (C1)
C302-7.2	Explain various electronic, optical and thermal properties of semiconductors; various techniques used in device fabrication.	Understanding (C2)
C302-7.3	Solve numerical problems based on solid state electronic devices.	Applying (C3)
C302-7.4	Examine the impact of various parameters on semiconductor devices and their performances.	Analyzing (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Energy band and charges carriers in conductors	Bonding forces and energy bands in solids, charge carriers in semiconductors, carries concentrations, drift of carriers in electric and magnetic fields, Invariance of the Fermi level at equilibrium, optical absorption, Luminescence, Carrier lifetime and photoconductivity, diffusion of carriers	12
2.	Junctions	Fabrication of p-n junctions, equilibrium conditions, steady state conditions, reverse bias breakdown, recombination and generation in the transition region, metal semiconductor junctions, heterojunctions,	10
3.	Transistors	Field effect transistor (FET), Metal-insulator FET, Metal-	08

		insulator-semiconductor FET, MOS FET, Bipolar junction transistors	
4	Devices	Photodiodes, solar cell, light emitting diodes, semiconductor lasers, Negative conductance Microwave devices: Tunnel diode, IMPATT diode, Gunn diode	10
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz/Class Tests (07 M), Attendance (07 M) Internal Assessment (05 M) Assignment in PBL Mode (06 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.	Semiconductor Physics and Devices, *by* Donald A. Neamen and Dhrubes Biswas; 4th Edison Mc GrawHill.
2.	Physics of Semiconductor devices, *by* S. M. Sze; Wiley-Interscience.
3.	Solid State Electronic devices *by* Ben G.Streetman; Prentice-Hall.
4.	Semiconductor Devices, *by*Mauro Zambuto; Mc GrawHill

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH633	**Semester: Even**	**Semester:** VI **Session:** 2019 -2020 **Month: January to June**
Course Name	Photovoltaic Techniques		
Credits	4/3	**Contact Hours**	4/3

Faculty (Names)	**Coordinator(s)**	Dr. B. C. Joshi -JIIT 62 Dr. Prashant Chauhan – JIIT 128
	Teacher(s)	Dr. B. C. Joshi Dr. Prashant Chauhan

COURSE OUTCOMES		**COGNITIVE LEVELS**
C302-8.1	Classify various type of renewable energy sources and explain working of photovoltaic device.	Understand Level (Level 2)
C302-8.2	Demonstrate the use of basic principles to model photovoltaic devices	Understand Level (Level 2)
C302-8.3	Identify challenges and apply strategies to optimize performance of various type of solar cells	Apply Level (Level 3)
C302-8.4	Analyze Solar PV module, mismatch parameter and rating of PV module	Analyze Level (Level 4)
C302-8.5	Evaluate the performance of various stand-alone PV systems with battery and AC and DC load	Evaluate Level (Level 5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Review	Energy issues, conventional energy sources, Renewable energy sources, Solar Energy	02
2.	Solar cell fundamentals	Fundamental of semiconductor, charge carriers and their motion in semiconductors, carriers generation and recombination, p-n junction diode, introduction to solar cell, p-n junction under illumination, Current-Voltage (I-V), open circuit voltage (V_{OC}), short circuit current (I_{SC}) Maximum power, current and voltage and Efficiency, Quantum Efficiency	10
3.	Design of solar cells	Upper limits of cell parameters, loses in solar cell, solar cell design, design for high I_{sc}, V_{oc}, FF, solar simulators	08
4.	Solar cell technologies	Production of Si, Si wafer based solar cell technology, thin film solar cell technologies (CIGS, microcrystalline and polycrystalline Si solar cells, amorphous Si thin film solar cells), multijunction solar cells, Emerging solar cell technologies: organics solar cells, Dye-sensitized solar cell (DSC), GaAs solar cell	12
5.	Photovoltaic system	PV system: Introduction, Stand-alone system, Grid connected system, Hybrid system, Designing of PV system, Balance of system- BOS (Inverters, Controllers, Wiring, Batteries) Photovoltaic Cells, Estimating PV system size and cost, Photovoltaic safety.	08
		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. (Textbooks, Reference Books, Journals, Reports, Websites etc. in the IEEE format)

1.	Tom Markvart and Luis Castaner, "Solar Cells: Materials, Manufacture and Operations," Elsevier, 2006
2.	Stuart R. Wenhem, Martin A. Green, M.E. Watt, "Applied Photovoltaics," Earthscan, 2007
3.	Jenny Nelson, "The Physics of Solar Cells" Imperial college press," 003.Aatec publications, 1995.
4.	C S Solanki, Solar Photovoltaics, PHI

Detailed Syllabus and Evaluation Scheme

Medical and Industrial Applications of Nuclear Radiation (16B1NPH636)

Course Code	16B1NPH636	**Semester: Even**	**Semester: VI Session** 2019 -2020 **Month from: January to June**
Course Name	Medical and Industrial Applications of Nuclear Radiation		
Credits	4	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	Dr. Manoj Tripathi
	Teacher(s)	Dr. Papia Chowdhury & Dr. Manoj Tripathi.

Course Name: Medical & Industrial Applications of Nuclear Radiation (16B1NPH636)
COURSE OUTCOMES: Upon the completion of this subject, students will be able to

S.N.	**DESCRIPTION**	**COGNITIVE LEVEL**
C302-11.1	Define nuclear structure, properties and reactions; Nuclear magnetic resonance process	Remembering (C1)
C302-11.2	Explain models of different nuclear imaging techniques; CNO cycle; principle of radioactive decays	Understanding (C2)
C302-11.3	Apply knowledge of nuclear reaction mechanisms in atomic devices, dosimetry, radiotracers, medical imaging, SPECT, PET, tomography etc.	Applying (C3)
C302-11.4	Analyze different radiocarbon dating mechanisms and processes	Analyzing (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Nuclear Structure	Structure of matter**;** Nucleus: Nuclear Size, Structure and forces; Binding energy and Nuclear stability, mass defect; Nuclear reaction: Fission, Fusion, chain reaction. Nuclear fusion in stars, Formation of basic elements: proton-proton	17

		chain, CNO cycle, Hydrostatic equilibrium; Applications: atom bomb, hydrogen bomb, nuclear power plants, Nuclear reactor problems, precautions. **ii)** Radioactive decay, kinetics of radioactive decay, Types of radioactive decay and their measurement, Half life, decay constant, Population of states, Production of radionuclides. Radioactive dating, Radiocarbon dating: Formation, mechanism of dating, carbon cycle, radiocarbon clock and applications, advantages, disadvantages, precautions; Other dating techniques, protein dating, accuracy in dating;	
2.	Radioactive Dating	Dosimetry and applications: Interaction of Radiation of matter: Biological effects of radiations; dosimetry, working principles, Tools and radiotherapy, Doses, Radioisotopes, Radiotracers;	09
3.	Nuclear Magnetic Resonance	Nuclear Magnetic Resonance: General Introduction to Magnetic Resonance, Reference Frame; RF Pulses, Larmor precision, Basic principles of NMR & ESR Spectroscopy, Nuclear shielding, Chemical shifts; Couplings, Nuclear Imaging; 1D,2D, 3D Images, Application of NMR in medical industry as MRI, working MRI, Types of differen MRI, Applications of NMR in quantum computation;	09
4	Dosimetry and applications	Nuclear Medicine and Nuclear imaging techniques, preclinical imaging, detector designing, photon counting, Medical imaging using $\beta+\gamma$ coincidences, SPECT AND PET: Radiation tomography	05
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz/Class Tests (07 M), Attendance (07 M) Internal Assessment (05 M) Assignment in PBL Mode (06 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.	Basic Sciences of Nuclear Medicine; Magdy M K halil, Springer.
2.	Gopal B Saha, Physics and Radibiology of Nuclear Medicine; Springer.

3.	A. Beiser, Concepts of Modern Physics, Mc Graw Hill International.
4.	Radionuclide Techniques in Medicine, JM McAlister (Cambridge University Press, 1979).
5.	S.N.Ghosal, Nuclear Physics.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B19EC691	**Semester** Even **(specify Odd/Even)**	**Semester** 6th **Session** 2019 -2020 **Month from** Jan-June
Course Name	Renewable Energy		
Credits	0	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Shivaji Tyagi, Vinay Anand Tikkiwal
	Teacher(s) (Alphabetically)	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C305-4.1	Overview of Energy use, Major Energy options, Global climate change issues, effects on ecology and biodiversity	Understanding (C2)
C305-4.2	Basics of Solar radiation and Solar Photovoltaics, Solar Resource Assessment, Solar Cell structures and working	Analyzing (C4)
C305-4.3	Basics of Wind resource, Aerodynamics, Fundamental Power Equations, Design of Wind Energy Generators	Analyzing (C4)
C305-4.4	Biomass Resource, Extracting Biomass Energy, Landfill gas,Fuel Crops, Anaerobic Digestion, Biomass Gasifiers	Understanding (C2)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Overview of energy use and related issues, Necessity of energy storage, major energy options, issues of supply and demand, energy conversions, global climate change issues, effects on ecology and biodiversity, major energy alternatives.	6
2.	Solar Energy & their sources	Solar cell fundamentals and characteristics, Solar Resource Assessment, Solar Photovoltaic technologies and Solar Thermal systems.	8
3.	Electric grid	Working and performance related issues. New developments and challenges in the electric grid.	6
4.	Wind Energy & their sources	Wind resource, basic aerodynamics, fundamental power equation, Basic	4
5.	Biomass sources	Biomass resource, photosynthesis process and usable form of biomass, extracting biomass energy, fuel crops, landfill gas, waste to energy, energy balances and economics.	6
		Total number of Lectures	**30**

Evaluation Criteria	
Components	**Maximum Marks**
T2	30
End Semester Examination	40
TA	30 (Assignment = 15, Quiz = 10, Attendance = 05)
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.	Chetan Singh Solanki, Solar Photovoltaics: Fundamental, technologies and applications. Prentice Hall of India, 2015
2.	James Momoh, Smart Grid: Fundamentals of Design and Analysis, Wiley-IEEE Press, 2012.
3.	Ahmed, Wind Energy: Theory and Practice, PHI
4.	Jenny Nelson, Physics of Solar Cell, World Scientific

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B19PH692	**Semester Even**	**Semester:** 6th **Session** 2019 -2020 **Month from:** January to July
COURSE NAME	LIGHT EMITTING DEVICES: BASICS & APPLICATIONS		
Credits	3	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	Dr. Bhubesh Chander Joshi
	Teacher(s) (Alphabetically)	Dr. Bhubesh Chander Joshi

COURSE OUTCOMES		**COGNITIVE LEVELS**
C305-6.1	Recall the basic concepts of semiconducting materials, working of p-n junction diode and light emitting diodes.	Remembering (C1)
C305-6.2	Explain the various physical parameters involved in designing and fabrication of LEDs.	Understanding (C2)
C305-6.3	Solve various problems related to efficiency, emission intensity and spectrum of LEDs.	Applying (C3)
C305-6.4	Analyze the problems in designing & fabricating blue, white and green high brightness LEDs.	Analyzing (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	History of LEDs	History of SiC, GaAs, GaAsP, GaInP, GaN, and InGaN LEDs.	4
2.	Theory of Recombination's	Radiative and non-radiative recombination's, Low-level and high-level excitations, Bio-molecular rate equation for quantum well structure, Van Roosbroeck-Shockley Model, Einstein Model.	6
3.	LED Basics	Electrical properties: I-V characteristics, parasitic resistances, carrier distribution in homo and hetero junctions, carrier losses, carrier overflow in heterojunctions, Optical properties: Internal, external, extraction and power efficiencies, Emission spectra, escape cone and temperature dependency	6
4.	Growth & Fabrications	LED materials, Organic LEDs, Growth, Fabrication and Characterization Techniques	4
5.	Applications	Solid state lighting, White LEDs, HB LEDs, Color Mixing	10

		and Rendering, LED Drivers, Display Devices, AMOLED, Communication, High Voltage LEDs	
		Total number of Lectures	**30**

Evaluation Criteria

Components	**Maximum Marks**
Mid Term Examination	30
End Semester Examination	40
TA	30 (Presentations/projects/Attendance)
Total	**100**

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

1.	**Text 1:** Light-Emitting Diodes, Schubert E. Fred, Cambridge University Press, 3rd Edition 2018.
2.	**Reference:** Introduction to Light Emitting Diode Technology and Applications, Held Gilbert, Auerbach Publications, 2008.
3.	**Reference:** Light-Emitting Diodes; Materials, Processes, Devices and Applications, Editors: Jinmin Li, G. Q ZHANG, Springer, 2019

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12HS611	**Semester EVEN (specify Odd/Even)**	**Semester** VI **Session** 2019 -2020 **Month from :Jan - June**
Course Name	Marketing Management		
Credits	**3(2-1-0)**	**Contact Hours**	28

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

COURSE OUTCOMES		**COGNITIVE LEVELS**
C304-7.1	To illustrate the fundamentals of marketing, marketing environment and market research	Understanding Level (C2)
C304-7.2	To model the dynamics of marketing mix	Applying Level (C3)
C304-7.3	To demonstrate the implications of current trends in social media marketing and emerging marketing trends.	Understanding Level (C2)
C305-7.4	To appraise the importance of marketing ethics and social responsibility	Evaluating(C5)
C-305-7.5	To conduct environmental analysis, design business portfolios and develop marketing strategies for businesses to gain competitive advantage.	Creating (C6)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	**Understanding New Age Marketing**	Defining Marketing For 21st Century The importance of marketing and marketing's role in business and society. Introduction to Digital Marketing. Online Communication Tools. The Social Media-Conversations, Community and Content. Affiliate Marketing and Mobile Engagement. The Digital Campaigns	5
2	**Marketing Environment and Market Research and insights**	Internal and external forces impacting marketers. Marketing and Customer Value. Gathering Information and Scanning the environment. Company's Micro and Macro Environment Responding to the Marketing Environment	3
3	**Strategic Planning and the marketing Process**	Explore the impact of social forces on marketing actions. Describe how technological change affects marketing. Designing the business Portfolio Discuss the Strategic Planning Process and Strategic Marketing Process.	5

4	**Consumer and Business Buyer Behaviour**	Consumer Markets and consumer buyer behaviour. The buying decision process. Business Markets and business buyer behaviour. Discuss the modern ethical standards.	5
5	**Branding**	Brand Image, Identity and Association. Product brands and Branding decisions. Product line and mix decisions. Consumer Brand Knowledge. New Product Development and Product life cycle strategies.	4
6	**Pricing products: Pricing considerations and strategies**	Factors to consider when setting prices. New product pricing strategies. Product mix pricing strategies. Price adjustments and changes.	4
7	**The New Age Social Marketing**	Ethics and social responsibility in marketing. Ethical behaviour in business. Ethical decision making. Social forces affecting marketing. Impact of culture on marketing. Discuss modern ethical standards. Importance of marketing in CSR and business sustainability.	2
		Total number of Lectures	**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment 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.	Grewal and Levy, Marketing, 5th Edition, Mc Graw Hill Education,2017
2.	Darymple, Douglas J ., and Leonard J. Parsons, Marketing Management: Text and Cases, 7th Edition, John Wiley & Sons(Asia) Pte. Ltd., 2002.
3.	Kotler, Philip., and Kevin Lane Keller, Marketing Management, 12th Edition, New Delhi, Pearson Education, 2006.
4.	Winer, Russell S ., Marketing Management, 2nd Edition, Prentice Hall,2003.
5	Dalrymple, Douglas J ., and Leonard J. Parsons, 2nd Edition, Wiley Publication, 2000.

Detailed Syllabus

Lecture-wise Breakup

Course Code	18B12MA611	**Semester** Even		**Semester** VI **Session** 2019 -2020 **Month from** Jan 2020 - June 2020	
Course Name	Operations Research				
Credits	4		**Contact Hours**	3-1-0	
Faculty (Names)	**Coordinator(s)**	Dr. Neha Sighal			
	Teacher(s)	Prof. Pato Kumari			
	(Alphabetically)	Dr. Amita Bhagat			

COURSE OUTCOMES		**COGNITIVE LEVELS**
After pursuing the above mentioned course, the students will be able to:		
C302-3.1	construct mathematical models for optimization problems and solve linear programming problems (LPP) using graphical and simplex method.	Applying Level (C3)
C302-3.2	apply two-phase, Big-M and dual simplex method for linear programming problems.	Applying Level (C3)
C302-3.3	make use of sensitivity analysis to linear programming problems.	Applying Level (C3)
C302-3.4	solve transportation, assignment and travelling salesman problems.	Applying Level (C3)
C302-3.5	apply cutting plane and branch & bound techniques to integer programming problems.	Applying Level (C3)
C302-3.6	examine optimality conditions and solve multivariable nonlinear problems.	Analyzing Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Preliminaries	Introduction, Operations Research Models, Phases and Scope of O.R. Studies.	3
2.	Linear Programming Problems (LPP)	Convex Sets, Formulation of LPP, Graphical Solutions, Simplex Method, Big-M Method, Two Phase Method, Special Cases in Simplex Method.	8
3.	Duality and Sensitivity Analysis	Primal-Dual Relationship, Duality, Dual Simplex Method, Sensitivity Analysis.	8
4.	Transportation Problems	Introduction, Matrix Form, Applications, Basic Feasible Solution- North West Corner Rule, Least Cost Method, Vogel's Approximation Method. Degeneracy, Resolution on Degeneracy, Optimal Solution, Maximization TP Model.	5
5.	Assignment Problems	Definition, Hungarian Method, Traveling Salesmen Problems.	4
6.	Integer Linear Programming Problems	Pure and Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method.	6
7.	Non Linear	Introduction to NLP, convex functions and	8

	Programming	graphical solution, Unconstrained Problem, Constrained Problems - Lagrange Method for equality constraints, Kuhn-Tucker Conditions for inequality constraints, Quadratic Programming -Wolfe's Method	
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. Taha, H. A. - Operations Research - An Introduction, Pearson Education, 2005.
2. Hadley, G. - Linear Programming, Massachusetts: Addison-Wesley, 1962.
3. Hiller, F.S. and Lieberman, G. J. - Introduction to Operations Research, San Francisco, 1995.
4. Wagner, H. M. - Principles of Operations Research with Applications to Managerial Decision, PHI, 1975.
5. Vohra, N. D., Quantitative Techniques in Management, Second Edition, TMH, 2003.
6. Taha, H. A. - Operations Research - An Introduction, Pearson Education, 2005.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B19CI591	**Semester** Odd **(specify Odd)**	**Semester** V **Session** 2019 -2020 **Month from** July to December
Course Name	Minor Project-1		NBA Code: C350
Credits	2	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	K Vimal Kumar
	Teacher(s) (Alphabetically)	ALL FACULTY

COURSE OUTCOMES		**COGNITIVE LEVELS**
C351.1	Analyze chosen literature addressing real world research problem to identify the requirements	Analyzing Level (4)
C351.2	Build technical report detailing the software specification, design, test plan, and implementation details.	Creating Level (6)
C351.3	Build a practicable solution for the research problem	Creating Level (6)
C351.4	Evaluate results to test the effectiveness of the proposed solution	Evaluating Level (5)
C351.5	Develop effective communication skills for presentation of project related activities	Apply Level (3)

Evaluation Criteria

Components	**Maximum Marks**
Viva-1	20
Viva-2	20
D2D	60
Total	**100**

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B22CI621	Semester : Even	Semester 6th Session 2019 -2020 Month from Jan 20 to June 20
Course Name	Data Mining And Web Algorithms		
Credits	4	Contact Hours	4(3+1)

Faculty (Names)	Coordinator(s)	Archana Purwar
	Teacher(s) (Alphabetically)	Archana Purwar

COURSE OUTCOMES		COGNITIVE LEVELS
C313.1	Understand the basics of data mining and pre-processing of data.	Understand Level (Level 2)
C313.2	Analyze the transactional data for finding frequent and interesting patterns using association rule mining techniques like Apriori and FP-Growth.	Analyse Level (Level 4)
C313.3	Apply a wide range of classification techniques like Naïve-bayes, decision tree, and KNN for the numerous application including fraud detection, target marketing, medical diagnosis, etc.	Apply Level (Level 3)
C313.4	Cluster the similar/dissimilar objects using different methods like partitioning, hierarchical and density based clustering.	Create Level (Level 6)
C313.5	Analyze the link structure of web using page rank and HITS algorithms.	Analyse Level (Level 4)
C313.6	Develop recommendation system using collaborative filtering techniques	Create Level (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Course overview	What Motivated Data Mining? Why Is It Important? What Is Data Mining? Data Mining—On What Kind of Data? Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Are All of the Patterns Interesting? Data mining process, Types of datasets and attributes, Major Issues in Data Mining.	03
2.	Data Preprocessing	Getting To know your data, Data extraction, Data cleaning,	06

		Data Integration and transformation, Data reduction	
3.	Association Rule mining	Usability and Complexity Analysis of Apriori Algorithm, Sampling Algorithm, Partitioning, Using multiple minimum supports	**05**
4.	Classification Algorithms	Issues Regarding Classification and Prediction, Bayesian Classification, Usability and Complexity Analysis of Bayesian algorithm, Nearest Neighbor algorithm, Decision Tree based algorithm.	**07**
5.	Clustering Algorithms	Clustering Algorithms: Types of Data in Cluster Analysis, Similarity Measures, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Usability and Complexity Analysis of Agglomerative Hierarchical Algorithm, K-means and K-Mediod Partitioning Algorithm, subspace clustering techniques, ,Applications of clustering.	**10**
6.	Web algorithms:	Web algorithms: Link Based Search Algorithm, Web Crawling, Indexing, Searching, Zone Indexing, Term-Frequency, Link Analysis Algorithm.	**03**
7.	Ranking Algorithms:	Ranking Algorithms: Page rank, Hits ranking algorithms	**03**
8	Web caching Algorithm :	Web caching Algorithm : LRV, FIFO, LRU, Random, OPT	**02**
9	Recommendation Algorithms:	Recommendation Algorithms: Collaborative Filtering, Item-to-Item recommendation, Memory Based Recommendation,	**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.	**Text Books**
2.	Han, Jiawei, Jian Pei, and Micheline Kamber. Data mining: concepts and techniques. Elsevier, 3rd edition ,2012
3.	Kimball R. and Ross M ,The Data Warehouse Toolkit", Wiley, 3rd edition,2013
4.	Pujari, Arun K, Data mining techniques , Universities press, 3rd edition , 2013
5.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, second edition, 2019
6.	Langville, Amy N., and Carl D. Meyer. Google's PageRank and beyond: The science of search engine rankings. Princeton University Press, 2012.
	Reference Books
7.	Soumen Chakrabarti, Mining the Web: Discovering knowledge from hypertext data", Morgan Kaufmann, Elsevier,2002
8.	Berson, Alex, and Stephen J. Smith. Data warehousing, data mining, and OLAP. McGraw-Hill, Inc., 2004

9.	Inmon W.H.,Building the Data Warehouse ,4th Edition, Wiley,2005
10.	Anahory, Sam, and Dennis Murray. Data warehousing in the real world: a practical guide for building decision support systems. Addison-Wesley Longman Publishing Co., Inc., 1997.
11.	Dunham, Margaret H. Data mining: Introductory and advanced topics. Pearson Education India, 2006.
12.	Mattison, Rob, and Brigitte Kilger-Mattison. Web warehousing and knowledge management. McGraw-Hill School Education Group, 1999.
13.	Hand, David, Heikki Mannila, and Padhraic Smyth. Principles of data mining.PHI, 2005
14.	C.D. Manning, P. Raghavan, H. Schütze., Introduction to Information Retrieval, Cambridge Press,1st edition, 2008.

Detailed Syllabus
Lab-wise Breakup

Course Code	15B28CI681	**Semester :** Even (specify Odd/Even)	**Semester** 1st **Session** 2019-2020 **Month from** Jan to May
Course Name	DATA MINING AND WEB ALGORITHMS LAB (15B28CI681)		
Credits	1	**Contact Hours**	**2**

Faculty (Names)	**Coordinator(s)**	Aditi Sharma
	Teacher(s) (Alphabetically)	Aditi Sharma , Ankit Vidyarthi

COURSE OUTCOMES
COGNITIVE LEVELS
C375.1

Apply the data pre-processing techniques on the dataset and implement association rule mining techniques like Apriori and FP-Growth to analyze frequent and interesting patterns in the transactional data.
Apply (Level III)
C375.2

Apply a wide range of classification techniques like Naïve-Bayes, decision tree, and KNN for the numerous data mining applications.
Apply (Level III)
C375.3

Implement and validate the Clustering methods and outcomes of different methods like partitioning, hierarchical and density based clustering.
Evaluate (Level V)
C375.4

Analyze the link structure of web using different Web caching and ranking algorithms.
Analyze (Level IV)
C375.5

Creation of project using data mining technique to solve the real world problems like fraud detection, hand writing recognition, stock prediction etc.

Create (Level VI)

Module No.

Title of the Module

List of Experiments

1.

Data Preprocessing

Explore the various data mining tools.
Apply Data pre-processing i.e. Data extraction, Data cleaning, Data Integration and transformation, Data reduction.
Perform Data Similarity Measure (Euclidean, Manhattan Distance).
Implement Jaccard coefficient for documents similarity.

2.

Association Rule Mining

Develop Apriori algorithm to mine frequent item-sets.
Implement FP-growth algorithm to identify the frequent item sets.

Implement ECLAT algorithm for rule mining.

3.

Classification

Analysis of Bayesian algorithm, Nearest Neighbor algorithm, Decision Tree based algorithm for classification.

Implement ID3, C4.5 and Naïve Bayes.

4.

Clustering
Develop different clustering algorithms like K-Means, K-Medoids Algorithm, Partitioning Algorithm and Hierarchical Approach to generate clusters.

5.

Validity Measures
Implement Validity Measures to evaluate the quality of Data Mining Algorithms.

6.

Web Application
Analyze the link structure of web using page rank algorithms.
Analyze the link structure of web using HITS algorithms.
Analyze different Web caching Algorithm : LRV, FIFO, LRU etc.
Evaluation Scheme

Components	**Maximum Marks**
Lab Test 1	20
Lab Test 2	20
Day-to-Day (Evaluations , Project, Attendance)	60
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)	
TEXTBOOKS	
1	Jiawei Han, Micheline Kamber, Data Mining, Morgan Kaufmann Publishers,Elsevier (2012).
2	Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of Massive Datasets, Cambridge Universities press(2014).
3	Pujari, Arun K,Data mining and statistical analysis using SQL, Universities press(2016)
4.	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, second edition, 2019
5.	Langville, Amy N., and Carl D. Meyer. Google's PageRank and beyond: The science of search engine rankings. Princeton University Press, 2012.
REFERENCES	
1.	Transactions on Database Systems (ACM)
2.	IEEE Transactions on Knowledge & Data Engineering
3.	The VLDB Journal The International Journal on Very Large Data Bases
4	Thuraisingham, B. Data Mining. Boca Raton: CRC Press, https://doi.org/10.1201/b16553.(2014)
5.	Kimball R. and Ross M ,The Data Warehouse Toolkit", Wiley (2011)
6.	Soumen Chakrabarti, Mining the Web:Discovering knowledge from hypertext data", Morgan Kaufmann, Elsevier (2009)
7.	Alex, Berson,Stephen J.Smith, Data Warehousing, data mining and OLAP , McGraw-Hill,2001
8.	Inmon W.H.,Building the Data Warehouse ,4th Edition, Wiley(2005).
9.	Mattison R. ,Web Warehousing and Knowledge Management", Tata McGraw-Hill. (2007)
10.	David Hand, Heikki Mannila and Padhraic Smyth ,Principles of Data Mining,PHI (2001).

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NCI633	**Semester** Even **(specify Odd/Even)**	**Semester** VI **Session** 2019 -2020 **Month from** January-June
Course Name	Introduction to Mobile Application Development		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Dr. Arpita Jadhav Bhatt (62), Dr. Bindu Verma (128)
	Teacher(s) (Alphabetically)	Dr. Arpita Jadhav Bhatt (62), Dr. Bindu Verma (128)

COURSE OUTCOMES		**COGNITIVE LEVELS**
C331-5.1	Analyze functional aspects of Android mobile operating system for developing Android applications	Analyze Level (Level 4)
C331-5.2	Explain how Android applications work, their life cycle, manifest, Intents, event handling and using external resources	Understand Level (Level 2)
C331-5.3	Design and develop useful Android applications with compelling user interfaces by using, extending, and creating own layouts using different adapters and picker views, fragments, sending and receiving SMS and email	Create Level (Level 6)
C331-5.4	Make use of Google Map API to develop location aware services through Internet for mobile environments	Apply Level (Level 3)
C331-5.5	Apply functional aspects of database handling to develop Android applications using SQLite database	Apply Level (Level 3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction to App development	Introduction to app development process and its platforms and development tools, Android Architecture, Setting up the environment, SDK, Architectural components, Creating simple Android applications, Activities, Intents and manifest files, Life cycles of an activity, working with intents, using intent object to link activities and types of intent, passing data using intents,	8
2.	Event Handling	Handling buttons and action listener methods and events, performing simple operations with button	6
3.	Designing and handling Graphical User Interface –I	Views and View Groups, Types of Layouts, Textview, EditText, XML layouts, Image View, List View, Grid View, Spinners Navigation bar, tab bar, user inputs like	10

		swipes, pinch, zoom etc. Adapter classes, model classes	
4.	Designing and handling Graphical User Interface –II	Handling different types of buttons: Radio button, Check box button, toggle, progress bar view, displaying pictures and menus with views, using menus with views Designing interfaces with Views: Basic views, Picker views : Date/Time,	8
5.	Designing and handling Graphical User Interface –III	Customizing List view, Enabling Filtering and Multi-Item Support in the List View , Creating and Using a List Fragment, customizing Grid and Spinner views by defining row layouts, using GridView view, Sending and receiving SMS programmatically, sending Email and implementing location based services using map APIs	7
6.	Mobile Databases	Sqlite introduction, database Create, Retrive, Update, delete operations, backup of DB's	7
		Total number of Lectures	**46**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance:7, Project:7, Internal Assessment:5, Assignment PBL Mode: 6)
Total	**100**

Recommended Reading material:

Text books: Author(s), Title, Edition, Publisher, Year of Publication etc. (in the IEEE format)

1.	Hagos T. Android Studio IDE Quick Reference: A Pocket Guide to Android Studio Development. Apress; 2019 Jul 31.
2.	Meier R, Lake I. Professional Android. John Wiley & Sons; 2018 Aug 23.
3.	Griffiths D, Griffiths D. Head First Android Development: a brain-friendly guide. " O' Reilly Media, Inc."; 2017 Aug 9.
4.	Darwin IF. Android Cookbook: Problems and Solutions for Android Developers. " O'Reilly Media, Inc."; 2017 May 10.
5.	Burd BA. Android application development all-in-one for dummies. John Wiley & Sons; 2015 Jul 9.
6.	Burton M. Android App Development For Dummies. John Wiley & Sons; 2015 Mar 9.

Reference Books and Links : Author(s), Title, Edition, Publisher, Year of Publication etc. (in the IEEE format)

1	Annuzzi Jr J, Darcey L, Conder S. Introduction to Android application development: Android essentials. Pearson Education; 2014.
2.	Hardy B, Phillips B. Android Programming: The Big Nerd Ranch Guide. Addison-Wesley Professional; 2013 Apr 9.
3	Wei-Meng L. Beginning android application development. Hoboken: Wiely. 2012.

.	
4.	Meier R. Professional Android 4 application development. John Wiley & Sons; 2012.
5.	https://developer.android.com
6.	https://developer.android.com/training/basics/firstapp/building-ui

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NCI634	**Semester Even (specify Odd/Even)**	**Semester: VIth Session** 2019 -2020 **Month** from **January** to **May**
Course Name	Agile Software Development		
Credits	**4**	**Contact Hours**	**3+1**

Faculty (Names)	**Coordinator(s)**	Indu Chawla
	Teacher(s) (Alphabetically)	Indu Chawla

COURSE OUTCOMES		**COGNITIVE LEVELS**
C331-4.1	Interpret the trade-offs between traditional software development methods and agile software development methods for a software project effectively.	Understand level (Level 2)
C331-4.2	Identify and make use of an appropriate agile software engineering approach viz. extreme programming, Scrum, Crystal techniques as a part of software development.	Apply Level (Level3)
C331-4.3	Apply Refactoring techniques on source code for improved design	Apply Level (Level3)
C331-4.4	Choose tools and construct the methods for testing Agile projects using various testing strategies	Apply level (Level3)
C331-4.5	List the Planning, tracking, estimation and monitoring of agile projects with techniques like burn down charts, velocity calculation and task boards etc.	Analyze level (level4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Traditional software development methods, Agile software development methods and lean software development methods	3
2.	Agile Fundamentals	Agile manifesto, Agile principles, Characteristics of Agile processes, an iterative development process, Pros and cons of incremental development and software prototyping.	3
3.	Requirements and Planning	User stories, agile estimation, planning techniques- Prioritizing Themes, Financial prioritization, prioritizing desirability	4
4.	Scrum	Introduction, Scrum - Prioritizing, Estimating, and Planning, The Scrum Experience (hands-on exercise)	5
5.	Extreme Programming (XP)	Extreme Programming Values, Principles and Practices, Pair programming, Embracing change, incremental change	5
6.	Crystal	Crystal methodologies: project categories, complexity, family members, Crystal's seven properties, Crystal clear development process cycle, Crystal yellow, crystal orange and crystal orange web.	4

7.	Kanban	The principles of kanban, Improving process with kanban, Measure and manage flow, Emergent behavior	4
8.	Feature-Driven Development	Processes of feature driven development, practices and progress in FDD	2
9.	Testing	Agile testing strategy, automated unit test, test plan, test driven development, alpha, beta and acceptance testing	5
10.	Refactoring	Bad smells in code, properties of refactoring, refactoring examples, benefits, cost and risk of reafctoring	7
		Total number of Lectures	42

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25
	Attendance = 07 Class Test, Quizzes, etc = 07 Internal assessment = 05 Assignments in PBL mode = 06.
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)

	Text Books
1.	Stellman, Andrew, and Jennifer Greene. Learning agile: Understanding scrum, XP, lean, and kanban. " O'Reilly Media, Inc.", 2014.
2.	Kung, David. Object-oriented software engineering: an agile unified methodology. McGraw-Hill Higher Education, 2013.
3.	Layton, Mark C., and Steven J. Ostermiller. Agile project management for dummies. John Wiley & Sons, 2017.
4.	Gupta, Rajeev. Agile Automation and Unified Funtional Testing. Pearson Education India, 2016.
5.	Fowler, Martin. Refactoring: improving the design of existing code. Addison-Wesley Professional, 2018.
6.	Stellman, Andrew, and Jennifer Greene. Learning agile: Understanding scrum, XP, lean, and kanban. " O'Reilly Media, Inc.", 2014.
7.	Viscardi, Stacia. The Professional ScrumMaster's Handbook. Packt Publishing Ltd, 2013.
	References
8.	Shore, James. The Art of Agile Development: Pragmatic guide to agile software development. " O'Reilly Media, Inc.", 2007.
9.	Schwaber, Ken. Agile project management with Scrum. Microsoft press, 2004.
10.	Pressman, Roger S. Software engineering: a practitioner's approach. Palgrave macmillan, 2005.
11.	Cohn, Mike. User stories applied: For agile software development. Addison-Wesley Professional, 2004.
12.	Cohn, Mike. Agile estimating and planning. Pearson Education, 2005.
13.	Martin, Robert C. Agile software development: principles, patterns, and practices. Prentice Hall, 2002

Detailed Syllabus
Lecture-wise Breakup

Subject Code	16B1NCI642	**Semester (Even)**	**Semester** Even **Session** 2019 - 2020 **Month from** January **to** May
Subject Name	Wireless Networks		
Credits	**3+1**	**Contact Hours**	**3 Lectures +1 Tutorial**

Faculty (Names)	**Coordinator(s)**	Dr. Manju
	Teacher(s) (Alphabetically)	Dr. Manju, Dr. Gagandeep Kaur, Dr. Vivek Kumar Singh

COURSE OUTCOMES		**COGNITIVE LEVELS**
C331-3.1	Define basic concepts & terms related to IEEE 802.11 wireless networks	Remember Level (Level 1)
C331-3.2	Explain cellular concepts of mobile radio propagation in wireless networks, IEEE 802.11 adhoc routing protocols and transport layer protocols	Understand Level (Level 2)
C331-3.3	Identify different categories and design issues of IEEE 802.11 MAC protocol	Apply Level (Level 3)
C331-3.4	Analyze metrics of MAC & Mobile IP based routing protocols using simulators	Analyze Level (Level 4)
C331-3.5	Evaluate various security parameters in wireless networks	Evaluate Level (Level 5)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures**
1.	Overview of Wireless Communications & Networks	Introduction to wireless communication & wireless networks, principles and challenges of various wireless communication generations; GSM, GPRS, 3G, 4G, and 5G	4
2.	Data Link Layer	Path Loss and Shadowing, The 802.11 MAC, MAC Access Modes and Timing Section, Contention-Based Access Using the DCF Section, Fragmentation and Reassembly Frame Format. Data Frames, Control Frames, Management Frames, Contention-Based Data Service, Multi-acces communication, Aloha and CSMA Protocols, Other MAC Protocols, Multiple access Interference, IEEE 802.11 wireless LAN, Medium Access control, Interframe spaces, Virtual Carrier Sensing and Network Allocation Vector, ARQ and Atomic Operations, Backoff Procedure with the DCF, Hidden and Exposed Stations,	10
3.	Network Layer	Mobile IP, Network layer routing protocols, key	8

		component mechanisms, link metric estimation and neighborhood table management for proactive and reactive routing protocols, opportunistic routing, End-to-End Path Capacity, Mobility, Capacity of Mobile Ad Hoc Networks	
4.	Transport Layer	Transport layer protocols, with an emphasis on congestion control, including TCP over wireless, Feedback TCP, Adhoc TCP, Split TCP, congestion sharing mechanisms, Explicit and precise rate control,	8
5.	Security in Wireless Networks	Wireless security techniques, WEP, The Extensible Authentication Protocol, Application based attacks, Network Security Attacks, Transport Layer Attacks, DLL Attacks, Cryptographic solutions	8
6.	Introduction to Simulation Tools & Performance Measurement	Network simulation software tools, MAC Protocol Performance Measures, Wireless networks security performance measurement	4
			42

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance = 07, Class Test/Quizzes = 07, Internal assessment = 05 Assignments in PBL mode = 06.)
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)

Text Books

1.	C. Siva Ram Murthy, B. S. Manoj (2012), "Ad Hoc Wireless Networks Architectures and Protocols, Prentice Hall Communications Engineering and Emerging Technologies Series.
2.	James F. Kurose, Keith W. Ross (2013), "Computer Networking : A Top-Down Approach", 6th Edition, Pearson
3.	Nupur Prasad Giri (2016), "Wireless Technology", 1st edition, Dreamtech Engineering Textbooks
4.	Sunil kumar S. Manvi, Mahabaleshwar S. Kakkasageri (2016), "Wireless and Mobile Networks: Concepts and Protocols", 2nd Edition (2016), Wiley

Reference Book

1.	Matthew Gast (2005), "802.11Wireless Networks: The Definitive Guide ", O'Reilly.
2.	Ivan Marsic (1995)," Wireless Networks: Local and Ad Hoc Networks", 1st Ed., Prentice-Hall, Englewood Cliffs, NJ.

3.	IEEE, ACM Transactions, Journals and Conference papers on “Wireless Communications & Networking.”

Detailed Syllabus
Lecture-wise Breakup

Course Code	**16B1NCI643**	**Semester EVEN**	**Semester** VI **Session** 2019 -2020 **Month from JAN-JUN**
Course Name	Computational Intelligence		
Credits	4	**Contact Hours**	3 – 1 - 0

Faculty (Names)	**Coordinator(s)**	Dr. R.B. Mishra, Dr. Swati Gupta
	Teacher(s) (Alphabetically)	Dr. R.B. Mishra, Dr. Satish Chandra, Dr. Swati Gupta

COURSE OUTCOMES		**COGNITIVE LEVELS**
C330-1.1	Infer vagueness, ambiguity and uncertainty in natural language using fuzzy logic concepts.	Understanding [Level 2]
C330-1.2	Apply the intelligent techniques using rough set theory, fuzzy Logic, genetic and hybrid techniques to solve different type of real world problems	Apply [Level 3]
C330-1.3	Analyze the principles of fuzzification, defuzzification and their applications in different set of problems.	Analyze[Level 4]
C330-1.4	Integrate and develop hybrid Intelligent techniques for real time engineering application.	Create [Level 6]
C330-1.5	Compare and conclude the results of different techniques through writing technical reports.	Evaluate [Level 5]

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	Introduction to CI: Pitfalls of AI, formal definition of CI, synergism in soft computing, Types of Adaptation and learning, Computational intelligence as Adaptation and Self organization.	03
2.	Methods of Knowledge representation	Rough Set Theory, Fuzzy sets and Fuzzy relations, methods of knowledge representation	04
3.	Fuzzy Inference System with applications	Rule-Based Expert Systems and Fuzzy Expert Systems: Rule-based expert systems, Fuzzy sets and operations of fuzzy sets, Fuzzy rules and fuzzy inference, Fuzzy expert systems . Case Studies (data clustering, pattern recognition)	09
4.	Neural Network with Applications	Pattern recognition and neural networks: Supervised and unsupervised learning, machine perception, object identification and speech recognition Unsupervised learning neural networks: self-organizing feature maps , Radial basis function networks , ART network, case studies	09
5.	Evolutionary Computations	Introduction to evolutionary computing: GA, DE, PSO, ACO, ABC, GWO, BBO	08
6.	Intelligent Systems	Hybrid Intelligent systems: Evolutionary algorithms in designing neural networks, Evolutionary algorithms vs. fuzzy system Neuro Fuzzy Systems concepts and applications	09

Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance = 07, Class Test, Quizzes, etc = 07, Internal assessment = 05 Assignments in PBL mode = 06.)
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)

Reference Books:

1.	Konar, Amit. *Computational intelligence: principles, techniques and applications*. Springer Science & Business Media, 2006.
2.	Fulcher, John. *Computational intelligence: an introduction*." In *Computational intelligence: a compendium*, pp. 3-78. Springer, Berlin, Heidelberg, 2008.
3.	Eberhart, Russell C., and Yuhui Shi. *Computational intelligence: concepts to implementations*. Elsevier, 2011.
4.	Ross, Timothy J. *Fuzzy logic with engineering applications.* John Wiley & Sons, 2017.
5.	Jang, Jyh-Shing Roger, Chuen-Tsai Sun, and Eiji Mizutani. *Neuro-fuzzy and soft computing; a computational approach to learning and machine intelligence*, 2015.
6.	Cox, Earl, Michael O'Hagan, Rodman Taber, and Michael O'Hagen. *The fuzzy systems handkbook with cdrom*. Academic Press, Inc., 1998.
7.	Haykin, Simon. *Neural networks: a comprehensive foundation*. Prentice Hall PTR, 1994.
8.	De Jong, Kenneth A. *Evolutionary computation: a unified approach*. MIT press, 2006.
9.	Ajith Abraham, Rafael Falcón, Rafael Bello, *Rough Set Theory: A True Landmark in Data Analysis,* Springer, 2009

Text Books:

10.	Andries P. Engelbrecht, *Computational Intelligence: An Introduction, 2nd Edition*. John Wiley & Sons, 2013

Detailed Syllabus
Lecture-wise Breakup

Subject Code	16B1NCI644	**Semester Even (specify Odd/Even)**	**Semester** Even **Session** 2019 - 20 **Month from** January to May
Subject Name	Cloud based Enterprise Applications		
Credits	4	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	Bharat Gupta
	Teacher(s)	Bharat Gupta

COURSE OUTCOMES		**COGNITIVE LEVELS**
C331-6.1	Differentiate between Public, Private, and Hybrid Clouds	Understand Level (Level 2)
C331-6.2	Develop Enterprise applications based on XML, JavaScript, Java Servlets, Java Server Pages, etc.	Apply Level (Level 3)
C331-6.3	Develop web service based solutions by using REST, JSON, SOAP, etc.	Apply Level (Level 3)
C331-6.4	Examine emerging technologies in cloud environment.	Analyse Level (Level 4)
C331-6.5	Evaluate the performance of different Public Cloud Platforms e.g., GAE, AWS and Azure.	Evalute Level (Level 5)
C331-6.6	Design and deploy Enterprise applications on one of the Cloud Service Providers, i.e., Amazon AWS or Microsoft Azure.	Create Level (Level 6)

Module No.	**Subtitle of the Module**	**Topics in the module**	**No. of Lectures for the module**
1	XML Programming	XML, DTD, XML schema, XPath, XQuery	6
2	Web services	REST, JSON,SOAP	6
3	JavaScript	Basic constructs, Conditional statements, Loop, External linking with .js, Browser related events	6
4.	Server Side programming	Java servlet, Java server pages	8
5.	Introduction to Cloud Computing	Public, private, and Hybrid clouds; Features of cloud platforms	4
6.	Public Cloud Platforms	Introduction to GAE, AWS and Azure; Programming support of Google App Engines, Amazon AWS, and Microsoft Azure; Emerging cloud software environments	7
7.	Apache Hadoop	Introduction to distributed computing, Map Reduce	3
8.	Virtualization	Virtualization structures/tools and mechanism, Virtualization of CPU, Memory and I/O devices	2

Total number of Lectures	42

Evaluation Criteria

Components	**Maximum Marks**
T1	**20**
T2	**20**
End Semester Examination	**35**
TA	**25**

- **Attendance:7**
- **Tutorial Assessment/Quiz:7**
- **Internal assessment:5**
- **Assignments in PBL mode:6**

Total	**100**

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

Text Book

1. Arshdeep Bahga, Vijay Madisetti, “Cloud Computing:A Hands-on Approach”, Universities Press, 2014

References

1. https://www.w3.org/XML/
2. https://aws.amazon.com/
3. https://azure.microsoft.com/en-in/
4. https://cloud.google.com/appengine/docs/
5. John Pollock, JavaScript, 3rd Edition, Mc Graw Hill, 2011
6. https://docs.oracle.com/javase/tutorial/jaxp/
7. Elliotte Harold, W. Means, XML in a Nutshell, 3rd Edition, O'Reilly Media, 2009
8. http://www.oracle.com/technetwork/java/javaee/jsp/index.html (JSP)
9. https://docs.oracle.com/javaee/6/tutorial/doc/bnafd.html (Java Servlet Technology)

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS631	**Semester Even**	**Semester 6th Session** 2019 -2020 **Month from January 2020 to May 2020**
Course Name	PROJECT MANAGEMENT		
Credits	3	**Contact Hours**	2-1-0

Faculty (Names)	**Coordinator(s)**	Dr. Santoshi Sengupta (Sec-62), Dr. Deepak Verma (Sec-128)
	Teacher(s) (Alphabetically)	Dr. Deepak Verma, Dr. Santosh Dev, Dr. Santoshi Sengupta

COURSE OUTCOMES		**COGNITIVE LEVELS**
304-5.1	Apply the basic concepts of project management such as features, objectives, life cycle, model and management, in a given context	Apply Level (C3)
304-5.2	Analyze projects and their associated risks by understanding the various theoretical frameworks, non-numerical and numerical models in order to make correct selection decisions	Analyze Level (C4)
304-5.3	Evaluate the stages of project management and identify and determine correct techniques for planning and scheduling	Evaluate Level (C5)
304-5.4	Evaluate management processes for budgeting, controlling and terminating projects in order to achieve overall project success	Evaluate Level (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Project Management: Introduction	Characteristics of project; Life Cycle of Project; Project Model; Project Management as discipline; Contemporary aspects of Project Management	4
2.	Project Selection	Theoretical Models; Non-numeric models; Numeric Models; Financial Models; Project Portfolio process, Significance and applicability of Monte Carlo simulation	6
3.	Project Organization, Manager and Planning	Pure Project organization; Functional Organizations; Mixed organizations; Matrix organizations; Role, Attitudes and Skills of Project Manager, Project Coordination, Systems Integration, Work Breakdown Structure, Linear Responsibility Charts.	4
4.	Risk Management	Theoretical Aspects of risk, Risk Management process, Numeric Techniques, Hillier model, Sensitivity Analysis, Certainty Equivalent approach and Risk adjusted discount rates, Game theory.	4
5.	Project Scheduling and Resource Allocation	Theoretical aspects-Importance, Focus Area-PERT/CPM, AOA and AON charts, Probability Analysis, Gantt Charts, Crashing of Projects- Time and Cost tradeoff, Basics-Resource Leveling and Loading.	6

6.	Budgeting, Control and Project Termination	Estimating Project Budgets, Improving the process of cost estimation, Basics, Importance, Purpose of control, Types of Control, Desirable features of Control, Control Systems, Critical Ratio Method, Control of creative activities, Control of change and scope creep, Why Termination, Types of termination, typical termination activities.	4
Total number of Lectures			**28**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Project, Oral Questions)
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.	Meredith, Mantel, Project Management-A Managerial Approach, 10th Edition, Wiley Publications
2.	Timmothy Kloppenborg, Contemporary Project Management, 5th[t] Edition, Cengage Learning, 2017
3.	Vohra, N. D., Quantitative Techniques in Management, 5th Edition, Tata McGraw Hill Publishing Company, 2017

Department of Humanities & Social Science
AY: 2019-20 (Even Semester)
Course Opening Report

Program Name: B.Tech
Semester: VI
Course Name & Code: Cognitive Psychology 16B1NHS632

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

COURSE OUTCOMES		COGNITIVE LEVELS
304-4.1	Understand and apply the concepts of cognitive psychology in everyday life	(C3)
304-4.2	Analyze the different models of various cognitive processes	(C4)
304-4.3	Evaluate cognitive psychology issues and recommend possible solutions	(C5)
304-4.4	Evaluate interventions/solutions for self-development through cognitive processes	(C5)

CO-PO and CO-PSO Mapping:

													Biotech PSOs			CSE PSOs		ECE PSOs		IT PSOs	
COs	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**	**PSO1**	**PSO2**	**PSO1**	**PSO2**	**PSO 1**	**PSO 2**
304-4.1		1	2	1		2		1	3	2		3		1	1	2	2		1		
304-4.2			1	1		1			2	1		2				2			1		
304-4.3		1	2	2		1		2	2	1		3				1					
304-4.4		1	2	1		2			3	2		3		1	1	2	2				
Avg.		1	2	1		2		2	3	2		3		1	1	1.8	2		1		

3. Identified gaps in Syllabus/ Course Description (If Any):

Topics to be introduced	Strengthens CO	Strengthens PO, PSO	Method of Identification

4. Modifications in Syllabus/ Course Description (If Any):

Details of Modification (Addition/ Removal)	Justification	Strengthens POs/PSOs

5. Actions for Improving CO Attainments: (CSE)

COs	Attainments in 2018-19	Action to be taken in 2019-20 to improve CO attainment	Strengthens POs/PSOs
304-4.1	**2.4**		
304-4.2	**1.8**		
304-4.3	**2.1**		
304-4.4	**1.9**		

Actions for Improving CO Attainments: (ECE)

COs	Attainments in 2018-19	Action to be taken in 2019-20 to improve CO attainment	Strengthens POs/PSOs
304-4.1	**2.4**		
304-4.2	**2.0**		
304-4.3	**2.1**		
304-4.4	**2.1**		

Actions for Improving CO Attainments: (BT)

COs	Attainments in 2018-19	Action to be taken in 2019-20 to improve CO attainment	Strengthens POs/PSOs
304-4.1	**2.4**		
304-4.2	**1.8**		
304-4.3	**2.4**		
304-4.4	**1.7**	Expose students to discussions on efficacy of various interventions/solutions for self development through cognitive psychology	Strengthen attainment of CO4

Actions for Improving CO Attainments: (IT)

COs	Attainments in 2018-19	Action to be taken in 2019-20 to improve CO attainment	Strengthens POs/PSOs
304-4.1	**1.8**		
304-	**2.4**		

4.2			
304-4.3	**2.4**		
304-4.4	**1.5**	Expose students to discussions on efficacy of various interventions/solutions for self development through cognitive psychology	Strengthen attainment of CO4

6. Innovative Teaching and Learning Method to be used:

7. Strategies for

- **Weak Learners:** Give them case studies requiring use of cognitive psychology concepts for finding solutions
- **Bright Students:** Students will be asked to collect data and do real projects using variables of cognitive psychology

8. Innovative Evaluation Strategy to be used:

Signature: **Signature:**

Module Coordinator: Santoshi Sengupta

Course Coordinator: Dr. Badri Bajaj and Dr. Ruchi Gautam