

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH632	Semester EVEN	Semester VI Session 2018 -2019 Month from January to June
Course Name	SOLID STATE ELECTRONIC DEVICES		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Dinesh Tripathi & Dr. Sandeep Chhoker
	Teacher(s) (Alphabetically)	Dr. Dinesh Tripathi & Dr. Sandeep Chhoker

COURSE OUTCOMES		COGNITIVE LEVELS
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, carrier 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-insulator-semiconductor FET, MOS FET, Bipolar junction transistors	08
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 (10), Attend. (10) and Class performance (5)]
Total	100

Recommended Reading material:

1.	Donald A Neamen & Dhruves Biswas, Semiconductor Physics and Devices, McGraw Hill Education
2.	S. M. Sze, Physics of Semiconductor devices, Wiley-Interscience
3.	Streetman and Banerjee, Solid State Electronic devices, PHI
4.	Umesh Mishra and Jasprit Singh, Semiconductor Device Physics and Design,

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Course Code	16B1NPH633	Semester :Even	Semester VI Session 2018 -2019 Month: January to June
Course Name	Photovoltaic Techniques		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. B. C. Joshi and Dr. Prashant Chauhan
	Teacher(s)	Dr. B. C. Joshi and Dr. Prashant Chauhan

COURSE OUTCOMES		COGNITIVE LEVELS
C302-8.1	Classify various type of renewable energy sources and explain working of photovoltaic device.	Remembering (C1)
C302-8.2	Demonstrate the use of basic principles to model photovoltaic devices	Understanding (C2)
C302-8.3	Identify challenges and apply strategies to optimize performance of various type of solar cells	Applying (C3)
C302-8.4	Analyze Solar PV module, mismatch parameter and rating of PV module	Analyzing (C4)
C302-8.5	Evaluate the performance of various stand-alone PV systems with battery and AC and DC load	Evaluating (C5)

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, losses in solar cell, solar cell design, design for high I_{sc} , V_{oc} , FF, solar simulators	08
4.	Solar technologies cell	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 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
Total	100

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

1.	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

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Course Code	16B1NPH634	Semester: Even	Semester VI Session 2018 -2019 Month: from January to June
Course Name	Applied Statistical Mechanics		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Navendu Goswami
	Teacher(s) (Alphabetically)	Dr. Navendu Goswami

COURSE OUTCOMES		COGNITIVE LEVELS
C302-9.1	Define the fundamental parameters of Thermodynamics and Statistical Mechanics.	Remembering (C1)
C302-9.2	Explain the Thermodynamic potentials, Maxwell's equations and Heat equations.	Understanding (C2)
C302-9.3	Apply the concepts of thermodynamics and statistical ensembles to understand the phase space and distribution functions.	Applying (C3)
C302-9.4	Determine the distribution functions in case of various types of physical and chemical ensembles.	Evaluating (C5)
C302-9.5	Evaluate the ideas of Entropy with respect to Probability and Information Theory; and conclude Liouville's equation.	Evaluating (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Thermodynamics	Overview of basic laws of Thermodynamics; Microscopic and macroscopic parameters, Thermodynamic potentials; Introduction to equilibrium and non-equilibrium systems and related problems; Entropy and probability;	3
2.	Statistical Ensembles	Concept of Statistical ensembles, Density of States; Micro canonical, Canonical, Grand-canonical ensembles	5
3.	Distribution functions	Maxwell-Boltzmann, Bose-Einstein, Fermi-Dirac and their applications	6
4.	Non-equilibrium systems	Liouville's equation, von Neumann equation; Random walk, Stochastic methods;	6
5.	Modeling and Simulations	Ising model and its applications, Molecular dynamics, Monte-Carlo simulations and Multi-scale modeling for materials properties and engineering applications.	15
6.	Applications	Applications of ensemble formalism in dynamics of neural networks, ensemble forecasting of weather, propagation of uncertainty over time, regression analysis of gravitational orbits etc.,	5
Total number of Lectures			40

Evaluation Criteria	
Components	Maximum Marks
T1	20

T2	20
End Semester Examination	35
TA	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Frederick Reif , <i>Fundamentals of Statistical and Thermal Physics</i> , Waveland Pr Inc, 2008.
2.	Kerson Huang , <i>Statistical Mechanics</i> , Wiley, 2 nd Ed., 1987.
3.	R K Pathria, Paul D. Beale, <i>Statistical Mechanics</i> , Academic Press, 3 rd Ed., 2011.
4.	Daniel V. Schroeder, <i>An Introduction to Thermal Physics</i> , Addison-Wesley, 1 st Ed., 1999
5.	L D Landau, <i>Statistical Physics, Part 1: Volume 5 (Course of Theoretical Physics)</i> , Butterworth-Heinemann, 3 rd Ed., 1980

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Course Code	16B1NPH635	Semester Even	Semester VI Session 2018 -2019 Month from January to June
Course Name	Analytical Techniques for Materials		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Himanshu Pandey
	Teacher(s) (Alphabetically)	Dr. Himanshu Pandey

COURSE OUTCOMES		COGNITIVE LEVELS
C302-10.1	Recall preliminary concepts of various characterization techniques for the structure-property relationship of materials.	Remembering (C1)
C302-10.2	Outline different sophisticated characterization tools and explain basic knowledge about working principle.	Understanding (C2)
C302-10.3	Identify characterization tool as per the necessity of measurement or analysis and solve related problems based on concepts used in various techniques.	Applying (C3)
C302-10.4	Examine material's properties and analyze the results in context of specific techniques.	Analyzing (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Structural analysis by X-rays	X-rays and their properties, Production and detection of X-rays, Safety precautions; X-ray interaction with matter, Crystal structure, Different types of lattices, X-ray Diffraction, Bragg's Law; X-ray spectroscopy, diffraction methods, Scherrer formula, grain size, particle size, crystal perfection; Determination of crystal structure (detailed analysis only for cubic structures), X-ray reflectivity	10
2.	Microstructural analysis	Scanning electron microscopy, practical aspect of the technique, Composition analysis by EDX; Transmission electron microscopy and its analysis, sample preparation	08
3.	Molecular spectroscopy	Regions of spectrum, Spectroscopy (Microwave and Infrared), Fourier transform IR, Raman spectroscopy	08
4.	Electronic spectroscopies of surfaces	Photoelectron spectroscopy (X-ray, Ultra-violet), peak shifts, information about chemical state and elemental compositions	05
5.	Surface Morphology by scanning probe microscopy	Atomic force microscopy (contact & non-contact mode), wide areas of applications, AFM basics, Magnetic force microscopy	05
6.	Thermal analysis	Nomenclature, Thermo gravimetric analysis, Differential thermal analysis, Differential scanning calorimetry	04
Total number of Lectures			40

Evaluation Criteria

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

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

1.	B. D. Cullity, <i>Elements of X- ray Diffraction</i> , Addison-Wesley Publishing Company, Inc.
2.	C. Kittel, <i>Introduction to Solid State Physics</i> , Wiley-India.
3.	Colin N. Banwell & Elaine M. McCas, <i>Fundamentals of Molecular Spectroscopy</i> , Tata McGraw-Hill.
4.	Elton N. Kaufmann, <i>Characterization of Materials (Vol.1)</i> , John Wiley & Sons.
5.	Williams, David B., Carter, C. Barry, <i>Introduction to Transmission electron microscopy</i> , Springer.

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Course Code	16B19PH692	Semester Even	Semester VI Session 2018 -2019 Month from: January to June
Course Name	Light Emitting Diodes: Basics & Applications		
Credits	Value Added	Contact Hours	2

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	Analyse 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 and Rendering, LED Drivers, Display Devices, AMOLED, Communication, High Voltage LEDs	10
Total number of Lectures			30

Evaluation Criteria	
Components	Maximum Marks
Mid Term Examination	30

End Semester Examination	40
TA	30 [Presentation/project (15 M) + Attendance (15 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.	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
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Course Code	18B12MA611	Semester Even	Semester VI	Session 2018 -2019
Course Name	Operations Research			
Credits	4	Contact Hours	3-1-0	
Faculty (Names)	Coordinator(s)	Dr. Pato Kumari		
	Teacher(s) (Alphabetically)	Prof. A. K. Aggarwal 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 Programming	Introduction to NLP, convex functions and graphical solution, Unconstrained Problem, Constrained Problems - Lagrange Method for equality constraints, Kuhn-Tucker Conditions		8

		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

Subject Code	18B12MA612	Semester Even	Semester VI Session 2018-2019 Month from Jan2019 to June 2019
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 containing 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,	5

		Ostrogradsky equation, Variational problems in parametric form, applications to differential equations.	
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 approximation, successive substitution methods for Fredholm and Volterra integral equations.	8
5.	Numerical Methods	Finite difference method, derivation from Taylor's polynomial, Accuracy and order, explicit method, implicit method, Crank–Nicolson method and applications,	8
6.	FEM and its comparison	Galerkin finite element method for one dimensional problems, various type of elements and their shape functions, stiffness matrix, assembly of equations, handling of the boundary conditions, triangular and rectangular elements, stiffness matrices and assembly. Comparison of FEM and FDM.	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, 1997.		
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.	Zienkiewicz, O.C. , Morgan, K. , Finite Elements and Approximation, John Wiley, 1983.		
7.	Smith, G. D. , Numerical solution of partial differential equations: finite difference methods. Oxford University Press, 1985		

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS631	Semester	Even	Semester 6th Session	2018 -2019
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 various stages of project management and identify and determine correct techniques for planning, scheduling, controlling and terminating the projects	Evaluate Level (C5)
304-5.4	Evaluate project management processes, tools and techniques 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, 10 th Edition, Wiley Publications, First Published 1985
2.	Timmothy Kloppenborg, Contemporary Project Management, 1 st Edition, Cengage Learning, 2014
3.	Vohra, N. D., Quantitative Techniques in Management, 3 rd Edition, Tata McGraw Hill Publishing Company, 2007

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Course Code	16B1NHS635	Semester: Even	Semester: VI Session: 2018 -2019 Month: Jan 2019 to June 2019
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
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			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 Leadership	Inspirational Approach to Leadership: Authentic, Ethical & Servant Leadership Defining Authentic 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	6
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 (Oral Questions, 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 , <i>Organizational Behavior</i> , 13th Ed, Prentice-Hall India, 2001
2.	P.Subba Rao , <i>Organizational Behavior: Text Cases & Games</i> , 2 nd Edition, Himalaya Publishing House , 2015
3.	John R. Schermerhorn, Richard N. Osborne, Mary Uhl-Bien; James G. Hunt , <i>Organizational Behavior</i> , 12 th Edition, Wiley India Pvt. Ltd, 2012
4.	Debra L.Nelson and James C. Quick , <i>Organizational Behavior</i> , Cengage Learning, India Edition, 2009
5.	Steven L. McShane and Mary Ann Von Glinow , <i>Organizational Behavior Essentials</i> , Tata McGraw Hill Publishing Company Ltd, 2007
6.	Jerald Greenberg , <i>Behavior in Organizations</i> , 10 th Ed, PHI Learning Pvt Ltd

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Subject Code	16B1NHS632	Semester: EVEN	Semester VI Session 2018-19 Month from Jan 2019 to June 2019
Subject Name	COGNITIVE PSYCHOLOGY		
Credits	3	Contact Hours	2-1-0
Faculty (Names)	Coordinator(s)	Dr. Ruchi Gautam Dr. Badri Bajaj	
	Teacher(s) (Alphabetically)	Dr. Badri Bajaj Dr. Ruchi Gautam	

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
304-4.1	Understand and apply the concepts of cognitive psychology in everyday life	Applying Level (C3)
304-4.2	Analyze the different models of various cognitive processes	Analyzing Level (C4)
304-4.3	Evaluate cognitive psychology issues and recommend possible solutions	Evaluating Level (C5)
304-4.4	Evaluate interventions/solutions for self-development through cognitive processes	Evaluating Level (C5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction to Cognitive Psychology	Historical Background: Emergence of modern cognitive Psychology; Approaches: Information Processing and	3

		PDP Model; Research Methods	
3.	Perceptual Processes	Perceptual learning and development; perception of shape, space and movement.	4
3.	Attention	Selective Attention and Divided Attention: Meaning, Definition and Theories.	4
4.	Memory	Short Term Memory	3
5.	Imagery	Properties of mental images; Representation of images and cognitive maps.	3
6.	Language	Structure of language and its acquisition, speech perception, factors affecting comprehension.	4
7.	Thinking and Problem Solving	Types of thinking; Classification of problems; Problems solving approaches, Problems space theory by Newell and Simon, Creativity	4
8.	Decision Making	Logical reasoning types and errors in reasoning processes. Concept formation and categorization; Judgment and decision making	3

Total number of Hours

28

Evaluation Criteria

Components

Maximum Marks

T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Quiz , 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.	Ronald T. Kellogg, Fundamentals of Cognitive Psychology, 2 nd Ed., Sage Publishing, 2012
2.	Robert Solso, Otto Maclin, M. Kimberly Maclin, Cognitive Psychology, 8 th Ed., Pearson Education, 2013
3.	Kathleen M. Galotti, Cognitive Psychology, 5th Ed., Sage Publishing, 2014

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS636	Semester : Even	Semester VI Session 2018 -2019 Month from Jan 2019 to June 2019
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.	Understand 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.	Apply 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.	Analyse 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.	Evaluate 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.	Create 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	4
4.	Play & adaptations	The Pygmalion: George Bernard Shaw Hamlet : William Shakespeare	6
5.	Novel & Adaptations	Pride & Prejudice: Jane Austen The Kite Runner: Khalid Hossenni The Namesake: Jhumpa Lahiri The Godfather: Mario Puzo	12
Total number of Lectures			28

Evaluation Criteria

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

Recommended Reading material:

1.	Linda Hutcheon , <i>A Theory of Adaptation</i> , Routledge, 2006
2.	Mark William Roche , <i>Why Literature matters in the 21st Century</i> , 1 st edition, Yale University Press 2004
3.	George Bernard Shaw , <i>Pygmalion</i> , Electronic Version, Bartleby.com, New York, 1999
4.	Stanley Wills & Gary Taylor , <i>The Complete Works. The Oxford Shakespeare</i> (Compact ed.). Oxford: Clarendon Press. , 1988.
5.	Jhumpa Lahiri , <i>The Namesake</i> , 1 st Edition, Houghton Mifflin US, 2003
6.	Jane Austen , <i>Pride & Prejudice</i> , Reprint, Thomas Egerton, 2013
7.	Mario Puzo , <i>The Godfather</i> , 1 st Edition, G. P. Putnam's Sons , USA, 1969
8.	Khalid Hossenni , <i>The Kite Runner</i> , 1 st edition, Riverhead Books US,.2003

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12HS612	Semester : Even	Semester VI Session 2018 -2019 Month from Jan 2019 to June 2019
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 Building	Cyberbranding, Online brand presence and 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.	4
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	3

		the Indian Diaspora	
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 and Class Test)	
Total		100	

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

1.	Social Media Marketing A Strategic Approach, Melissa Barker, Donald Barker, Second Edition Cengage Learning ,2017.
2.	Digital Marketing ,Seema Gupta, First Edition ,Mc Graw Hill Education (India) Private Limited ,2018
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	19B12HS611	Semester : EVEN (specify Odd/Even)	Semester : VI Session 2018 -2019 Month from: January- June
Course Name	Econometric Analysis		
Credits	03	Contact Hours	2-1-0

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

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
C304-2.1	<i>Demonstrate</i> the key concepts from basic statistics to understand the properties of a set of data.	Understanding Level –(C2)
C304-2.2	<i>Apply</i> Ordinary Least Square method to undertake econometric studies.	Apply Level – (C3)
C304-2.3	<i>Examine</i> whether the residuals from an OLS regression are well-behaved.	Analyze Level – (C4)
C304-2.4	<i>Evaluate</i> 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)
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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 Relationship	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 (4 th ed.), New York: McGraw Hill.
2.	Greene, W.H. (2003), Econometric Analysis, New Jersey: Prentice Hall.
3.	Madala, G.S. (1992), Introduction to Econometrics (2 nd ed.), New York: Macmillan.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12HS611	Semester :EVEN	Semester VI Session 2018 -2019 Month from Jan 2019 to June 2019
Course Name	Marketing Management		
Credits	3	Contact Hours	2-1-0

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

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
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	Defining Marketing For 21 st Century The importance of marketing and marketing's role in	5

	Marketing	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	
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 Behavior	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 behavior 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 and Viva)
Total	100

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

1.	Kotler, Philip and Gary Armstrong, Principles of Marketing, 17 th Edition, New Delhi, Pearson Education, 2017.
2.	Kotler, Philip., and Kevin Lane Keller, Marketing Management, 15 th Edition, New Delhi, Pearson Education, 2014.
3.	Grewal D., &Levy Michael, Marketing, 5 th Edition, Mc graw Hill Education (India) Private Limited 2017.
4.	Winer, Russell S ., Marketing Management, 4 th Edition, Prentice Hall,2014.

**Detailed Syllabus
Lecture-wise Breakup**

Course Code	15B11CI611	Semester Even (specify Odd/Even)	Semester 6th Session 2018 -2019 Month from January
Course Name	Theory of Computation and Compiler Design		
Credits	4 (3-1-0)	Contact Hours	4

Faculty (Names)	Coordinator(s)	Ambalika Sarkar...
	Teacher(s) (Alphabetically)	Mukta Goel Sanjeev Patel

COURSE OUTCOMES		COGNITIVE LEVELS
C314.1	Understand the regular expression, regular languages, context free languages and its acceptance using automata.	Understand level (C2)
C314.2	Identify the phases of compilers for a programming language and construct the parsing table for a given syntax	Apply Level (C3)
C314.3	Build syntax directed translation schemes for a given context free grammar by analyzing S-attributed and L-attributed grammars.	Analyze Level (C4)
C314.4	Construct grammars and machines for a context free and context sensitive languages.	Apply Level (C3)
C314.5	Generate the intermediate code and utilize various optimization techniques to generate low level code for high level language program.	Apply Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Unit-1	Finite automata: Review of Automata, its types and regular expressions, Equivalence of NFA, DFA and ϵ -NFA, Conversion of	14

		automata and regular expression, Applications of Finite Automata to lexical analysis. [14 L]	
2.	Unit-2	PDA and Parser: Push down automata, Context Free grammars, top down and bottom up parsing, YACC programming specification [12 L]	12
3.	Unit-3	Chomsky hierarchy and Turing Machine: Chomsky hierarchy of languages and recognizers, Context Sensitive features like type checking, Turing Machine as language acceptors and its design.[6L]	6
4.	Unit-4	Code generation and optimization: Syntax directed translation, S-attributed and L-attributed grammars, Intermediate code generation, type conversions, and equivalence of type expression, Code generation and optimization. [10L]	10
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignments : 10 Quizzes/Tutorial : 10 Attendance : 5)	
Total		100	

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

Text Book(s):

1. Peter Linz, "An Introduction to Formal Languages and Automata," 3rd Edition, Narosa Publisher 2005.
2. Alfred Aho, Monica S. Lam, Ravi Sethi, and Jeffrey D. Ullman, "Compilers: principles, techniques, and tools," 2nd Edition, Pearson Education

Reference Book(s):

3. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", 2nd Edition, Pearson Education Asia 2002
4. K. L. P. Mishra, N. Chandrasekaran, "Theory of Computer Science Automata, Languages and Computation", 3rd Edition, PHI 2007
5. John C. Martin, "Introduction to Language and the Theory of Computation", TMH 2004
6. S.P.Eugene, "Theory of automata, formal language and computation", New Age International Publishers , New Delhi 2003
7. Sipser, M., Introduction to the Theory of Computation, Second Edition, Thomson Course Technology, 2007
8. ACM Transactions on Computation Theory

9.	ACM Journal on Theory of Computation.
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Detailed Syllabus
Lecture-wise Breakup

Course Code	15B22CI621	Semester : Even	Semester 6th Session 2018 -2019 Month from Jan 19 to June 19
Course Name	Data Mining And Web Algorithms		
Credits	3	Contact Hours	4(3+1)

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

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, Data Integration and transformation, Data reduction	06
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. Applications of clustering.	08
6.	Web algorithms:	Web algorithms: Link Based Search Algorithm, Web Crawling, Indexing, Searching, Zone Indexing, Term-Frequency, Link Analysis Algorithm.	04
7.	Ranking Algorithms:	Ranking Algorithms: Page rank, Hits ranking algorithms	03
8	Web caching Algorithm :	Web caching Algorithm : LRV, FIFO, LRU, Random, OPT	03
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)	
	Jiawei Han, Micheline Kamber, Data Mining, Morgan Kaufmann Publishers,Elsevier,2005
	Kimball R. and Ross M ,The Data Warehouse Toolkit”, Wiley
	Pujari, Arun K,Data mining and statistical analysis using SQL, Universities press
	Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining
	Soumen Chakrabarti, Mining the Web: Discovering knowledge from hypertext data”, Morgan Kaufmann, Elsevier
	Alex, Berson,Stephen J.Smith, Data Warehousing, data mining and OLAP , McGraw-Hill,2004
	Inmon W.H.,Building the Data Warehouse ,4th Edition, Wiley
	Anahory S. and Murray D, Data Warehousing in the Real World, Addison-Wesley
	Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Prentice Hall,2003
	Mattison R. ,Web Warehousing and Knowledge Management”, Tata McGraw-Hill.
	David Hand, Heikki Mannila and Padhraic Smyth ,Principles of Data Mining,PHI
	Transactions on Database Systems (ACM)
	IEEE Transactions on Knowledge & Data Engineering
	The VLDB Journal The International Journal on Very Large Data Bases

Detailed Syllabus
Lab-wise Breakup

Course Code	15B28CI681	Semester Even	Semester VI Session 2018 -2019
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			Month from Jan – June 2019
Course Name	Data Mining And Web Algorithms Lab		
Credits	0-0-1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Dr Dharmveer Singh Rajpoot
	Teacher(s) (Alphabetically)	Dr. Dharmveer Singh Rajpoot, Mr. Mahendra Gurve

COURSE OUTCOMES		COGNITIVE LEVELS
C375.1	Apply the data pre-processing techniques on the dataset to handle missing information, duplicate information etc.	C3
C375.2	Implement association rule mining techniques like Apriori and FP-Growth to analyze frequent and interesting patterns in the transactional data.	C3
C375.3	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.	C3
C375.4	Implement and validate the Clustering methods and outcomes of different methods like partitioning, hierarchical and density based clustering using SSE.	C5
C375.5	Analyze the link structure of web using page rank and HITS algorithms.	C4
C375.6	Develop a project using data mining technique to solve the real world problems like fraud detection, hand writing recognition, stock prediction etc.	C5

Module No.	Title of the Module	List of Experiments	CO
1.	Data Preprocessing	Explore the various data mining tools. Apply Data pre-processing i.e. Cleaning, Integration, and Missing Value etc. Perform Data Similarity Measure (Euclidean, Manhattan Distance). Implement Jaccard coefficient for documents similarity.	C3
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.	C3
3.	Clustering	Develop K-Means Algorithm to generate clusters. Develop K-Medoids Algorithm to generate clusters. Develop Hierarchical Approach to generate clusters.	C5
4.	Classification	Do Practice of Decision Tree Algorithm for classification. Implement ID3, C4.5 and Naïve Bayes.	C3
5.	Validity Measures	Implement Validity Measures to evaluate the quality of Data Mining Algorithms.	C5
6.	Web Application	Analyze the link structure of web using page rank algorithms. Analyze the link structure of web using HITS algorithms.	C4
Evaluation Scheme		Lab Test 1 Lab Test 2 Day-to-Day (Evaluations , Project, Attendance)	20 20 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)

1.	Jiawei Han, Micheline Kamber, Data Mining, Morgan Kaufmann Publishers,Elsevier,2005
2.	Kimball R. and Ross M ,The Data Warehouse Toolkit”, Wiley
3.	Soumen Chakrabarti, Mining the Web:Discovering knowledge from hypertext data”, Morgan Kaufmann, Elsevier
4	Alex, Berson,Stephen J.Smith, Data Warehousing, data mining and OLAP , McGraw-Hill,2004
5.	Inmon W.H.,Building the Data Warehouse ,4 th Edition, Wiley
6.	Anahory S. and Murray D, Data Warehousing in the Real World, Addison-Wesley
7.	Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Prentice Hall,2003
8.	Mattison R. ,Web Warehousing and Knowledge Management”, Tata McGraw-Hill.
9.	David Hand, Heikki Mannila and Padhraic Smyth ,Principles of Data Mining,PHI
10.	Pujari, Arun K,Data mining and statistical analysis using SQL, Universities press
11.	Transactions on Database Systems (ACM)
12.	IEEE Transactions on Knowledge & Data Engineering
13.	The VLDB Journal The International Journal on Very Large Data Bases

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NCI643	Semester EVEN, 2019	Semester VI Session 2018 -2019 Month from January to June
Course Name	Computational Intelligence		
Credits	4	Contact Hours	3+1

Faculty (Names)	Coordinator(s)	Parul Agarwal
	Teacher(s) (Alphabetically)	Parul Agarwal

COURSE OUTCOMES		COGNITIVE LEVELS
C330-1.1	Infer vagueness, ambiguity and uncertainty in natural language using fuzzy logic concepts.	Understanding Level- (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 (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	9
5.	Evolutionary Computations	Introduction to evolutionary computing: GA, DE, PSO, ACO.	8

6.	Intelligent Systems	Hybrid Intelligent systems: Evolutionary algorithms in designing neural networks, Evolutionary algorithms vs. fuzzy system Neuro Fuzzy Systems concepts and applications	9
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.	Ross, Timothy J. <i>Fuzzy logic with engineering applications</i> . John Wiley & Sons, 2005.
2.	Poole, David Lynton, Alan K. Mackworth, and Randy Goebel. <i>Computational intelligence: a logical approach</i> . Vol. 1. New York: Oxford University Press, 1998.
3.	Jang, Jyh-Shing Roger, Chuen-Tsai Sun, and Eiji Mizutani. "Neuro-fuzzy and soft computing; a computational approach to learning and machine intelligence." (1997).
4.	Konar, Amit. <i>Computational intelligence: principles, techniques and applications</i> . Springer Science & Business Media, 2006.
5.	Rutkowski, Leszek. <i>Computational intelligence: methods and techniques</i> . Springer Science & Business Media, 2008.
6.	Eberhart, Russell C., and Yuhui Shi. <i>Computational intelligence: concepts to implementations</i> . Elsevier, 2011.
7.	Fulcher, John. "Computational intelligence: an introduction." In <i>Computational intelligence: a compendium</i> , pp. 3-78. Springer, Berlin, Heidelberg, 2008.
8.	Cox, Earl, Michael O'Hagan, Rodman Taber, and Michael O'Hagen. <i>The fuzzy systems handbook with cdrom</i> . Academic Press, Inc., 1998.
9.	Haykin, Simon. <i>Neural networks: a comprehensive foundation</i> . Prentice Hall PTR, 1994.
10.	De Jong, Kenneth A. <i>Evolutionary computation: a unified approach</i> . MIT press, 2006.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NCI631	Semester Even (specify Odd/Even)	Semester VI Session 2019-2020 Month from Jan 2019
Course Name	Advanced Data Structures and Applications		
Credits	4	Contact Hours	3-1-0

Faculty (Names)	Coordinator(s)	Mr. Prantik Biswas, Prof. Krishna Asawa
	Teacher(s) (Alphabetically)	Prof. Krishna Asawa, Mr. Prantik Biswas, Mr. Vimal Kumar K

COURSE OUTCOMES: At the completion of the course, students will be able to		COGNITIVE LEVELS
C330-2.1	Comprehend insights of various variants of string processing and space partitioning data structures.	Understand level (Level 2)
C330-2.2	Build efficient storage and sorting mechanisms for large data with the help of k-way merge-sort algorithm.	Apply Level (Level 3)
C330-2.3	Analyse various advanced data structures- BST Variants, Heap variants, Indexed Trees, Disjoint Set etc.	Analyse Level (Level 4)
C330-2.4	Compare performance of various Hashing algorithms.	Evaluating Level (Level 5)
C330-2.5	Propose solutions for the real life problems with the aid of suitable data structures.	Creating Level (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Amortized Analysis	Aggregate, Accounting and Potential Method, Dynamic tables	3
2.	External Sorting	Introduction to external sorting. Selection trees & k-way merging. Run generation. Optimal merging of runs.	3
3.	Binary Trees Variants	Optimal Binary Search Tree, Splay tree, AA-Tree, Treap.	5
4.	Indexed Tree	T-tree, Dancing tree, Queaps	3

5.	String Processing Data Structures	Rope, Tries, Suffix Tree, Ternary search tree, Gap buffer	4
6.	Disjoint Set Data Structures	Disjoint-set operations, representation of disjoint sets, Disjoint-set forests	6
7.	Heaps	Pairing heap, Beap, Leftist tree.	3
8.	Space partitioning tree	Binary space partitioning, KD tree, Quad tree, Interval Tree, Segment Tree, Priority Search Tree.	6
9.	Hashes	Introduction, Perfect hash function - Cuckoo hashing, Coalesced hashing, Universal Hashing.	5
10.	Applications	Searching, Memory Indexing, Computer Graphics, Image Data Structures, Computational Biology.	4
Total number of Lectures			42

Evaluation Criteria

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

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

1	Hanan Samet: Foundations of Multidimensional and Metric Data Structure, Morgan Kaufman, 2006
2	Kurt Mehlhorn: Data Structures and Algorithms 3, Springer, 1984
3	Dinesh P Mehta, Sartaj Sahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004
4	Langsam, Augenstein, Tenenbaum: Data Structures using C and C++, 2nd Edition, PHI, 2001
5	Sahni: Data Structures, Algorithms and applications in C++, Universities press, Hyderabad, 2005
6	Kruse, Tonso, Leung: Data Structures and Program Design in C, 2rd Edition, Pearson Education Asia, 2002
7	Weiss, Mark Allen: Data Structures and Algorithm Analysis in C/C++, 2nd Edition, Pearson Education Asia, 2003
8	Cormen et al: Introduction to Computer Algorithms, 2nd edition , PHI New Delhi 2003
9	Aho, Hopcraft, Ullman: Data Structures and Algorithms, Pearson Education Asia (Adisson Wesley), New Delhi, 2001
10	Standish: Data Structures in Java, Pearson Education Asia (Adisson Wesley), New Delhi, 2000
11	Knuth: The Art of Computer programming Vol I, Vol III, 2nd edition , Pearson Education Asia (Adisson Wesley), New Delhi, 2002
12	Heileman: Data Structures, Algorithms and Object Oriented Programming, Tata Mc-Graw Hill, New Delhi, 2002
13	Sorenson and Tremblay: An Introduction to Data Structures with Algorithms, 2nd Edition, Tata Mc-Graw Hill, New Delhi, 2003

**Detailed Syllabus
Lecture-wise Breakup**

Course Code	19B12CS312	Semester Even (specify Odd/Even)	Semester VI Session 2018 -2019 Month: from January 2019
Course Name	Blockchain Technology		
Credits	3	Contact Hours	42

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

COURSE OUTCOMES		COGNITIVE LEVELS
C330-5.1	Define all the basic terminologies related to blockchain, bitcoin, decentralized applications and smart contracts.	Remember Level (Level 1)
C330-5.2	Understand the pillar security featured in decentralized networks like cryptography, digital signatures, proof of work and consensus algorithms.	Understand Level (Level 2)
C330-5.3	Identify the feasibility of applying blockchain security features in real world scenarios using different consensus algorithms.	Apply Level (Level 3)
C330-5.4	Analyze various consensus algorithms like PoW, PoS, PoB, Raft consensus, Paxos consensus, BFT etc.	Analyze Level (Level 4)

C330-5.5	Evaluation of blockchain based consensus algorithms namely Byzantine fault tolerance, proof of work etc.	Evaluate Level (Level 5)
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Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Blockchain defined	We will introduce and define blockchain, explain the structure and operational aspects of Bitcoin blockchain, and compare different types of blockchains.	8
2.	Ethereum Blockchain	We will discuss the innovation of the Ethereum blockchain, review its protocol, and explore the payment model for code execution.	6
3.	Algorithms & Techniques	We will discuss the concept of asymmetric key encryption, define the concept of hashing, and explain techniques that use algorithms to manage the integrity of transactions and blocks in blockchain.	6
4.	Trust Essentials	The purpose of this module is to introduce the reasons for a smart contract and its critical role in transforming blockchain technology from enabling decentralized systems. We will explore the 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.	7
5.	Smart Contract Basics	The purpose of this module is to introduce the reasons for a smart contract and its critical role in transforming blockchain technology from enabling decentralized systems. We will explore the 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.	7
6.	Decentralized Applications (Dapps)	We will explore the notion of the blockchain server as the foundation for a Decentralized Application. We will demonstrate how to install the 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.	4
7.	Current challenges and solutions	We will explore just a few of the 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 , Assignment and Quiz)
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	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

Detailed Syllabus
Lecture-wise Breakup

Subject Code	16B1NCI642	Semester (Even)	Semester VI Session 2018 - 19 Month from January to May
Subject Name	Wireless Networks		
Credits	3+1	Contact Hours	3 Lectures +1 Tutorial
Faculty	Coordinator(s)	Dr. Gagandeep Kaur	

(Names)	Teacher(s) (Alphabetically)	1. Dr. Gagandeep Kaur
COURSE OUTCOMES		COGNITIVE LEVELS
C330-6.1	Define basic concepts & terms related to IEEE 802.11 wireless networks	Remember Level (Level 1)
C330-6.2	Explain cellular concepts of mobile radio propagation in wireless networks, IEEE 802.11 adhoc routing protocols and transport layer protocols	Understand Level (Level 2)
C330-6.3	Identify different categories and design issues of IEEE 802.11 MAC protocol	Apply Level (Level 3)
C330-6.4	Analyze metrics of MAC & Mobile IP based routing protocols using simulators	Analyze Level (Level 4)
C330-6.5	Evaluate various security parameters in wireless networks	Evaluate Level (Level 5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
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-access 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 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	8
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 (Assignments+Attendance)	
Total		100	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Matthew Gast, 802.11 Wireless Networks: The Definitive Guide , O'Reilly .
2	C. Siva Ram Murthy, B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols, Prentice Hall Communications Engineering and Emerging Technologies Series
3.	James F. Kurose, Keith W. Ross, ‘Computer Networking : A Top-Down Approach, 6 th Edition, Pearson
4.	Ivan Marsic , Wireless Networks: Local and Ad Hoc Networks, 1 st Ed., Prentice-Hall, Englewood Cliffs, NJ, 1995.
5.	Nupur Prasad Giri, Wireless Technology, Dreamtech Engineering Textbooks
6.	Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, ‘Wireless and Mobile Networks: Concepts and Protocols, 1 st Edition, Wiley
7.	IEEE, ACM Transactions, Journals and Conference papers on “Wireless Communications & Networking.”
8.	NS2 Simulator, https://www.isi.edu/nsnam/ns/

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NCI634	Semester Even (specify Odd/Even)	Semester: VIth Session 2018 -2019 Month from January to May
Course Name	Agile Software Development		
Credits	4	Contact Hours	4

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

COURSE OUTCOMES		COGNITIVE LEVELS
C330-7.1	Interpret the trade-offs between traditional software development methods and agile software development methods for a software project effectively.	Understand level (Level 2)
C330-7.2	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)
C330-7.3	Apply Refactoring techniques on source code for improved design	Apply Level (Level3)
C330-7.4	Choose tools and construct the methods for testing Agile projects using various testing strategies	Apply level (Level3)
C330-7.5	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,	4

		family members, Crystal's seven properties, Crystal clear development process cycle, Crystal yellow, crystal orange and crystal orange web.	
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 refactoring	7
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.	Cohn, Mike. Agile estimating and planning. Pearson Education
2.	Beck, Kent. Extreme programming explained: embrace change. Addison-wesley professional
3.	Martin, Robert C. Agile software development: principles, patterns, and practices. Prentice Hall.
4.	Shore, James. The Art of Agile Development: Pragmatic guide to agile software development. " O'Reilly Media, Inc."
5.	Schwaber, Ken. Agile project management with Scrum. Microsoft press
6.	Stellman, Andrew, and Jennifer Greene. Learning agile: Understanding scrum, XP, lean, and kanban. " O'Reilly Media, Inc."
7.	Cohn, Mike. User stories applied: For agile software development. Addison-Wesley Professional

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NCI633	Semester Even (specify Odd/Even)	Semester VI Session 2018 -2019 Month from January-June
Course Name	Introduction to Mobile Application Development		
Credits	3	Contact Hours	3(Lectures) + 1 (Tut)

Faculty (Names)	Coordinator(s)	Arpita Jadhav Bhatt
	Teacher(s) (Alphabetically)	Arpita Jadhav Bhatt, Mradula Sharma

COURSE OUTCOMES		COGNITIVE LEVELS
C330-8.1	Analyze functional aspects of Android mobile operating system for developing Android applications	Analyze Level (Level 4)
C330-8.2	Explain how Android applications work, their life cycle, manifest, Intents, event handling and using external resources	Understand Level (Level 2)
C330-8.3	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)
C330-8.4	Make use of Google Map API to develop location aware services through Internet for mobile environments	Apply Level (Level 3)
C330-8.5	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	8

		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,	
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 swipes, pinch, zoom etc. Adapter classes, model classes	10
4.	Designing and handling Graphical User Interface –II	Part 1: 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 –II	Part 2: 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 (Project:15, Class Test:5, Attendance:5)
Total	100

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

1.	Griffiths D, Griffiths D. Head First Android Development: a brain-friendly guide. " O' Reilly Media, Inc."; 2017 Aug 9.
2.	Burd BA. Android application development all-in-one for dummies. John Wiley & Sons; 2015 Jul 9.
3.	Annuzzi Jr J, Darcey L, Conder S. Introduction to Android application development: Android essentials. Pearson Education; 2014.
4.	Meier R. Professional Android 4 application development. John Wiley & Sons; 2012.
5.	Lee WM. Beginning android 4 application Development. John Wiley & Sons; 2012 Feb 3.
6.	Darcey L, Conder S. Sams Teach Yourself Android Application Development in 24 Hours: Sams Teac Your Andr Appl D_2. Pearson Education; 2011 Jul 25.
7.	Felker D. Android application development for dummies. John Wiley & Sons; 2010 Nov 17.
8.	Murphy, M. L. "The Busy Coder's Guide to Advanced Android Development: CommonsWare." (2009).
9.	Hashimi SY, Komatineni S. Pro Android. Apress; 2009 Jun 22.
10.	Rogers R, Lombardo J, Mednieks Z, Meike B. Android application development: Programming with the Google SDK. O'Reilly Media, Inc.; 2009 May 26.

11.	https://developer.android.com
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Detailed Syllabus

Subject Code	19B16CS311	Semester odd	Semester Sixth Session 2018- 2019
Subject Name	Neural network Workshop		
Credits	0-0-4	Contact Hours	4 lab hours

Faculty (Names)	Coordinator(s)	Anuja Arora		
	Teacher(s) (Alphabetically)	Anuja Arora	Archana Purwar	Pawan Upadhay Ankit Vidhyarthi

SNO	Description	Cognitive Level (Bloom Taxonomy)
C305-8.1	Understand the fundamentals and concepts of neural network, neural network architectures, and its paradigm.	Understand Level (Level 2)
C305-8.2	Apply the neural network to solve practical problems	Apply Level (Level 3)
C305-8.3	Examine the engineering applications that can learn using neural networks	Evaluate Level (Level 5)

C305-8.4	Implement Neural network in context of problem solving and modelling in python	Analyze Level (Level 4)
C305-8.5	To develop neural network applications on real-world tasks	Create Level (Level 6)

Module No.	Subtitle of the Module	Topics in the module	No. of Labs for the module
1.	Overview of classification and Regression	Linear Regression, Multiple Linear Regression, KNN classifier, SVM Classifier	4
2.	Neural Fundamental Concept	Neuron models, basic Learning rules, Single Neuron NN, Single layer neural network, Activation Function, Two Layer Neural Network, error function	4
3	Basic neural network models	Multilayer Perceptron Learning Algorithm, Stochastic gradient descent, Forward Propagation, Backpropagation, Real life case studies	8
4	Other Neural network models	Associative memory, Self-organizing feature map, Neural network decision tree, Data visualization with self-organizing feature map	6
5	Convolution Neural Network	Fundamentals of convolution Neural network and Object detection, introducing tensor flow and keras libraries for CNN, neural style transfer Case studies of Convolution neural network.	6
Total number of Lectures			28

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. Haykin, Neural Networks: A Comprehensive Foundation 2nd edition, (Prentice Hall, 1999)
2.	Rajasekaran, S., & Pai, G. V. (2003). Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd..
3.	C. Looney, Pattern Recognition Using Neural Networks, Oxford University Press, 1997
4.	Hagan, M. T., Demuth, H. B., Beale, M. H., & De Jesús, O. (1996). Neural network design (Vol. 20). Boston: Pws Pub..
5.	Sivanandam, S. N., & Deepa, S. N. (2007). Principles of Soft Computing (With CD). John Wiley & Sons.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B16CS312	Semester Even (specify Odd/Even)	Semester VI Session 2018 -2019 Month from Jan-Jun
Course Name	R Programming Workshop		
Credits	0	Contact Hours	1-0-2 (3 hrs per week)
Faculty (Names)	Coordinator(s)	Megha Rathi	
	Teacher(s) (Alphabetically)	Dr. Adwitiya Sinha, Kirti Aggarwal, Megha Rathi	
COURSE OUTCOMES			COGNITIVE LEVELS

C305-9.1	Define all tools and techniques used for Data Mining and Analysis. Explain the basic & core concept of R	Understand Level (Level 2)
C305-9.2	Develop code for data extraction & loading. Apply data pre-processing techniques and build predictive model	Apply Level (Level 3)
C305-9.3	Choose Data Visualization techniques for graphical representation of results	Apply Level (Level 3)
C305-9.4	Analyze the results. Compare and contrast the results obtained to discover new pattern insight in data.	Analyze Level (Level 4)
C305-9.5	Design predictive models and techniques towards research initiatives	Create Level (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to R	Introduction to R, Installation, Getting Started ,Some Information on R Commands, Objects,Functions, Number & Vector, Matrices & Array,Factors, Conditional Statements, Loop, Scripts, R package.	1+3
2.	List , Data Frames & String Handling	Introduction, Creating a List, List Operation, Recursive List, Introduction to Data Frame, Creating Data Frame, Data Frame Operations, lapply() and sapply() functions. Introduction to String handling, String functions, String Manipulation, Regular Expressions & Pattern Matching, and Introduction to “stringr” package.	2+3
3.	Object Oriented Programming	Introduction, Object Oriented Programming Concepts, S3 classes, S4 classes, Reference Classes.	1+3
4.	Import & Export	Introduction, Saving & Loading R data, Import and Export to different file formats: Excel File, Binary File, XML File, JSON File. Analyzing data & Reshaping the data.	1+3
5.	R-working with database (Mysql + Hadoop)	Introduction to Databases, Introduction to SQL Commands, RMySQL Package, Connecting R to MySQL ,Import Table, Querying Data, Export data to MySQL , Disconnect Function. Introduction to Hadoop, Import and Export data (Hadoop)	2+4
6.	Data Preprocessing using R	Data Pre-processing, forms of Data Pre-processing, Data Cleaning Techniques, Data Redundancy- chi square test, correlation analysis, covariance coefficient, Data Transformation, Data Reduction- Principal Component Analysis, R packages for Data Pre-processing.	2+4
7.	Data Visualization	Visual Representation of statistical analysis, High level plotting commands- create plots with axes, titles, labels and others on the graphics device and Low level plotting commands- add new features like extra labels, point or line. Plots, Histogram, Scatter Plots, Pie chart, Box Plot, QQ Plot, customized Plotting. Introduction to data visualization packages: Ggobi & ggplot.	2+3
8	Classification and Clustering Algorithm	Classification Techniques: Introduction to Classification, Regression, Naïve Bayes, Decision Tree, KNN, Ensemble Methods. Clustering Techniques: Introduction to Clustering, K-means, Hierarchical Clustering, DB Scan.	3+4
9	Data Analytics	Tools for Data Analytics by integrating R with Android or web Interface, Introduction to shiny Package.	1+3

Total number of Lectures			45
Evaluation Criteria			
Components	Maximum Marks		
Lab Test1	30		
End Semester Examination	40		
TA	30 (Quiz + Evaluative Assignment + Class Test + 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.	Paul Teetor.R Cookbook - Proven Recipes for Data Analysis, Statistics, and Graphics. O'Reilly, 2011.
2.	Alain F. Zuur, Elena N. Ieno, and Erik Meesters. A Beginner's Guide to R. Use R. Springer, 2009. ISBN: 978-0-387-93836-3.
3.	John Maindonald and John Braun. Data Analysis and Graphics Using R. Cambridge University Press, Cambridge, 2nd edition, 2007. ISBN 978-0-521-86116-8.
4.	Advanced R, by Hadley Wickham, ISBN 9781466586963.
5.	Using R for Introductory Statistics, by John Verzani, Chapman & Hall/CRC, 2004, ISBN 1584884509
6.	R Programming for Data Science, by Roger D. Peng,
7.	Phil Spector. Data Manipulation with R. Springer, New York, 2008. ISBN 978-0-387-74730-9.

Detailed Syllabus

Subject Code	18B16CS311	Semester: Even (specify Odd/Even)	Semester VI Session 2018-2019 Month from January'19 to June'19
Subject Name	Internet Of Things (Workshop)		
Credits	0-0-4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr K. Rajalakshmi
	Teacher(s) (Alphabetically)	Dr K. Rajalakshmi Dr. Prakash Kumar Ms. Purtee Kholi Mr. Vivek Kumar Singh

COURSE OUTCOMES		COGNITIVE LEVELS
C305-10.5.1	Define exiting IoT frameworks and techniques used for developing applications	Remember (level 1)
C305-10.5.2	Explain the uses of IoT edge devices & basic concept of Node-RED platform.	Understand (level 2)
C305-10.5.3	Develop Java Script based IoT applications using functional nodes , flows and dashboard on Node-RED platform	Apply (level 3)
C305-10.5.4	Evaluate the data gathered using Node-RED functionalities and choose appropriate graphical user interface to output the results.	Evaluate (level 5)
C305-10.5.5	Analyze various communication protocols, network connectivity, and cloud services using Node-RED platform.	Analyze (level 4)

Module No.	Subtitle of the Module	Topics in the module	CO
1.	Java scripts for inbuilt functional nodes and deploy it in Node-Red flows, types of Message	Setup and Install Node.js and Node-RED as IDE platform for IoT application development.	C1
2.		I/O nodes, flows, third party palettes, import/export of flows in Node-RED	C1,C2
3.	User defined functional nodes into Node-RED flows and FRED cloud and using various dashboard UI interfaces	Java scripts for user defined functional nodes and deploy it in Node-Red flows.	C2,C3
4.		User defined functional nodes into Node-RED flows and FRED cloud.	C2,C3
5.		UI modules for peripheral sensors and devices that can be controlled through smart phones and web pages	C2,C3
6.	MQTT brokers for publishing and subscribing between IoT sensors and devices.	MQTT brokers for publishing and subscribing between IoT sensors and devices.	C4,C5
7.	Using websocket for HTTP, TCP and UDP traffic flow in IoT applications.	HTTP, TCP and UDP traffic flow for IoT applications.	C4,C5
8.		Using WebSocket through internet and cloud platforms.	C4,C5
Total number of Lab hours			56

Evaluation Criteria	
Components	Maximum Marks
Mid Term Evaluation	30
D2D Evaluation	30 (Lab Evaluation (20) + Attendance (10))
Final Evaluation	40
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.	“Internet of Things: A Hands-on Approach”, by Arshdeep Bahga and Vijay Madisetti (Universities Press)
2.	“Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud” Cuno Pfister
3.	The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)
4.	https://www.raspberrypi.org/documentation/
2.	https://www.arduino.cc/en/Tutorial/HomePage
3.	https://nodered.org/docs/hardware/raspberrypi
4.	https://nodered.org/docs/getting-started/installation
5.	https://docs.oasis-open.org/mqtt/mqtt/v5.0/mqtt-v5.0.html
6.	https://mosquitto.org/

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B16CS312	Semester Even (specify Odd/Even)	Semester VI Session 2018 -2019 Month from Jan-Jun
Course Name	Data Analytics Workshop		
Credits	0	Contact Hours	1-0-2 (3 hrs per week)

Faculty (Names)	Coordinator(s)	Dr. Adwitiya Sinha
	Teacher(s) (Alphabetically)	Dr. Adwitiya Sinha, Megha Rathi

COURSE OUTCOMES		COGNITIVE LEVELS
C305-11.1	Demonstrate basic & advance facets of application-based data analytical tools & IDEs	Understand Level (Level 2)
C305-11.2	Apply large scale data spanning over complex structures	Apply Level (Level 3)
C305-11.3	Analyze benchmark methods for pre-processing, indexing, clustering and classification algorithms	Analyze Level (Level 4)
C305-11.4	Evaluate performance of innovated algorithms for application-specific target domains	Evaluation Level (Level 5)
C305-11.5	Design methods to yield required information from real-world data sources	Create Level (Level 6)
C305-11.6	Construct low-complexity computation framework for massive datasets	Create Level (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Data	Overview to Data & Analysis, Needs for Analytics, Data Visualization	1+0
2.	Analytical Tools	Matlab, Gephi, Netlogo, Python, R, Python, Libraries & Packages like – plotly, Matplotlib, Numpy, Pandas, Seaborn, Scikit-Learn, Scipy, BeautifulSoup, Bokeh, Urllib, PandaSQL, Basemap	1+6
3.	Data Collection & Extraction	Data Crawling, Data Scrapping, Real-time Data Extraction, Streaming Data, Authenticated Data Repositories	1+4
4.	Data Management	Data Mining & Management, Data Cleaning, Data Pre-processing, Spatial Data Representation, Demographic Analysis	1+4
5.	Descriptive & Inferential Statistics	Descriptive Statistics - Central Tendency & Data, Distribution & Dispersion, Random Variables, Probability Distribution, Inferential Statistics – Error Analysis, Confidence Intervals, Regression, Logistic	3+4
6.	Graph Analytics	Random Graphs, Bollobás Configuration Model, Isolation Probability, Giant Component, Strategic Networks, Game Theory, Big Data Analytics, Social Networks, Web Analytics, Google Analytics	3+4

7.	Supervised Learning	Linear Discriminant Analysis, Quadratic Discriminant Analysis, Classification Trees, Support Vector Machines, Random Forest	2+2
8.	Unsupervised Learning	Clustering, Divisive & Agglomerative Clustering, Density-based Clustering, Associative Rule Mining	1+2
9.	Deep Learning	Neural Networks, Feed Forward Neural Networks, Fuzzy Logic, Recurrent Neural Nets, Convolutional Neural Nets, Deep Neural Networks	1+2
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
Lab Test1		30	
End Semester Examination		40	
TA		30 (Quiz + Evaluative Assignment + Class Test + 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.	Data Analytics by Anil Maheshwar, McGraw Hill Education, 2017
2.	Data Smart: Using Data Science to Transform Information into Insight, by J. W. Foreman, Wiley 2013
3.	The Elements of Statistical Learning by Hastie, Trevor, Tibshirani, Robert, Friedman, Jerome, Springer, 2009
4.	Introduction to Statistical Learning by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Springer, 2017
5.	Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten, Eibe Frank, Mark A. Hall, The Morgan Kaufmann Series, Elsevier, 2011
6.	Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly, 2017
7.	Big Data at Work: Dispelling the Myths, Uncovering the Opportunities by Thomas H. Davenport, Harvard Business School Publishing Corporation, 2014
8.	Machine Learning by Tom Mitchell, McGraw Hill Education, 2017
9.	Advanced Analytics with Spark: Patterns for Learning from Data at Scale by Sandy Ryza, Uri Laserson, Sean Owen, Josh Wills, O'Reilly, 2017
10.	Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, by B. Baesens, Wiley, 2014
11.	Business UnIntelligence: Insight and Innovation Beyond Analytics and Big Data, by B. Devlin, Technics Publications, 2013

Detailed Syllabus
Lab-wise Breakup

Course Code	15B29CI691	Semester Even (specify Odd/Even)	Semester VI Session 2018 -2019 Month from Jan-June
Course Name	Minor Project (IT)		
Credits	5	Contact Hours	

Faculty (Names)	Coordinator(s)	Kirti Aggarwal
	Teacher(s) (Alphabetically)	Anuja Arora, Archana Purwar, Adwitiya Sinha, Gagandeep Kaur, Kirti Aggarwal, K. Rajalakshmi, Megha Rathi, Pawan Kumar, Prakash Kumar, Prashant Kaushik, Vikas Hassija

COURSE OUTCOMES		COGNITIVE LEVELS
C351.1	Compare and Contrast all tools and techniques to generate solution that meet specific need to solve complex problems.	Understand Level (Level 2)
C351.2	Identify, discuss and justify the technical aspects of the chosen project with a comprehensive and systematic approach	Apply Level (Level 3)
C351.3	Develop software systems that meet specified design and performance requirements that contributes to global, economic, environmental and social-context	Apply Level (Level 3)
C351.4	Evaluate & justify the proposed solution using appropriate learning strategies	Evaluate Level (Level 5)
C351.5	Design & develop integrated software models and techniques towards research initiatives	Create Level (Level 6)

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

3.
4.
5.
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<i>n.</i>

Evaluation Criteria	
Components	Maximum Marks
Synopsis	10
Mid-Term evaluation	40
Final evaluation	50
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	...
2.	...
3.	...
...	...
<i>m.</i>	...

Detailed Syllabus
Lab-wise Breakup

Course Code	19B13CS311	Semester Even	Semester 6th Session 2018 -2019 Month from Jan to Jul
Course Name	Blockchain& Cyber Security		
Credits		Contact Hours	4hrs

Faculty (Names)	Coordinator(s)	Dr. Gagandeep Kaur
	Teacher(s) (Alphabetically)	Dr. Gagandeep Kaur

COURSE OUTCOMES		COGNITIVE LEVELS
C305-7.1	Define all the basic terminologies related to blockchain, Cryptocurrencies and Smart contract mechanism	Remember Level (Level 1)
C305-7.2	Understand blockchain mechanisms, Proof-of-Work, Proof-of-Stake concepts, and Block Certs.	Understand Level (Level 2)
C305-7.3	Implement smart contracts based decentralized network processes; Identify and implement Cryptographic concepts of Blockchain	Apply Level (Level 3)
C305-7.4	Analyze blockchain technology for integrity and availability of the information, Test for the issues in the existing implementations of blockchain and consensus algorithms	Analyze Level (Level 4)
C305-7.5	Evaluate Blockchain based network protection	Evaluate Level (Level 5)

Module No.	Title of the Module	List of Experiments	CO
1.	Introduction to Blockchain & Cyber Security	1. Read and understand papers: Satoshi Nakamoto, Bitcoin, "A Peer-to-Peer Electronic Cash System" Michael Crosby, Nachiappan, Pradhan Pattanayak, Sanjeev Verma, Vignesh Kalyanaraman, "BlockChain Technology Beyond Bitcoin" Install node js Study and implement Constructor function in java script Study and implement Prototype object in java script	CO1
2.	Basics of Blockchain and Cryptocurrencies	Create the blockchain using the constructor functions and prototype objects install Postman Create an API using express framework of node js to interact with blockchain data structure, create three API methods for getting the current blockchain, posting transactions and mining a block Install body parser. Requests that we send using postman will go through this body parser, and we can use that data in the requests. Test post request using postman. Apply POST, SEND to check working of postman. Write code for allowing transactions through postman method. Write a new method to create new transactions. This method will take three parameters i.e amount, sender and receiver. All these transactions are pending transactions and are not recorded in any block. These transactions get mined and get added to the next block in that chain.	CO2
3	Science of Blockchain-I (POW, POS etc.)	Write a proof of work and proof of stake methods. PoW method validates that whatever transactions we are adding to the blockchain are valid. This method will take in the current block data, previous block hash and will think of a nonce, that should create a specific hash as output test the proof of work method, check that the block is valid, by using it in hash block method. Create a genesis block in blockchain data structure. Genesis block is the first block. It has no previous block hash. It doesn't include any transactions in genesis block, so it has no hash and we don't need to do any proof of work for this, so nonce is also not required	CO2, CO3
4	Science of Blockchain-II (Decentralization)	Create a decentralized network to host blockchain to have a look that how blockchain works in real world. Create a decentralized network by creating multiple instances of API. Each instance will represent a node in the blockchain network. These all nodes will work together to host our blockchain. Register the nodes to a network. For this we need to create three new end point in networkNodes.js. Synchronize the network, so that the copy of blockchain is same at all the nodes Update the mine end point, so that it broadcasts the newly created block to all the other nodes in the network and we need to broadcast the mining reward transaction to all nodes.	CO3, CO4
5	Smart Contracts (Solidity)	Build smart contract on Ethereum command line. Construct smart contract in javascript to connect front-end.	CO3
6	HyperLedger	Build your application with hyperledger technologies	CO4
7	Blockchain Security	Create a hash block method, that will take the block data as parameter and will hash the complete data into a 256 bit string. import it in blockchain Use library packages to generate private keys, Public Keys Generate Private Key WIF "wallet import format" Bitcoin wallet that to make transactions. Check address in blockchain.info to see balance. Use	CO2, CO4, CO5

		it to infer public key hash from node address Apply homomorphic encryption in python Apply homomorphic encryption in blockchain Read paper Decentralizing Privacy: Using Blockchain to Protect Personal Data (ZNP15) in the same folder	
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Evaluation Criteria

Components	Maximum Marks
Lab Test 1	20
Lab Test 2	20
Evaluation 1	15
Evaluation 2	30
Attendance	15
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.	Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton
2.	Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, Imran Bashir, Packt Publishing
3.	Bitcoin: A Peer-to-Peer Electronic Cash System, Satoshi Nakamoto
4.	Michael Crosby, Nachiappan, Pradhan Pattanayak, Sanjeev Verma, Vignesh Kalyanaraman, "BlockChain Technology Beyond Bitcoin
5.	Using Blockchain to Protect Personal Data, Guy Zyskind, et. al.
6.	IEEE Blockchain Initiative at https://blockchain.ieee.org/

Detailed Syllabus Lecture-wise Breakup

Course Code	19B13HS611	Semester: Even	Semester: VI Session: 2018 -2019 Month From Jan 2019 to June 2019
Course Name	Morality of Everyday Living and Moral Decision Making		
Credits	2	Contact Hours	1-0-2

Faculty (Names)	Coordinator(s)	Ms Puneet Pannu, Dr Deepak Verma
	Teacher(s) (Alphabetically)	Ms Puneet Pannu, Dr Ekta Srivastava, Dr Praveen Sharma, Dr Deepak Verma

COURSE OUTCOMES	COGNITIVE LEVELS
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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	UPSC Case Study Ethical Dilemma of a Marketing Manager	C305-3.2 C305-3.3

	Decision Making		
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 Study Assessment, Assignment, 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.	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

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B13HS612	Semester : Even	Semester VI Session 2018 -2019 Month from Jan 2019 to June 2019
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
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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 Control and special topics	Human Resources Audit, The Human Resource Information System (HRIS), Human Resources Accounting, Competency Management, Human Resource Management Practices in India, Internationalization of Human Resource Management Commonly Used Jargons.	2
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	C305-2.1, C305-2.2
2.	Self Branding and strategies to do well in Recruitment	Practical Sessions on Job Description, Job Specification and Self-Branding	C305-2.3, CO4

	and Selection		
3.	Personnel Development and your career	Practical Sessions on Johari Window-Knowing Thyself, Transaction Analysis-Parent, Child, Adult Ego State for effective interpersonal communication.	C305-2.1, C305-2.3
4.	Human Resource Evaluation and Compensation	Practical Sessions on HR Interview and Mock HR Interview	C305-2.2, C305-2.4
5.	Human Resource Control and special topics	Practical Sessions on Group Discussions and Mock Group Discussions	C305-2.2, C305-2.4

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. Pande and Basak, Human Resource Management- Text and Cases, Pearson, 2012

2. Dessler and Varkkey, Human Resource Management, Pearson, 2011

3. VSP Rao, Human Resource Management, Excel Books, 2007

4. Aswathappa, Human Resource Management, McGraw-Hill, 2010

5. Gary Dessler, Human Resource Management, Pearson/Prentice Hall, 2005

Detailed Syllabus Lecture-wise Breakup

Course Code	19B13BT311	Semester Even	Semester VI Session 2018 -2019
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		(specify Odd/Even)	Month from January-June
Course Name	Nanoscience in Food Technology		
Credits	2	Contact Hours	2

Faculty (Names)	Coordinator(s)	Prof. Sudha Srivastava
	Teacher(s) (Alphabetically)	Prof. Sudha Srivastava

COURSE OUTCOMES		COGNITIVE LEVELS
C305-1.1	Explain properties of nanoparticles and nanoemulsions	Understand Level (C2)
C305-1.2	Outline food processing, packaging and preservation	Understand Level (C2)
C305-1.3	Apply nanotechnology concepts to improve food quality, texture, and shelf life	Apply Level (C3)
C305-1.4	Apply concepts of nanoscience for improving agriculture yields	Apply Level (C3)
C305-1.5	Analyze food quality degradation and pathogens detection, using nanosensors	Analyze Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Nanomaterials	Introduction to nanomaterials, nanoemulsions, method of synthesis and identification of nanoemulsions	5
2.	Food Packaging and Preservation	Introduction to food processing, packaging and preservation. Modified atmosphere packaging, active packaging and intelligent packaging.	6
3.	Application of nanotechnology in Food and agriculture	Microemulsions for delivery of nutraceuticals, edible films and coating for food, Polymer nanocomposites, effect of nanomaterials on mechanical, thermal and barrier properties of polymers. Application of nanotechnology for pesticide delivery, nutrient uptake etc. Nanomaterials in Food-Health and Safety Issues	7
4.	Biosensors for monitoring food quality	Time temperature indicators, pathogen detection using biosensors, Pesticide detection using biosensor.	6
Total number of Lectures			24

Evaluation Criteria	
Components	Maximum Marks
Mid Term	30
End Term	40
TA	30 (Presentation, Class Test)
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	VellaichamyChelladurai, Digvir S. Jayas, 2018 Nanoscience and Nanotechnology in Foods and BeveragesCRC Press, ISBN 9781498760638

2.

Recent Research papers

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NMA633	Semester : Even	Semester VI Session 2018 -2019
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, efficiency, UMVUE, Cramer-Rao inequality, sufficiency, factorization theorem, completeness, Rao-Blackwell theorem.	10
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.		