Course Code		16B1NHS63	1	Semester E	ven	Semeste Month 1	er 6 th from J	Session 2 January 201	2018 -2019 19 to May 2019
Course Name		PROJECT MANAGEMENT							
Credits			3		Contact H	lours		2-1	-0
Faculty (N	ames)	Coordinato	r(s)	Dr. Santoshi S	engupta (Se	ec-62), Dr	. Deep	ak Verma (S	Sec-128)
		Teacher(s) (Alphabetica	ally)	Dr. Deepak Ve	erma, Dr. Sa	intosh De	v, Dr.	Santoshi Se	ngupta
COURSE	OUTCO	OMES						COGNIT	IVE LEVELS
304-5.1	Apply objecti	the basic conc ves, life cycle,	epts of p model a	project managem	ent such as t, in a given	features, context		Apply Lev	vel (C3)
304-5.2	Analyz various in orde	ze projects and s theoretical fra er to make corr	their as ameworl ect sele	sociated risks by ks, non-numeric ction decisions	understand al and nume	ling the erical mod	lels	Analyze L	evel (C4)
304-5.3 Evaluate the various determine correct tec terminating the projection		te the various ine correct tec ating the project	stages of hniques cts	f project manage for planning, sc	ement and ic heduling, co	lentify an ontrolling	d and	Evaluate Level (C5)	
304-5.4 Evaluate project mar to achieve overall pro		nagement processes, tools and techniques in order ject success			Evaluate Level (C5)				
Module No.	Title o Modu	of the le	the Topics in the Module			No. of Lectures for the module			
1.	Project Manag Introdu	t gement: uction	nt: Characteristics of project; Life Cycle of Project; Project Model; Project Management as discipline; Contemporary aspects of Project Management				4		
2.	Project	ect 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 PlanningPure 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 M	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 and Re Alloca	t Scheduling esource tion	Theore AOA a Crashi Resour	etical aspects-In and AON charts ng of Projects- rce Leveling and	nportance, s, Probabilit - Time and l Loading.	Focus A y Analys d Cost t	rea-PE is, Ga radeof	ERT/CPM, ntt Charts, f, Basics-	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					
Eval	uation Criteria				
Components Maximum Marks					
T1	-	20			
T2		20			
End	Semester Examination	35			
TA		25 (Assignment, Project, Oral Questions)			
Tota	1	100			
			·		
Reco Refe	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				

3	Vohra, N. D., Quantitative Techniques in Management, 3 rd Edition, Tata McGraw Hill Publishing
5.	Company, 2007

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

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

		Terry and Bill George; Authentic Leadership: Trust and Ethics, Dimensions of Trust, Counseling & Mentoring	
5.	Power & Politics	Concept of Power; Sources of Power Contingencies of Power; Power Tactics; Measuring Power Bases: Power Authority Obedience Organizational Politics: Types Factors contributing to Political Behavior; Consequences & Ethics of Politics	5
6.	Employee Engagement	Creating a Culture of Engagement, Models of engagement, Benefits of Employee Engagement, Gallup Study, Methods of engaging employees – from entry to exit, Managers Role in Driving Engagement	2
7.	Organizational Culture & Workplace Spirituality	Creating Organizational Culture Approaches to Organizational Culture; How employees learn culture; Measuring Organizational Culture; Spirituality & Organizational Culture	3
8.	Organizational Change & Development	Organizational Change: Meaning & Types; Technology & Change; Resistance to Change v/s Inviting Change; Approaches to Organizational Change; Planning & Implementing Change; Organizational Development; OD Interventions & Change	3
		Total number of Lectures	28
		Evaluation Criteria	
Components T1 T2 End Semester Examination TA Total		Maximum Marks 20 20 35 25 (Oral Questions, Assignment, Project) 100	

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

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

Subject Code	16B1NHS632		Semester: EVEN	Semester VI	Session 2018-19	
				Month from Jan 20	019 to June 2019	
Subject Name	COGNITIVE PSY	CHO	DLOGY			
Credits	3		Contact Hours	2-1-0		
Faculty	Coordinator(s)	Dr.	. Ruchi Gautam Dr. Badri Bajaj			
(Names)	Teacher(s) (Alphabetically)	Dr. Dr.	Badri Bajaj . Ruchi Gautam			

COURSE	OUTCOMES	COGNITIVE LEVELS
After pursu	ing 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 PDP Model; Research Methods	3
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	Types of thinking; Classification of	4

	Solving	problems; Problems solving approaches, Problems space theory by Newell and Simon, Creativity	
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
	Ev	aluation Criteria	
Components	Maximum Ma	arks	
T1	20		
T2	20		
End Semester E	xamination 35		
ТА	25 (Assignm	ent, 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		

Course Code	19B12HS612	Semester : Even		Semeste Month f	er VI Session 2018 -2019 From Jan 2019 to June 2019
Course Name	Social Media and Socie	ety			
Credits	3	Contact H		Iours	2-1-0
Faculty (Names)	Coordinator(s)	Dr. Shirin Alavi			
	Teacher(s) (Alphabetically)	Dr. Shirin Alavi			

COURSE O	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)

Mod ule 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 the Indian Diaspora	3	
8.	Integrating Mobile into Social Media Marketing	Types of Mobile Marketing, Progression of the mobile as a Marketing channel, some Indian mobile marketing campaigns, Impact of Social Media on government, the economy, development, and education	2	
	Tota	al number of Lectures	28	
Evaluation CriteriaComponentsMaximum MarksT120T220End Semester Examination35TA25 (Assignment and Class Test)Total100				
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.

Course Code	18B12HS611	Semester :EVEN		Semester VI Session 2018 -2019 Month from Jan 2019 to June 2019	
Course Name	Marketing Managem	ent	ent		
Credits	3	Contact Hours 2-1-0			
Faculty (Names)	Coordinator(s)	Dr Swati Sharma			
	Teacher(s) (Alphabetically)	Dr. Swati Sharma			
COURSE OUTCOMES COGNITIVE LEVEL				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 Marketing	Defining Marketing For 21 st Century The importance of marketing and marketing's role in business and society. Introduction to Digital Marketing. Online Communication Tools. The Social Media-Conversations, Community and Content. Affiliate Marketing and Mobile Engagement. The Digital Campaigns	5
2	Marketing Environment and Market Research and insights	Internal and external forces impacting marketers. Marketing and Customer Value. Gathering Information and Scanning the environment. Company's Micro and Macro Environment Responding to the Marketing Environment	3
3	Strategic Planning and the marketing Process	Explore the impact of social forces on marketing actions. Describe how technological change affects marketing. Designing the business Portfolio Discuss the Strategic Planning Process and Strategic	5

		Marketing Process.	
4	4Consumer and Business Buyer BehaviorConsumer 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
6Pricing products: Pricing considerations and strategiesFactors to consider when setting p New product pricing strategies. Product mix pricing strategies. Price adjustments and changes.		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 CriteriaComponentsMaximum MarksT120T220End Semester Examination35TA25 (Assignment and Viva)Total100			
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.

Course Code	19B12HS611	Semester : EVEN (specify Odd/Even)		Semester : VI Session 2018 -2019 Month from: January- June		
Course Name	Econometric Analysi	S				
Credits	03	Contact H		act Hours 2-1-0		
Faculty (Names)	Coordinator(s)	Manas Ranjan	Behera			
	Teacher(s) (Alphabetically)	Manas Ranjan Behera				

COURSE OU	TCOMES	COGNITIVE LEVELS
After pursuing t	he 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	<i>Create</i> models for prediction from a given set of data.	Creation Level – (C6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Statistical Inference	Point and interval estimation; ;The Z distribution ;The Null and Alternate hypotheses ;The chi-square distribution; The F distribution; The t distribution	3
2.	Regression Analysis	Two variable regression model; The concept of the PRF; Classical assumptions of regression; Derivation of the OLS estimators and their variance; Properties of OLS estimators under classical assumptions; Gauss-Markov Theorem; Tests of Hypothesis, confidence intervals for OLS estimators; Measures of goodness of fit: R square and its limitations; Adjusted R square and its limitations	7
3.	Econometric Model Specification	Identification: Structural and reduced form; Omitted Variables and Bias; Misspecification and Ramsay RESET; Specification test; Endogeneity and Bias	5
4.	Failure of Classical Assumptions	Multi-collinearity and its implications; Auto-correlation: Consequences and Durbin-Watson test ;Heteroskedasticity: Consequences and the Goldfeld -Quandt test	2
5.	Forecasting	Forecasting with a)moving averages b) linear trend c) exponential trend CAGR; Forecasting with linear regression; Classical time series decomposition; Measures of forecast performance: Mean square error and root mean	5

	square error; Limitations of econometric forecasts						
6.	6. Time Series Univariate Time Series Models: Lag Operator, ARMA, Analysis ARIMA models, Autoregressive Distributed Lag Relartionship						
7.	Linear Programming	Linear programming; Dual of a linear programming problem; Simplex method Transportation	3				
		Total number of Lectures	28				
Eval	uation Criteria						
Com	ponents	Maximum Marks					
T1		20					
T2		20					
End	Semester Examination	35					
TA		25 (Quiz+ Assignment+Viva -Voce)					
Tota	1	100					
[
Reco Refe	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), Eco	nometric Analysis, New Jersey: Prentice Hall.					
3.	Madala, G.S. (1992), Intro	duction to Econometrics (2 nd ed.), New York: Macmillan.					

Course Code		15B11EC611	-	Semester - EVEN Semester (Month from		er 6 S from J	5 Session 2018 -2019 n Jan 2019 to June 2019		
Course Na	me	Telecommunication Networks							
Credits			4		Contact H	Hours		4	1
Faculty (N	ames)	Coordinato	r(s)	1. Ankur 2. Anand	Bhardwaj Agrawal(C	CCC)			
		Teacher(s) (Alphabetica	ally)	ly) 1.Ankur Bhardwaj 2.Dr. Bhagirath sahu 3. Bhawna Gupta 4. Dharmendra Jhariya 5. Neetu Singh					
COURSE	OUTCO	OMES						COGNIT	IVE LEVELS
CO1	Unders Traffic	stand the basic Engineering a	concept and swite	s of Telecommu ching technologi	nication ne es.	twork mo	del,	Understan	ding (Level II)
CO2	Unders and flo	stand the conce ow control mec	epts of C hanisms	SI model and ar introduced by d	nalyze the v lata link lay	arious err er.	or	Analyzing	g (Level IV)
CO3	Unders concep a netw	stand the TCP/ ot of subnetting ork.	IP proto to alloc	col, routing algo cate and distribut	rithm and a te the logica	apply the al address	es in	Apply (L	evel III)
CO4	Understand concept of LAN access protocols, ISDN, B-ISDN and ATM, their implementation and performance issues.					ding (Level II)			
	,			and performance	155465.				
Module No.	Title o Modu	f the le	Topics	s in the Module					No. of Lectures for the module
Module No. 1.	Title o Modul Teleco networ	f the le ommunication k model	Topics Teleco types	s in the Module	twork mode	el, Differe	ent netv	works	No. of Lectures for the module 2
Module No. 1. 2.	Title o Modul Teleco networ Switch techno	f the le ommunication tk model logies	Topics Teleco types Switch networ Switch Multip Princip Messag	mmunication ne med Communica ks, Time Divis- ing, Time D lexed Time Sw oles-Datagram ge switching.	ation Netw ion Switch Division T vitching and and Virt	el, Differe vorks, Ci ing-Time Time Sv d TSI, P ual Cire	rcuit Divisi vitchin acket cuit	works Switching ion Space g, Time Switching Approach,	No. of Lectures for the module 2 12
Module No. 1. 2. 3.	Title o Modul Teleco networ Switch techno Compu Netwo	f the le ommunication tk model hing logies	Topics Teleco types Switch networ Switch Multip Princip Messay Seven primiti	mmunication ne ed Communica ks, Time Divis ing, Time D lexed Time Sw oles-Datagram ge switching. layered OSI moo ves and services	twork mode ation Netw ion Switch Division T vitching and and Virt del, Functio	el, Differe vorks, Ci ing-Time Fime Sv d TSI, P ual Circ	ent netv rcuit Divis: vitchin acket cuit erent la	works Switching ion Space g, Time Switching Approach, ayers,	No. of Lectures for the module 2 12 2
Module No. 1. 2. 3. 4.	Title o Modul Teleco networ Switch techno Compu Netwo Detaile of data	of the le ommunication tk model ing logies uter rks ed working link layer	Topics Teleco types Switch networ Switch Multip Princip Messag Seven primiti Data li Contro Back-P Analys	s in the Module mmunication ne ded Communica ks, Time Divis ing, Time D lexed Time Sw bles-Datagram ge switching. layered OSI mod ves and services nk Control, Flow bl, Sliding Windo N ARQ, Selectiv sis, HDLC.	twork mode ation Netw ion Switch Division T vitching an and Virt del, Function w Control, S ow Flow Co e-Reject Al	el, Differe vorks, Ci ing-Time Fime Sv d TSI, P ual Circ ons of diff Stop and V ontrol, Err RQ, Perfo	ent netv rcuit Divisi vitchin acket cuit erent la vait flo or Cor rmanc	works Switching ion Space g, Time Switching Approach, ayers, ayers, ow itrol, Go- e	No. of Lectures for the module21226
Module No. 1. 2. 3. 4. 5.	Title o Modul Teleco networ Switch techno Compu Netwo Detaile of data	of the le ommunication tk model hing logies uter rks ed working hink layer rk, Transport tysical layers.	Topics Teleco types Switch networ Switch Multip Princip Messa Seven primiti Data li Contro Back-N Analys Basic D Routin routing	s in the Module mmunication ne ed Communica ks, Time Divis ing, Time Divis ing, Time Divis ing, Time Divis lexed Time Sw bles-Datagram ge switching. layered OSI mod ves and services nk Control, Flow bl, Sliding Windo N ARQ, Selectiv sis, HDLC. Principles of Net g Schemes-Dis g, Hierarchical ro	twork mode ation Netw ion Switch Division T /itching and and Virt del, Function del, Function del del del del del del del del del del	el, Differe vorks, Ci ing-Time Sime Sv d TSI, P ual Circ ons of diff Stop and V ontrol, Err RQ, Perfo isport and ctor rout	ent netv rcuit Divisi vitchin acket cuit erent la or Cor rmanc Physi ing, l	works Switching ion Space g, Time Switching Approach, ayers, ayers, ow atrol, Go- e cal layers. Link-State	No. of Lectures for the module212266

7.	Local area networks	LAN Protocols-ALOHA, CSMA, CSMA-CD, Implementation and performance issues, High speed LAN.	6				
8.	ISDN, B-ISDN ATM.	2					
		Total number of Lectures	40				
Eval	uation Criteria						
Com	ponents	Maximum Marks					
T 1		20					
T2		20					
End	Semester Examination	35					
TA		25 (10 – attendance, 10 - Quiz/Assignment/tutorial, 5 -Class r	performance)				
Tota	1	100					
U							
Reco Refe	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.	W. Stallings, Data & Com	puter Communication, PHI					
2.	B. A Forouzan, DATA CO	OMMUNICATIONS AND NETWORKING, 4 th Edition TMH					
3.	A.S. Tanenbaum, Comput	er Networks, PHI					
4.	John C. Bellamy, Digital	Celephony, 3 rd Edition, Wiley.					

5. Thiagarajan Viswanathan, Telecommunication Switching Systems and Networks, PHI

_	Detaneu Synabus							
Course C	ode	15B11CI518	Semester - ODD		Semest	er VI	Session 2018 - 2019	
			(specify Odd/Even)		Month	onth from Jan '19 to Jun '19		
Course N	ame	Data Structures & A	lgorithms					
Credits 3-1-0 Contact Hours 4				4				
			Ш.					
Faculty		Coordinator(s)	Dr. K. Vimal Kumar					
(Names)		Teacher(s) (Alphabetically)	Prantik Biswas, Shardha Porwal, Dr. Tribhuwan Tewari, Dr. K Vimal Kumar					
COURSE OUTCOMES						COGNITIVE LEVELS		
COL	Explai	n the fundamental Dat	a Structures incl	uding linke	d-lists, tre	es,	Understand level	

	binary search trees, AVL trees, heap trees, graphs, and hash-tables.	(Level 2)
CO2	Analyze and compare different sorting algorithms - Merge Sort, Quick sort, Shell sort and Bucket Sort.	Evaluating Level (Level 5)
СО3	Develop basic programs using data structures in various real-time practical problems	Apply Level (Level 3)
CO4	Formulate novel solutions for programming problems or improve existing code using learned algorithms such as, Backtracking, Branch and Bound, Greedy algorithm and Dynamic programming	Apply Level (Level 3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module		
1.	Introduction	Introduction to data structures, lists, Doubly linked list, circular linked list, multi linked list, Applications - sparse matrix representation, Stack and queue (array and linked list representation)	6		
2.	Algorithm ComplexityAbstract data type, Growth of function, Space-Time tradeoffs, Complexity analysis of algorithms - Asymptotic analysis				
3.	Sorting & Searching	Merge Sort, Quick sort, Shell sort, Bucket Sort, Median search, Interpolation search	6		
4.	Trees	Binary Tree, Binary Search tree, AVL Tree, RB Tree, B Tree, B+ Tree	7		
5.	Heaps Introduction, Binary heap, Binomial heap, Skew heaps				
6.	Graph	Introduction to graphs, Representation – adjacency list, adjacency matrix, Traversal – BFS, DFS, Minimum	8		

	spanning tree – Prims and Kruskal's algorithm, Shortest path – Dijkstra algorithm and Floyd–Warshall algorithm						
7.		Hashing	Introduction to hashing, Collision resolution – open and closed hashing methods	4			
8.		Algorithm	Backtracking Algorithm (n-queens puzzle, rat in a maze), Branch and Bound, Greedy algorithm, Dynamic programming	6			
			Total number of Lectures	44			
Eval	uation	Criteria					
Com	ponent	S	Maximum Marks				
T2			20				
End S TA Tota	Semeste I	er Examination	35 25 (Assignment-10, Quiz-10, Regularity & Attendance-5) 100				
Reco book	ommen s, Refe	ided Reading mate erence Books, Journ	erial: Author(s), Title, Edition, Publisher, Year of Publica als, Reports, Websites etc. in the IEEE format)	tion etc. (Text			
1.	Yedid 2 nd Ed	yah Langsam, Moshe ition, PHI, 2001	2 J., Augenstein and Aaron M. Tenenbaum: Data Structures Us	sing C and C++,			
2.	Kurt N	Mehlhorn: Data Struct	ures and Algorithms 3, Springer, 1984				
3.	Dines	h P Mehta, Sartaj Sah	ani: Handbook of Data Structure and Applications, Chapman &	z Hall, 2004			
4.	Mark	Allen Weiss: Data Str	ructures and Algorithm Analysis in C, 2 nd Edition, Pearson				
5.	Sahni:	Data Structures, Alg	orithms and applications in C++, Universities press, Hyderabac	1, 2005			
6.	Kruse,	, Tonso, Leung: Data	Structures and Program Design in C, 2rd Edition, Pearson Edu	cation Asia, 2002			
7.	Weiss Educa	, Mark Allen: Data St tion Asia, 2003	ructures and Algorithm Analysis in C/C++, 2nd Edition, Pearso	on			
8.	Corme	en et al: Introduction t	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 Wesle	: The Art of Compu y), New Delhi, 2002	tter programming Vol I, Vol III, 2nd edition, Pearson Educati	on Asia (Adisson			
12.	Heilen Delhi,	nan: Data Structure 2002	s, Algorithms and Object Oriented Programming, Tata Mc-	Graw Hill, New			
13.	Sorens Hill, N	son and Tremblay: A New Delhi, 2003	In Introduction to Data Structures with Algorithms, 2nd Editio	n, Tata Mc-Graw			

Subject Code	15B11CI578	Semester: Odd	Semester EVEN Session 2018-2019 Month from Jan'19 to Jun'19
NBA Code	C311		
Subject Name	Data Structures & Al	gorithms Lab	
Credits	1	Contact Hours	2

Faculty	Coordinator(s)	Suma Dawn
(Names)	Teacher(s) (Alphabetically)	K Vimal Kumar, Neetu Sardana, Prashant Kaushik, Suma Dawn, Taj Alam, Tribhuwan Tewari

COURSE	OUTCOMES	COGNITIVE LEVELS
C311.1	Demonstrate the use of basic data structure and algorithm design such as Linked lists, Stacks, Queues, and others, for various applications.	Understanding Level (C2)
C311.2	Interpret the complexity of algorithms for given problems.	Understanding Level (C2)
C311.3	Apply Searching, Sorting, and Trees and use their properties for abstractions and defining modules for implementing functionalities.	Apply Level (C3)
C311.4	Examine case-study specific application of Heaps, Graphs, and Hashing methods.	Apply Level (C3)
C311.5	Model algorithmic solutions for small real-life problems using Backtracking, Greedy algorithm and Dynamic programming, Branch and Bound, and others	Apply Level (C3)

Module No.	Title of the Module	List of Experiments	СО
1.	Introduction & Algorithm Complexity	Lab Assignments 1, 2: Conversion from one number system to another; Manipulation with arrays and strings, structures; Manipulation with a single Linked lists of integers; Stacks and Queues Finding Complexity: Big O, Big Omega Lab Assignment 6: Cost Analysis	CO1, CO2, Understanding Level (C2)

2.	Sorting, Searching & Trees	Lab Assignments 2, 3: Doubly Linked List, Circular Linked List, Multi-Linked Lists	CO1 Understanding (C2)	Level			
		Lab Assignments 4, 5: Sorting, Searching, Application based.	CO3				
		Lab Assignments 6: Binary Tree, Binary Search Trees, AVL Tree, Case-study: Priority Queue with Binary Trees	Apply Level (C3)				
3.	Heaps, Graph	Lab Assignments 7: B Trees, Heaps, Lab Assignments 8: Directed and undirected graphs, weighted graphs, etc.	CO4 Apply Level (C3)				
4.	Hashing & other Algorithms	CO5 Apply Level (C3)					
Eval	uation Criteria						
Com Lab Lab Day- Day-	ponents Test 1 Test 2 to-Day Evaluations to-Day - Attendance	Maximum Marks 20 20 45 15					
Tota	1	100					
Reco book	ommended Reading ma s, Reference Books, Jou	Iterial: Author(s), Title, Edition, Publisher, Year Irnals, Reports, Websites etc. in the IEEE format	r of Publication etc.	(Text			
1	Yedidyah Langsam, M and C++, 2 nd Edition, F	loshe J., Augenstein and Aaron M. Tenenbaum PHI, 2001	: Data Structures Us	sing C			
2	Kurt Mehlhorn: Data S	tructures and Algorithms 3, Springer, 1984					

- 3 Dinesh P Mehta, Sartaj Sahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004
- 4 Mark Allen Weiss: Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson

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

Course Code	15B11EC613	Semester: Even		Semester: 6 th Session: 2018 -2019 Month from: Jan-May	
Course Name	Control Systems				
Credits	4		Contact Hours		4
Faculty (Names)	Coordinator(s)	Dr. Jitendra M	ohan, Dr. S	hamim A	khter
	Teacher(s) (Alphabetically)	Dr .Bhartendu Chaturvedi, Dr. Jitendra Mohan, Dr. Kirmender Singh, Dr. Megha Agarwal, Dr. Shamim Akhter, Ms. Ruby Beniwal			

COURSE	OUTCOMES	COGNITIVE LEVELS
CO1	Classify the open loop and closed loop control systems and construct mathematical model for physical systems.	Applying (Level III)
CO2	Solve complex systems through block diagram reduction method and signal flow graph technique.	Applying (Level III)
CO3	Determine transient response and steady state response of the systems using standard test signals.	Evaluating (Level V)
CO4	Analyze the stability of the system and select suitable controllers and compensators for linear time invariant system.	Analyzing (Level IV)
CO5	Apply time domain and frequency domain techniques to identify the stability of control systems.	Applying (Level III)
CO6	Solve continuous time and discrete time systems using state variable approach.	Applying (Level III)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Control System	Development of control systems, non feedback and feedback systems, negative feedback a means of automatic regulation, basic classification of control systems	3
2.	Modeling and Mathematical Representation of Systems	Block diagram simplification of continuous-time systems, Classification of system models, input – output description of systems, signal flow graph representation	8
3.	Time Domain Analysis and Design	Time domain response, steady state error and error coefficients, design considerations for second order systems, time domain response considerations for higher order systems. PID Controller	7
4.	Stability Analysis for continuous- time systems	Basic stability concept of linear systems, absolute stability criteria for continuous-time systems, relative stability Concepts	5
5.	Root Locus Method and Design in Time Domain	Fundamentals of Root Locus, construction of root loci, root contour diagram	6

6.	Frequency	Bodes plot and Nyquist plot, Gain Margin & Phase	7		
•••	Response Analysis	Margin, stability analysis	,		
	and Design				
7.	State Variable	State variable representation of continuous-time	6		
	Approach to Time	systems; System Response and State Transition Matrix			
	Domain Analysis	(STM); Applications of STM.			
Total number of Lectures					
Eval	uation Criteria				
Com	ponents N	Aaximum Marks			
T1		20			
T2		20			
End	Semester Examination	35			
TA		25 (Attendance : 5 Marks, Quiz:10 Marks, Assignment: 10 Marl	ks)		
Tota	1	100			
Reco	ommended Reading material	: Author(s), Title, Edition, Publisher, Year of Publication etc. (7	Fext books,		
Refe	rence Books, Journals, Report	s, Websites etc. in the IEEE format)			
-	I. J. Nagrath and M. Gopal, Control Systems Engineering, Fifth edition, New age International, 5 th				
1.	• Edition, 2009.				
2.	Normal S. Nise,, Control Systems Engineering, 7 th Edition, John Wiley,2014				
3.	K.Ogata, Modern Control Er	gineering, 5 th Edition, Prentice Hall, 2010			

Lecture-wise Breakup

Course Code		16B1NMA63	33	Semester : Even	Semester VI Session 2018 -2019 Month from Jan 2019 to June 2019			
Course No		Statistics		Wonth from Jan 20			19 to June 2019	
Course Na	ime							
Creatis		4	Contact Hours 3-1-0					
	[Coordinator(s) Dr. Himanshu Agarwal			•	1		
Faculty (IN	ames)	l eacher(s) (Alphabetica	ally)	Dr. Anuj Bhardwaj, Chauhan	, Dr. Himanshu .	Agarwa	al, Dr. Pinkey	
COURSE OUTCOMES							COGNITIVE LEVELS	
After pursu	ing the	above mention	ed cours	se, the students will b	e able to:			
C302-1.1	make u kurtosi	use of measure is for description	s of cent on and v	tral tendency, dispers isualization of popula	ion, skewness ar ation data.	nd,	Applying Level (C3)	
C302-1.2	apply correlation and regress			ion in statistical analy	vsis of data.		Applying Level (C3)	
C302-1.3	explain	n sampling the	ory and	its distributions.			Understanding Level (C2)	
C302-1.4	explain the concepts and properties of esti-				heory.		Understanding Level (C2)	
C302-1.5	apply sampling and estimatic			on theory to find the confidence interval.		Applying Level (C3)		
C302-1.6	1.6 analyze small and large sam			mple data by using the test of hypothesis.		Analyzing Level (C4)		
Module No.	Title o Modu	of the le	Topics	es in the Module			No. of Lectures for the module	
1.	Descri Statisti	ptive ics	Graphi frequer mode, kurtosi momer Box ar	ical representation ncy polygon, AM, measures of dispe is such as centra nts, population varia of Whisker plot	such as histo GM, HM, more rsion, skewness al and non-c nce, β , γ coeffi	gram, edian, s and entral cient,	8	
2.	Correlation and RegressionScatter rank regressAnalysisregress			ter diagram. Karl Pearson's and Spearman's correlation coefficient, regression lines, ession coefficient and their properties.			5	
3.	Sampl Sampl Distrib	ing and ing putions	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 <i>t</i> distribution.				7	

4	l.	Parametric Point General concept of point estimation, methods of 10					
		Estimation	moments and maximum likelihood for finding				
			estimators, unbiasedness, consistency,				
			efficiency, UMVUE, Cramer-Rao inequality,				
			sufficiency, factorization theorem, completeness,				
			Rao-Blackwell theorem.				
5	5.	Parametric Interval	definition of confidence interval, pivotal	5			
		Estimation	quantity, confidence interval for mean, variance,				
			difference of means and difference of variances				
			for small and large samples.				
6	5.	Hypothesis Testing	The basic idea of significance test. null and	7			
			alternative hypothesis, type-I and type II errors,				
			testing of small and large samples for mean,				
			variance, difference in means, and difference in				
			variances.				
Tota	l num	ber of Lectures		42			
Eval	uation	n Criteria					
Com	ponen	its	Maximum Marks				
T1			20				
T2			20				
End	Semes	ter Examination	35				
TA			25 (Quiz, Assignments, Tutprials)				
Tota	1		100				
Reco	mmer	nded Reading materia	al: Author(s), Title, Edition, Publisher, Year of Publ	ication etc. (Text			
book	s, Refe	erence Books, Journals	s, Reports, Websites etc. in the IEEE format)				
1	Bisw	as and Srivastava , A	Textbook, Mathematical Statistics Ist Edition, Naro	osa Publishing			
1.	Hous	e, New Delhi.					
2	W. F	eller, Introduction to l	Probability Theory and its Applications Vol. I and II	. Wiley Eastern-			
2.	Ltd, 1971						
3	V. K.Rohatgi, An Introduction to Probability Theory and Mathematical Statistics Wiley Eastern,						
5.	1984						
4.	R. V. Hogg, A. T. Craig, Introduction to Mathematical Statistics, McMillan, 1971						
5	AM.	Mood, F. A. Graybil	I, and D. C. Boes, Introduction to the Theory of Stat	tistics McGraw			
5	Hill, 1974						
6.	Des Raj & Chandak, Sampling Theory, Narosa Publishing House, 1998.						
7.	Shelo	don Ross, A First Cou	rse in Probability, 6th edition, Pearson Education As	sia, 2002.			
8	Mey	er, P.L, Introductory F	Probability and Statistical Applications Addison-Wes	sley Publishing			
0.	Company, 1965.						

Lecture-wise Breakup

Course Co	ode	18B12MA611		Semester Even		Semester VI Month from	Sess	ion 2018-2019 2019 - June 2019
Course Na	me	Operations Res	searc	h			<u> </u>	2017 - Julie 2017
Credits		4	Jeure		Cor	ntact Hours	3-1-0	1
Faculty		Coordinator(s)	Dr. Pato Kumari				
(Names)		Teacher(s)		Prof. A. K. Aggar	wal			
		(Alphabetical	ly)	y) Dr. Amita Bhagat				
COURSE	COURSE OUTCOMES					COGNITIVE LEVELS		
After pursu	ing the	e above mention	ed co	ourse, the students v	vill b	e able to:		
C302-3.1	const lineat meth	truct mathematic r programming od.	cal n pro	nodels for optimiza blems (LPP) using	ation g gra	problems and aphical and sin	solve nplex	Applying Level (C3)
C302-3.2	apply progi	/ two-phase, I ramming probler	Big-N ns.	A and dual sim	plex	method for	linear	Applying Level (C3)
C302-3.3	make	e use of sensitivi	ty an	alysis to linear prog	ramr	ning problems.		Applying Level (C3)
C302-3.4	solve	transportation,	assig	nment and travellin	g sal	esman problems	5.	Applying Level (C3)
C302-3.5	apply cutting plane and branch & bound techniques to integer A programming problems.						Applying Level (C3)	
C302-3.6	examine optimality conditions and solve multivariable nonlinear problems.					Analyzing Level (C4)		
Module No.	Title Mod	of the ule	Тој	pics in the Module				No. of Lectures for the module
1.	Preli	minaries	Intr Pha	oduction, Operations of O	ons .R. S	Research M tudies.	odels,	3
2.	Linea Progr Probl	ar ramming lems (LPP)	Cor Sol ¹ Tw	nvex Sets, Formul utions, Simplex M o Phase Method, S thod.	ation Metho Speci	of LPP, Grap od, Big-M Mo al Cases in Sin	phical ethod, nplex	8
3.	Dual Sensi	ity and itivity Analysis	Prin Sim	nal-Dual Relation Price Relation Relati	nshij itivit	o, Duality, y Analysis.	Dual	8
4.	Transportation ProblemsIntroduction, 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.	Assig Prob	gnment lems	Def Sale	finition, Hungaria esmen Problems.	ın	Method, Trav	veling	4
6.	Integ Progr Prob	er Linear ramming lems	Pur Pro Bou	e and Mixed Inte blems, Cutting Pla and Method.	ger i ane l	Linear Program Method, Brancl	nming n and	6

7	7.	Non	Linear	Introduction to NLP, convex functions and	8
	Programming			graphical solution, Unconstrained Problem,	
				Constrained Problems - Lagrange Method for	
				equality constraints, Kuhn-Tucker Conditions	
				for inequality constraints, Quadratic	
				Programming -Wolfe's Method	
Tota	l num	ber of Lec	ctures		42
Eval	uatior	n Criteria			
Com	poner	nts		Maximum Marks	
T1				20	
T2				20	
End	Semes	ter Examir	nation	35	
TA				25 (Quiz, Assignments, Tutorials)	
Tota	l			100	
Reco	Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text				
book	books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)				
1.	Taha	, H. A. - O	perations Re	esearch - An Introduction, Pearson Education, 2005.	
2.	Hadl	ey, G Li	near Prograr	nming, Massachusetts: Addison-Wesley, 1962.	
3.	Hille	r, F.S. and	Lieberman,	G. J Introduction to Operations Research, San Fra	ancisco, 1995.
4.	Wag PHI,	ner, H. M. 1975.	Principles	s of Operations Research with Applications to Mar	nagerial Decision,
5.	Vohr	a, N. D., C	Quantitative '	Techniques in Management, Second Edition, TMH,	2003.
6.	Taha	. H. A O	perations Re	esearch - An Introduction, Pearson Education, 2005.	

Lecture-wise Breakup

Subject Code		18B12M	IA612	Semester Even Semester VI Sess Month from Jan2		sion 2018-2019		
Subject Name		Applied	Mathematics	al Methods		II Jail	2017 to Julie 2017	
Credits 4			101utileinatie	Conta	ct Hours	3-1-0		
Faculty (N	ames)	Coordi	nator(s)	Dr. Puneet Rana				
		Teacher (Alphab	r(s) petically)	Dr. Puneet Rana, Dr. N	leha Ahlawat			
COURSE	OUTCO	OMES						
After pursu	ing the a	above mer	ntioned cours	se, the students will be al	ole to:		COGNITIVE LEVELS	
C302-4.1	explair physica	1 the funct al problen	tional and its n.	variations required to op	otimize the		Understanding Level (C2)	
C302-4.2	apply o variatio	lifferent for a state of the second s	orms of Eule ems with fix	r–Lagrange equation on ed boundaries.	the various		Applying Level (C3)	
C302-4.3	explair from I	ı different VP and B	types of interventerventerventerventerventerventerventerventerventerventerventerventerventerventerventerventerv VP.	egral equations including	their convers	sions	Understanding Level (C2)	
C302-4.4	solve V analyti	/olterra aı cal metho	nd Fredholm ds.	integral equations using	various		Applying Level (C3)	
C302-4.5	explair	1 various 1	numerical me	ethods along with their st	tability analys	sis.	Understanding Level (C2)	
C302-4.6	apply o	lifferent n	umerical me	thods for solving differe	ntial equation	ıs.	Applying Level (C3)	
Module	Title	of the	Topics in t	he Module			No. of Lectures	
No.	Modul	e					for the module	
I.	Elinction -	1 1 1	T 1 1	11 61 1.	1 11	Introduction, problem of brachistochrone, problem of geodesics, isoperimetric problem, variation and its		
	its Var	onal and iation	Introduction geodesics	n, problem of brachistoc	hrone, proble variation an	d its	0	
	its Var	onal and iation	Introduction geodesics, properties,	n, problem of brachistoc isoperimetric problem, comparison between	hrone, proble variation an the notior	d its	0	
	its Var	onal and iation	Introduction geodesics, properties, extrema of	n, problem of brachistoc isoperimetric problem, comparison between a function and a functior	hrone, proble variation an the notior nal.	d its	0	
2.	its Var Variati	onal and iation	Introduction geodesics, properties, extrema of Euler's equ	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta	hrone, proble variation an the notior nal. I lemma of	d its n of	5	
2.	its Var Variati Probler Fixed	onal and iation onal ms with	Introduction geodesics, properties, extrema of Euler's equ calculus of form of int	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta variations, examples, a egrals, special cases cor	hrone, proble variation an the notior nal. I lemma of functionals in otaning only s	d its n of the n the some	5	
2.	Variati Probler Fixed Bound	onal and iation onal ms with aries	Introduction geodesics, properties, extrema of Euler's equ calculus of form of intr of the var	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta variations, examples, egrals, special cases cor iables, examples, func	hrone, proble variation an the notion al. I lemma of functionals in itaning only s tionals invol	d its n of the n the some lving	5	
2.	Variati Problet Fixed Bound	onal and iation onal ms with aries	Introduction geodesics, properties, extrema of Euler's equ calculus of form of intro of the var more than	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta variations, examples, a egrals, special cases con- tiables, examples, func- one dependent variable	hrone, proble variation an the notion al. il lemma of functionals in taning only s tionals invoi es and their	d its n of the n the some lving first	5	
2.	Variati Problem Fixed Bound	onal and iation onal ms with aries	Introduction geodesics, properties, extrema of Euler's equ calculus of form of intro of the var more than derivatives,	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta variations, examples, egrals, special cases cor iables, examples, func one dependent variable the system of Euler's equip	hrone, proble variation an the notion al. I lemma of functionals in taning only s tionals invoi es and their uations,	d its n of the n the some lving first	5	
2.	Variati Probler Fixed Bound Variati Probler	onal and iation onal ms with aries onal ms	Introduction geodesics, properties, extrema of Euler's equ calculus of form of intr of the var more than derivatives, Functionals the depend	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta variations, examples, egrals, special cases cor tables, examples, func- one dependent variable the system of Euler's eq depending on the high lent variables, Euler-	hrone, proble variation an the notion al. al lemma of functionals in taning only s tionals invol es and their uations, her derivative Poisson equa	d its n of the some lving first es of ation,	5	
2.	Variati Problet Fixed Bound Variati Problet (contin	onal and iation onal ms with aries onal ms ued)	Introduction geodesics, properties, extrema of Euler's equ calculus of form of intro- of the var more than derivatives, Functionals the depend functionals	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta variations, examples, egrals, special cases con- riables, examples, func- one dependent variable the system of Euler's equal depending on the high lent variables, Euler- containing several indep	hrone, proble variation an the notion al. I lemma of functionals in taning only s tionals invo es and their uations, her derivative Poisson equa pendent varia	d its n of the n the some lving first es of ation, ibles,	5	
2.	Variati Problem Fixed Bound Variati Problem (contin	onal and iation onal ms with aries onal ms ued)	Introduction geodesics, properties, extrema of Euler's equ calculus of form of intr of the var more than derivatives, Functionals the depend functionals Ostrogradsl parametric	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta variations, examples, f egrals, special cases cor tables, examples, func- one dependent variable the system of Euler's eq depending on the high lent variables, Euler- containing several indep cy equation, Variation form applications	hrone, proble variation an the notion al. I lemma of functionals in taning only s tionals invoi es and their uations, her derivative Poisson equa pendent varia and problema	d its a of the the some lving first es of ation, bles, s in	5	
2.	Variati Problen Fixed Bound Variati Problen (contin	onal and iation onal ms with aries onal ms ued)	Introduction geodesics, properties, extrema of Euler's equ calculus of form of intr of the var more than derivatives, Functionals the depend functionals Ostrogradsl parametric equations.	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta variations, examples, egrals, special cases cor tables, examples, func- one dependent variable the system of Euler's eq depending on the high lent variables, Euler- containing several indep cy equation, Variation form, applications	hrone, proble variation an the notion al. al lemma of functionals in taning only s tionals invol es and their uations, her derivative Poisson equa pendent varian al problema to differe	d its a of the the some lving first es of ation, bles, s in ential	5	
2. 3. 4.	Variati Problet Fixed Bound Variati Problet (contin	onal and iation onal ms with aries onal ms ued)	Introduction geodesics, properties, extrema of Euler's equ calculus of form of intro- of the var more than derivatives, Functionals the depend functionals Ostrogradsl parametric equations.	n, problem of brachistoc isoperimetric problem, comparison between a function and a function nation, the fundamenta variations, examples, egrals, special cases con- riables, examples, func- one dependent variable the system of Euler's equation depending on the high lent variables, Euler- containing several inde- cy equation, Variation form, applications	hrone, proble variation an the notion nal. I lemma of functionals in taning only s tionals invoi es and their uations, her derivative Poisson equa pendent varia nal problema to differe	d its d its f of the some lving first es of ation, bles, s in ential	5	
2. 3. 4.	Variati Problem Fixed Bound Variati Problem (contine Fredho Voltern	onal and iation onal ms with aries onal ms ued) -Im and ra	Introduction geodesics, properties, extrema of Euler's equ calculus of form of intr of the var more than derivatives, Functionals the depend functionals Ostrogradsl parametric equations. Introduction	n, problem of brachistoc isoperimetric problem, comparison between a function and a function uation, the fundamenta variations, examples, egrals, special cases cor- tiables, examples, func- one dependent variable the system of Euler's eq depending on the high ent variables, Euler- containing several inder ky equation, Variation form, applications	hrone, proble variation an the notion nal. I lemma of functionals in taning only s tionals invoies and their uations, her derivative Poisson equa pendent varia nal problema to differe s, Classifica	d its a of the h the some lving first es of ation, bbles, s in ential	5	

			approximation, successive substitution methods for Fredholm and Volterra integral equations.					
5	5.	8						
6	<u>.</u>	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				
Tota	l num	ber of Lectures		42				
Eval	uation	Criteria						
Com	ponen	its	Maximum Marks					
T1			20					
T2			20					
End S	Semes	ter Examination	35					
TA	TA 25 (Quiz, Assignments, Tutorials)							
Tota	1		100					
Reco	mmer	nded Reading ma	aterial: Author(s), Title, Edition, Publisher, Year of Publ	lication etc. (Text				
book	s, Refe	erence Books, Jou	irnals, Reports, Websites etc. in the IEEE format)					
1.	Hild	erbrand, F.B., M	ethods of Applied Mathematics, 2ndEdition, Prentice Ha	ıll, 1969.				
2.	Gupta, A.S., Calculus of Variations with Applications, Prentice Hall of India, 1997.							
3.	3. Gelfand, I.M., Fomin, S.V. Calculus of Variations, Prentice Hall, 1963.							
4.	4. Elsgolts, L., Differential Equations and the Calculus of Variations, Mir Publishers, Moscow, 1973.							
5.	Petro	ovsky, I.G., Lectu	res on the Theory of Integral Equations, Mir Publishers,	Moscow, 1971.				
6.	Zien	kiewicz, O.C., M	organ, K., Finite Elements and Approximation, John Wi	iley, 1983.				
7	Smit	h, G. D., Nume	rical solution of partial differential equations: finite di	fference methods.				
/.	Oxfo	Oxford University Press, 1985						

Course Code	16B1NPH632	Semester EVI	EN	Semeste Month 1	er VI Session 2018 -2019 from January to June
Course Name	SOLID STATE ELECTRONIC DEVICES				
Credits	4	Contact Ho		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	Remembering (C1)
	electronic devices.	
C302-7.2	Explain various electronic, optical and thermal properties of	Understanding (C2)
	semiconductors; various techniques used in device fabrication.	
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	Analyzing (C4)
	and their performances.	

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Energy band and charges carriers in conductors	Bonding forces and energy bands in solids, charge carriers in semiconductors, carries concentrations, drift of carriers in electric and magnetic fields, Invariance of the Fermi level at equilibrium, optical absorption, Luminescence, Carrier lifetime and photoconductivity, diffusion of carriers	12
2.	Junctions	Fabrication of p-n junctions, equilibrium conditions, steady state conditions, reverse bias breakdown, recombination and generation in the transition region, metal semiconductor junctions, heterojunctions,	10
3.	Transistors	Field effect transistor (FET), Metal-insulator FET, Metal- 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	n Criteria		
Components		Maximum Marks	
T1		20	
		20	
End Semes	ster Examination	53 25 [2 Quiz (10) Attend (10) and Class performance (5)]	
Total		100	

Recommended Reading material:

1.	Donald A Neamen & Dhrubes 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,

Course Code	16B1NPH633Semester :Ev		en	Semester VI Session 2018 -2019	
				Month:	January to June
Course Name	Photovoltaic Techniques				
Credits	4	Contact Hours		Iours	4
Faculty (Names)	Coordinator(s)	Coordinator(s) Dr. B. C. Joshi and Dr. Prashant Chauhan			
	Teacher(s) Dr. B. C. Joshi		and Dr. Pra	ashant Ch	auhan

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, loses in solar cell, solar cell design, design for high I_{sc} , V_{oc} , FF, solar simulators	08
4.	Solar cell technologies	Production of Si, Si wafer based solar cell technology, thin film solar cell technologies (CIGS, microcrystalline and polycrystalline Si solar cells, amorphous Si thin film solar cells), multijunction solar cells, Emerging solar cell technologies: organics solar cells, Dye-sensitized solar cell (DSC), GaAs solar cell	12
5.	Photovoltaic system	PV system : Introduction, Stand alone system, Grid connected system, Hybrid system, Designing of PV system, Balance of system- BOS (Inverters, Controllers, Wiring, Batteries) Photovoltaic Cells, Estimating PV system size and cost, Photovoltaic safety.	08
		Total number of Lectures	40
Evaluation	n Criteria		
Componer	nts	Maximum Marks	

T1	20
T2	20
End Semester Examination	35
ТА	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

Course Code	16B1NPH634	Semester: Even		Semester VI Session 2018 -2019 Month: from January to June		
Course Name	Applied Statistical M	echanics				
Credits	4	Contact H		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 emsembles	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	n Criteria		
Components		Maximum Marks	
T1		20	
		20	
End Semester Examination		55	

ТА	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
Total	100

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

Course Code	16B1NPH635	Semester EvenSemester VIMonth from J		VI Session 2018 -2019 om January to June		
Course Name	Analytical Technique	es for Materials	s for Materials			
Credits	4	Contact Hours 4				
Faculty (Names)	Coordinator(s)	Dr. Himanshu Pandey				
	Teacher(s) (Alphabetically)	Dr. Himanshu Pandey				
COURSE OUTCOMES			COGNITIVE LEVELS			
Recall preliminary concepts of various characterization techniques			ues Remembering (C1)			

C202 10 1	Recall preliminary concepts of various characterization techniques	Remembering (C1)
C302-10.1	for the structure-property relationship of materials.	
C302-10.2	Outline different sophisticated characterization tools and explain	Understanding (C2)
	basic knowledge about working principle.	
C302-10.3	Identify characterization tool as per the necessity of measurement or	Applying (C3)
	analysis and solve related problems based on concepts used in	
	various techniques.	
C302-10.4	Examine material's properties and analyze the results in context of	Analyzing (C4)
	specific techniques.	

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
ТА	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
Total	100

Recommended Reading material:	Author(s), T	Fitle, Edition,	Publisher,	Year of Publication	etc. (Text books,
Reference Books, Journals, Reports,	Websites et	tc. in the IEEI	E format)		

2.	C. Kittel, Introduction to Solid State Physics,	Wiley-India.
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3. Colin N. Banwell&Elaine M. McCas, *Fundamentals of Molecular Spectroscopy*, Tata McGraw-Hill.

4. Elton N. Kaufmann, *Characterization of Materials (Vol.1)*, John Wiley & Sons.

5. Williams, David B., Carter, C. Barry, *Introduction to Transmission electron microscopy*, Springer.

•		1			
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 I	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		COGNITIV E LEVELS
C305-3.1	Apply and Analyze morality in all facets of personal and professional life	
		Analyze
		(C4)
C305-3.2		Analyze
	Discover ways to address moral dilemmas by deliberating on the pros and cons to	(C4)
	find the best possible outcome	
C305-3.3		Evaluate
	Justify and Formulate morally correct decisions and stand by them	(C5)
C305-3.4		Create
	Adapt and develop a character respected by peers and superior alike	(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	СО
1.	The Big Questions: Origins of Morality	Experiential Sharing: Morality & its significance to them Case Study: No such thing as free drink.	C305-3.1
2.	The Big Questions: Universal Aspects of Morality	Universal Aspects of Morality: Big Questions: Why be good? Universal Aspects of Morality: Big Questions: Is it permissible to lie? Universal Aspects of Morality: Big Questions: Is it good to gossip??	C305-3.1
3.	The Big Questions: Everyday Dilemmas and Decision Making	UPSC Case Study Ethical Dilemma of a Marketing Manager	C305-3.2 C305-3.3
4.	Evolution & Development of Morality	Ethical Analysis: A young Professor's Career	C305-3.1 C305-3.2 C305-3.3
5.	Compassion/ Empathy: Reason v/s Emotion	Discussion: Can we do better than the Golden Rule Discussion: Obligation to Others/ Is jealousy & Resentment always bad?	C305-3.1 C305-3.4
6	Compassion/ Empathy	EI Assessment Discussion on Reading: What's the matter with Empathy?	C305-3.1 C305-3.4
7	Moral Differences	Case Study: Difference in Morality Experiential Exercise: Country/ Org/ Home Moral Culture	C305-3.4
8	Moral Circles: Family, Friends, and Strangers	Experiential Sharing: Moral Circles and their influence on us Stereotyping in Morality	C305-3.4
9	Moral Decision Making	Contemporary Real World Scenario: Analyzing it through CATWOE	C305-3.1 C305-3.2 C305-3.3 C305-3.4

Evaluation Criteria	
Components	Maximum Marks
Mid Term	30 (Project Presentation)
End Semester Examination	40 (End Term Written Paper)
ТА	30 (Case Study Assessment, Assignment, Oral Questions)
Total	100

Reco Refe	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		

Course Code	18B13EC314	Semester Even	Semester VI Session 2018-2019 January
Course Name	Machine Learning for Signal Processing		
Credits	Audit course	Contact Hours	3

Faculty	Coordinator(s)	Dr. Abhinav Gupta		
(Names)	Teacher(s) (Alphabetically)	Dr. Abhinav Gupta		
COURSE OUTCOMES		COGNITIVE LEVELS		
CO1	Illustrate various machine learning approaches Understanding (C2)		Understanding (C2)	
CO2	Experiment with the different techniques for feature extraction and feature selectionApplying (C3)			
СО3	Apply and analyze various classifier models for typical machine learning applicationsAnalyzing (C4)		Analyzing (C4)	
CO4	Make use of deep learning techniques in real life problemsApplying (C3)		Applying (C3)	

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction and Basic Concepts	Linear algebra, Probability distributions, Representing signals, Types of Features and Proximity measures	8
2.	Linear Models for Regression and Feature Selection	Regression: Linear Basis Function Models, The Bias-Variance DecompositionTypes of Feature Selection : Mutual Information (MI) for Feature Selection, Goodman– Kruskal Measure, Laplacian Score, SVD, Ranking for Feature Selection, Feature Selection for Time Series Data	12
3.	Linear Models for Classification	Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models, The Laplace Approximation	6
4.	Decision Tree Learning	Decision Tree Representation, Hypothesis space search, Inductive bias, Issues in decision tree learning	7
5.	Support Vector Machines	Linear maximum margin classifier for linearly separable data, Linear soft margin classifier, Kernel induced feature spaces, Nonlinear classifiers, Regression by SVM, SVM variants	6
6.	Introduction to Deep	Convolutional neural networks and	4

Network	KS	applications	
		Total number of Lectures	43
Evaluation Criteria			<u>.</u>
Components	Maximum Ma	arks	
T1	NA		
T2	30		
End Semester Examinatio	on 40		
ТА	30		
Total	100		

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)		
1.	Pattern Recognition and Machine Learning, C.M. Bishop, 2nd Edition, Springer, 2011.	
2.	Deep Learning, I. Goodfellow, Y, Bengio, A. Courville, MIT Press, 2016.	
3.	The Elements of Statistical Learning, T. Hastie, R. Tibshirani, J. Friedman., 2nd Edition, 2008	
4.	Machine Learning, T. Mitchell, McGraw Hill, 1997.	

Course Code		16 B19EC69	1	Semester Even (specify Odd/)	ven Semester 6th d/Even) Month from Ja		h Session 2018-2019 Jan to June		
Course Name		Renewable E	able Energy						
Credits	Credits		2		Contact Hours		2	2	
Faculty (N	ames)	Coordinato	r(s)	Vinay A. Tikk	iwal				
		Teacher(s) (Alphabetica	ally)	Mandeep Naru	la, Vinay A	. Tikkiwa	ıl		
COURSE	OUTCO	OMES						COGNIT	IVE LEVELS
CO1	Explain energy	n the need of r on environme	enewab nt, chall	le sources of en- enges in the elec	ergy, impac etric grid, Si	t of renev mart Grid	vable	Understan	ding (Level II)
CO2	Analyz PV sys	te basics of So stems	olar radi	ation and Solar	photovolta	ics, Balan	ce of	Analysis (Level IV)
CO3	Analyz Genera	e wind ener ators	gy reso	ource and desi	gning of	Wind E	nergy	Analysis (Level IV)
CO4	Illustra energy	te different bio	omass ei	nergy resources,	and extract	ion of bic	omass	Understan	ding (Level II)
Module No.	Title of the Module Topics in the Module				No. of Lectures for the module				
1.	IntroductionOverview of energy use and related issues, major energy options, issues of supply and demand, energy conversions, global climate change issues, effects on ecology and biodiversity, status of renewable energy in India.				4				
2.	Solar]	Energy	Fundamentals of Solar radiation, Solar Resource Assessment, Solar Photovoltaics, Balance of PV Systems, and Solar Thermal.					10	
3.	3. Wind Energy Wind resource, Basics of aerodynamics, Maximum power extraction from wind resource fundamental power equations, Basic design concepts of Wind Energy Generators				8				
4.	Biom	ass Energy	Energy Biomass resource, extracting biomass energy, landfill gas, waste to energy, energy balances and economics. 6					6	
5.	Electr	ic Grid	Basic develo	operations, ppments and chal	berformance lenges in th	e related le electric	l issu grid.	ies, new	2

	Total number of Lectures	30						
Eval	Evaluation Criteria							
Com	nponents Maximum Marks							
Mid-	-Term 30							
End	Semester Examination 40							
TA	30							
Tota	d <u>100</u>							
Reco Refe	commended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (brence Books, Journals, Reports, Websites etc. in the IEEE format)	Text books,						
1.	Solanki, C.S., Solar Photovoltaics: Fundamental, technologies and applications, 3rd ed., Delhi: Prentice Hall of India, 2015							
2.	Momoh, J., Smart Grid: Fundamentals of Design and Analysis, Wiley-IEEE Press, 2012.							
3.	Ahmed S., Wind Energy: Theory and Practice, 3rd ed., Delhi: Prentice Hall of India, 2016							
4.	Earnest J., Wind Power Technology, 2nd ed., Delhi: Prentice Hall of India, 2015							
5.	Kothari, D.P., Singal, K.C. and Ranjan, R., <i>Renewable Energy Sources and Emerging Technologies</i> , 2nd ed., Delhi: Prentice Hall of India, 2016.							

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 (W	/orkshop)	
Credits	0-0-4	Contact Hours	4

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

COURSE	COGNITIVE LEVELS	
CO1	Define exiting IoT frameworks and techniques used for developing applications	Remember (level 1)
CO2	Explain the uses of IoT edge devices & basic concept of Node-RED platform.	Understand (level 2)
CO3	Develop Java Script based IoT applications using functional nodes, flows and dashboard on Node-RED platform	Apply (level 3)
CO4	Evaluate the data gathered using Node-RED functionalities and choose appropriate graphical user interface to output the results.	Evaluate (level 5)
CO5	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	СО
1.	Java scripts for inbuilt functional nodes and deploy it in Node-Red	Setup and Install Node.js and Node-RED as IDE platform for IoT application development.	C1
2.	flows, types of Message	I/O nodes, flows, third party palettes, import/export of flows in Node-RED	C1,C2
3.	User defined functional nodes into Node-RED	Java scripts for user defined functional nodes and deploy it in Node-Red flows.	C2,C3
4.	flows and FRED cloud and using various dashboard UI	User defined functional nodes into Node- RED flows and FRED cloud.	C2,C3
5.	interfaces	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	MQTT brokers for publishing and subscribing between IoT sensors and devices.	C4,C5

	devices.					
7.	Using	webs	ocket	for	HTTP, TCP and UDP traffic flow for IoT	C4,C5
	HTTP,	TCP	and	UDP	applications.	
8.	traffic	flow	in	IoT	Using WebSocket through internet and	C4,C5
	applications.				cloud platforms.	
	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/						

Course Code		16B19PH692	2	Semester Ev	Semester EvenSemester VISession2018 - 20Month from:January to June				2018 -2019 June		
Course Name		Light Emittin	Light Emitting Diodes: Basics & Applications								
Credits		V	alue Ad	ded	Contact I	Hours		2	2		
Faculty (N	ames)	Coordinato	r(s) Dr. Bhubesh Chander Joshi								
		Teacher(s) (Alphabetica	ally)	Dr. Bhubesh (Chander Josh	ni					
COURSE	OUTCO	OMES						COGNIT	IVE LEVELS		
C305-6.1	Recall junctio	the basic conc on diode and lig	cepts of ght emit	semiconducting ting diodes.	g materials, v	working c	of p-n	Remer	nbering (C1)		
C305-6.2	Explai fabrica	n the various tion of LEDs.	physica	al parameters in	nvolved in	designing	g and	Unders	standing (C2)		
C305-6.3	Solve spectru	various proble 1m of LEDs	ems rela	ted to efficient	cy, emission	n intensity	/ and	App	lying (C3)		
C305-6.4	Analys high bi	se the problems rightness LEDs	s in desi s.	gning & fabrica	ting blue, w	hite and g	reen	Anal	yzing (C4)		
Module No.	Title of the ModuleTo			ics in the Module					No. of Lectures for the module		
1.	Histor	y of LEDs	Histor LEDs.	History of SiC, GaAs, GaAsP, GaInP, GaN, and InGaN LEDs.					4		
2.	Theory Recom	/ of bination's	Radiat and hi quantu Einstei	diative and non-radiative recombination's, Low-level 6 d high-level excitations, Bio-molecular rate equation for antum well structure, Van Roosbroeck-Shockley Model, nstein Model.					6		
3.	LED B	Basics	Electri resistat junctic Optica efficiet depend	trical properties: I-V characteristics, parasitic 6 tances, carrier distribution in homo and hetero tions, carrier losses, carrier overflow in heterojunctions, cal properties: Internal, external, extraction and power iencies, Emission spectra, escape cone and temperature endency					6		
4.	Growt Fabric	h & ations	LED 1 Charac	materials, Organic LEDs, Growth, Fabrication and acterization Techniques					4		
5.	5. Applications Solid and R Com			d state lighting, White LEDs, HB LEDs, Color Mixing Rendering, LED Drivers, Display Devices, AMOLED, munication, High Voltage LEDs					10		
					Т	otal num	ber of	Lectures	30		
Evaluation Criteria Components Mid Term Examination End Semester Examination			Maxim 30 40 30 [Pro	um Marks esentation/proje	ect (15 M) +	Attendan	ce (15	M)]			

Tota	1 100
Reco Refe	ommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence 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

Course Code		15B11EC671	Semester VI ((Even)	Semester 6 th Session 2018 -20			9
			(specify Odd/	Even)	Month	from .	JanJune 2019	
Course Na	ne	TELECOMMU	NICATION NETWORKS LAB					
Credits	Credits			Contact Hours 2			2	
Faculty (Names) Coordinator(s)		Juhi Gupta						
		Teacher(s) (Alphabetically)	Ankur Bhardw Pankaj K. Yad	aj, Dharme av, Ruby B	ndra Jhar eniwal	iya, Jul	hi Gupta, Neetu Sing	jh,
COURSE OUTCOMES							COGNITIVE LEV	VELS
CO1	Learn a	about network simul cting network simula	ator, and building/ tion and summariz	installing N zing OSI, To	IS2 for CP & UD	Р	Understandin (Level-II)	ıg
CO2	Set up UDP/7	and anlaysis of the v CCP agents with CBF	vired and LAN net R/FTP traffic source	works and respective	understan ely	ding	Analyzing (Level- IV)	
CO3	To created network	ate and analyze the n ks and routing algor	nobile ad-hoc netw ithm.	vork and he	terogenou	IS	Analyzing (Level- IV)	
CO4 To label and explain data Networks and evaluating without errors).			race file (.tr) of Wired, Wireless and LAN throughput in Wired networks (with and (Level-V)					
Module No.	Title	of the Module	List of Experiments					СО
1.	Intro and I	duction to NS2 Linux	1. (a) To learn about network simulator, and use NS2 for conducting network simulation including LINUX commands.					CO1
			(b) To learn in	stalling NS	2 in Fedo	ra.		
2.	OSI	Model	 (a) Introduction to OSI, TCP & UDP. (b) To set up a network with two nodes; link them with duplex link, 10ms propagation delay, 1Mbps rate and DropTail procedure. Use Agent UDP with CBR traffic source. To set up a network with two nodes; link them with duplex link, 10ms propagation delay, 1Mbps rate and DropTail procedure. Use FTP over Agent TCP. 				CO2	
3.	Ethe	rnet	4. To implement	t wired LAI	N connect	ion in	NS2	CO2
4. Mobile Networks			 5. To create a mobile ad-hoc network with 3 nodes in 500*400 topography with following initial positions and movements: Node 0 (5, 5) Node 1 (490,285) Node 2 (150,240) At t = 10, 0 moves towards (250,250) at 3m/sec. At t =15, 10 moves towards (45,285) at 5m/sec. At t =110, 100 moves towards (480,300) at 5m/sec. 			CO3		
5.	Wire Netw	ed-cum-Wireless	6. To create a H wireless netw	eterogeneou ork).	us Networ	rk (wir	ed cum	CO3
6.	Inter Files	pretation of Trace	7. To interpret d LAN Network	lata trace file (.tr) of Wired, Wireless and ks.				CO4

7.	Throughput Calculation and Error Analysis	 8. Throughput calculation for TCP or UDP in Wired network. 9. To create a network with 4 nodes 0-2, 1-2, 2-3 with TCP from 0-3 and UDP from 1-3. Apply an error model on link 2-3 with error rate 0.2 and uniform distribution. Apply queue monitor on 2-3 link and interpret any five lines of qm.out file. 10. To create a network with 5 nodes, and apply uniform, exponential and constant error model with error rate 1% on 3 different links. 					
Evaluation	Criteria						
Components N		Iaximum Marks					
Mid-Sem Viva		20					
Final Viva 2		20					
Day-to-Day 6		0					
Total		100					

Reco	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.	NS2 for Beginners				
2.	W. Stallings, Data & Computer Communication, PHI				
3.	B. A Forouzan, DATA COMMUNICATIONS AND NETWORKING, 4 th Edition TMH				
4.	A.S. Tanenbaum, Computer Networks, PHI				

Course Code	15B19EC691	Semester Even		Semeste Month f	r 6 th	Session 2018 -2019		
		(specify Odd/Even) Wonth from 5						
Course Name	Minor Project -2							
Credits	5 Contact Hours							
Faculty (Namas)	Eaculty (Names) Coordinator(a) Mr. Paghyanda Kumar Singh							
Faculty (Maines)								
	Teacher(s) (Alphabetically)	Dr. Vimal Kumar Mishra						
COURSE OUTCOMES					COGNITIVE LEVELS			
Identifying planning and initiation of the individual projects in the					ı the	Applying		

CO1	Identifying, planning and initiation of the individual projects in the domain selected by them, respectively.	Applying (III)
CO2	Analyze the potential research areas in the field of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc.	Analyzing (IV)
CO3	Survey the available literature and gain knowledge of the State-of-Art in the chosen field of study.	Analyzing (IV)
CO4	Evaluate the existing algorithms of the domain selected and improvise the algorithm so that it yields better results than the existing metrics.	Evaluating (V)
CO5	Design and implement a working model, using various hardware components, which works as a prototype to showcase the idea selected for implementation.	Creating (VI)
Evaluati	on Criteria	

Components	Maximum Marks
Mid Term	20 (Viva)+20(Day to Day)
End Term	20 (Viva)+20(Day to Day)+20(Report)
Total	100

Course Code		18B12EC311		Semester OddS(specify Odd/Even)M		Semester 7thSession2018 - 2019Month fromJulytoDecember			
Course Name		Advanced Radio Access Networks							
Credits			3		Contact Hours			3	3
Faculty (N	ames)	Coordina	ator(s) Dr. Bajrang Bansal, Dr. Pankaj Yadav						
Te (A		Teacher(s (Alphabe	s) tically)	Dr. Bajrang Bansal, Dr. Pankaj Yadav, Dr. Rahul Kan) Vishal Saxana					ıshik, Dr.
COURSE	OUTCO	OMES						COGNIT	IVE LEVELS
CO1	Recall Wave	the basic co Propagation	oncepts of Digital Communication, Antenna and Remer			Remembe	nbering Level (C1)		
CO2	Identif 3GPP	y the difference ne	rent components of wireless network based on the etwork model. Applying					Applying	Level (C3)
CO3	Analyz examir	the archit	ecture and call flow.	channel structure	e of LTE ar	nd also		Analyzing	g Level (C4)
CO4	Explain in radio	Explain the importance of Optimization and Pre-Launch Optimization Evaluating					g Level (C5)		
Module No.	Title o Modul	f the e	Topics in the Module				No. of Lectures for the module		
1.	Introdu	iction	Overview structure, componer	Overview and evolution of Mobile Telephony, Telecom team structure, Generic network architecture, RAN network components, RAN life cycle.					6
2.	RF Basics		Concepts related to baseband signal processing, Microwave 6 theory fundamentals, Concepts of radio propagation, Antenna Concepts, Fading in wireless communication.					6	
3.	Radio Access Networks- Overview		Introduction to cellular concepts, Link adaptation, Power control, Generalized macro site overview, Generalized call flow, Introduction to KPI, Protocol layers, Standardization.					6	
4.	Radio . Netwo	Radio Access Network- LTEArchitecture of LTE, LTE Bearer, LTE QoS, LTE Radio Interface, Channel structure, Scheduling in LTE, Idle mo behavior, Power control in LTE, LTE mobility, LTE call				ndio mode call flow.	18		
5.	Radio AccessOptimization basics,RAN tuning and RAN optimization, Introduction to KPIs and Counters, Pre-launch optimization, Post-launch optimization.			ion, nization,	6				
					Т	otal num	ber of	f Lectures	42
Evaluation Criteria Components T1 T2 End Semester Examination TA		Maxim 20 20 35 25 100	um Marks						

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.	Advanced Radio Access Network, Student Book, Ericsson AB 2018.				
2.	T. S. Rappaport, Wireless Communications: Principles and Practice. Piscataway, NJ, USA: IEEE Press, 1996.				
3.	TEMS Investigation, User Guide, ARAN Program-2018, Ericsson.				
4.	Online resource material from NPTEL, Research Papers.				