

Detailed Syllabus

Course Code	20B12HS311	Semester Even (specify Odd/Even)	Semester Session 2020-21 Month from Jan - July
Course Name	Global Politics		
Credits	3(2-1-0)	Contact Hours	3

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

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Globalization: Conceptions and Perspectives	Political Dimension of globalization Globalization and Culture Technological Dimensions Debates on territoriality and sovereignty	6
2.	Global Economy	Its Significance and Anchors of Global Political Economy: IMF- history and India's benefit from its membership of IMF WTO- History and India's experience with WTO and reform proposals World Bank- history and role of world Bank in India Rise of TNCs and role of TNCs in globalization Global resistances (Global Social Movement and NGOs)- their nature and characteristics , prominent movements and their impact	8
3.	Contemporary Global Issues-I	Ecological Issues: historical overview of international environmental agreements-UNSCD, Paris agreement, climate change- Copenhagen summit to post Copenhagen summit policies of India, climate change and global initiatives	8

Detailed Syllabus
Lecture-wise Breakup

Course Code	20B16CS326	Semester EVEN	Semester VI Session 2020 -2021 Month from JAN-JUN
Course Name	Front End Programming		
Credits		Contact Hours	0-0-2 (2 hrs per week)

Faculty (Names)	Coordinator(s)	Dr. Shailesh Kumar
	Teacher(s) (Alphabetically)	Ms. Kritika Rani, Dr. Shailesh Kumar

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

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

Evaluation Criteria	
Components	Maximum Marks
Mid Semester Examination	30
End Semester Examination	40
TA	30 (Attendance-10, Assignments/ Class Test/ Quiz/ LAB Record -05, Project -15)
Total	100

Project based learning: In this subject students will learn the latest front end technology. After completing the subject, each student in a group of 3-4 will be able to create a mobile application.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
Reference Books:	
1.	Schildt, H. (2014). Java: The Complete Reference. McGraw-Hill Education Group.
2.	Mughal, K. A., & Rasmussen, R. W. (2016). A Programmer's Guide to Java SE 8 Oracle Certified Associate (OCA). Addison-Wesley Professional.
3.	Gaddis, T., Bhattacharjee, A. K., & Mukherjee, S. (2015). Starting out with Java: early objects. Pearson.
Text Books:	
4.	Duckett, J. (2014). Web Design with HTML, CSS, JavaScript and jQuery Set. Wiley Publishing.
5.	Shenoy, A., & Sossou, U. (2014). Learning Bootstrap. Packt Publishing Ltd.
6.	Lee, W. M. (2012). Beginning android for application Development. John Wiley & Sons.
7.	Hardy, B., & Phillips, B. (2013). Android Programming: The Big Nerd Ranch Guide. Addison-Wesley Professional.

DETAILED SYLLABUS AND EVALUATION SCHEME

CourseCode	21B12HS311	Semester:EVEN (specify Odd/Even)	Semester:VI Session:2020-21 Month from: Jan-June
CourseName	Development Issues and Rural Engineering		
Credits	03	ContactHours	2-1-0
Faculty(Names)	Coordinator(s)	Dr.Amandeep Kaur	
	Teacher(s) (Alphabetically)	Dr. Amandeep Kaur (amandeep.kaur@mail.jiit.ac.in)	

COURSE OUTCOMES		COGNITIVE LEVELS
C304-10.1	Understand the concept, philosophy and determinants of rural development	Understanding Level-(C2)
C304-10.2	Assess public policies related to rural development	Analyze Level -(C4)
C304-10.3	Explain the role of local self-governance in planning and development of rural areas.	Understanding Level-(C2)
C304-10.4	Analyze the impact of recent policy changes and schemes on rural development.	Analyze Level -(C4)
C304-10.5	Evaluate the issue and challenges of through possible determinants of rural development.	Evaluation Level-(C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Rural Development: An Introduction	Rural Development Philosophy, Concepts, Principles, Traditional and Modern Concept of Development, Trends and Pattern of micro as well as macro indicators of Rural Development.	4
2.	Public Policies and Rural Development	Policies related to Employment Generation, Poverty Reduction, Skill Development and, Infrastructure such as MGNREGA, DDUGKY, AtamNirbhar Bharat rojgaryojna and schemes related to MSMEs etc.	6
3.	Rural Development Administration and Panchayat Raj Institutions	Rural Development administration: Panchayat Raj System (73 rd Amendment Act), functions of Panchayat Raj System, Financial Distribution of Resources in Rural India through Panchayat Raj System, merits and demerits of Panchayat system, Ways to strengthen the existing system by overcoming the flaws.	6
4.	Rural Development Issues and Challenges	Issues and challenges of Rural development: Employment in line with sectoral distribution (GDP and Employment), Poverty and Migration Issue, Rural and Urban Consumption and Production Linkages.	7
5.	Recent Advancements and changes	Recent packages and schemes implemented in Rural India, Budget Allocation for Rural Development -2019-20 and 2020-21: For Employment Generation, poverty reduction,	5

	infrastructure and MSMEs.	
Total number of Lectures		28
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Assignment, Quiz, Project)	
Total	100	
<p>Project-based Learning: Students are required to collect the data related to different indicators of rural development (related to agriculture, health and education infrastructure, literacy levels, population density, poverty, employment etc.). They also need to check the compatibility of data (data mining and data refining process) and then analyse the contribution of these indicators in rural development of particular state/country as whole. Moreover, they are required to analyse the extent of progress and failure of programmes/schemes implemented in rural areas for poverty reduction, employment generation and MSMEs. Collecting information and analysing the data related to development indicators and policies will upgrade students'knowledge regarding the development issues and strengthen their skills to tackle multiple data handling and measuring issues.</p>		

Recommended Reading material:	
1.	Singh, Katar. Rural Development: Principles, Policies and Management (3e).2009
2.	Coke, P., Marsden, T. and Mooney, P. Handbook of Rural Studies. Sage Publications, 2006
3.	Todaro, M.P., Stephen C. Smith, Economic Development, Pearson Education, 2017
3.	Ahuja, H. L., Development Economics, S Chand publishing, 2016
4.	Musgrave, R. A., Musgrave, P. B., Public Finance in Theory and Practice, McGraw Hill Education,2017

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12HS611	Semester EVEN (specify Odd/Even)	Semester VI Session2020-2021 Month from: Jan - June
Course Name	Marketing Management		
Credits	3	Contact Hours	(2-1-0)

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

COURSE OUTCOMES		COGNITIVE LEVELS
C304-7.1	To illustrate the fundamentals of marketing, marketing environment and market research	Understanding Level (C2)
C304-7.2	To model the dynamics of marketing mix	Applying Level (C3)
C304-7.3	To demonstrate the implications of current trends in social media marketing and emerging marketing trends.	Understanding Level (C2)
C304-7.4	To appraise the importance of marketing ethics and social responsibility	Evaluating(C5)
C-304-7.5	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	Explore the impact of social forces on marketing actions. Describe how technological change affects	5

	Process	marketing. Designing the business Portfolio Discuss the Strategic Planning Process and Strategic Marketing Process.	
4	Consumer and Business Buyer Behaviour	Consumer Markets and consumer buyer behaviour. The buying decision process. Business Markets and business buyer behaviour. Discuss the modern ethical standards.	5
5	Branding	Brand Image, Identity and Association. Product brands and Branding decisions. Product line and mix decisions. Consumer Brand Knowledge. New Product Development and Product life cycle strategies.	4
6	Pricing products: Pricing considerations and strategies	Factors to consider when setting prices. New product pricing strategies. Product mix pricing strategies. Price adjustments and changes.	4
7	The New Age Social Marketing	Ethics and social responsibility in marketing. Ethical 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 (Project, Viva, Oral 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.	Kotler, Philip and Gary Armstrong, Principles of Marketing, 10 th Edition, New Delhi, Pearson Education, 2004.
2.	Darymple, Douglas J., and Leonard J. Parsons, Marketing Management: Text and Cases, 7 th Edition, John Wiley & Sons (Asia) Pte. Ltd., 2002.
3.	Kotler, Philip., and Kevin Lane Keller, Marketing Management, 12 th Edition, New Delhi, Pearson Education, 2006.

4.	Winer, Russell S., Marketing Management, 2 nd Edition, Prentice Hall,2003.
5.	Hollensen, S. (2019). Marketing management: A relationship approach. Pearson Education.

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12HS612	Semester:Even	Semester VI Session 2020 -2021 Month from Jan2021 to June 2021
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 the Indian Diaspora	3
8.	Integrating Mobile into Social Media Marketing	Types of Mobile Marketing, Progression of the mobile as a Marketing channel, some Indian mobile marketing campaigns, Impact of Social Media on government, the economy, development, and education	2
Total number of Lectures			28

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project,Viva and Attendance)
Total	100

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

1.	Digital Marketing, Chaffey, D., & Ellis-Chadwick, F, Seventh Edition, Pearson (U.K) 2019.
2.	Digital Marketing, Seema Gupta, First Edition, Mc Graw Hill Education (India) Private Limited ,2018
3.	Social Media Marketing A Strategic Approach, Melissa Barker, Donald Barker, Second Edition Cengage Learning ,2017.

4.	Internet Marketing: A Practical Approach in the Indian Context, Maity, Moutusy, First Edition Oxford University Press,2017.
5.	Fundamentals of Digital Marketing, Puneet Singh Bhatia, Second Edition, Pearson,2017.
6.	Digital Marketing, Vandana Ahuja, First Edition, Oxford University Press, 2015
7.	Social Media Marketing, Liana “Li” Evans, First Edition, Pearson, 2011.

Detailed Syllabus
Lecture-wise Breakup

Course Code	21B13HS311	Semester Even (specify Odd/Even)	Semester VI Session 2020 -2021 Month from Jan 2021-June 2021
Course Name	Poverty, Inequality and Human Development		
Credits	2	Contact Hours	1-0-2

Faculty (Names)	Coordinator(s)	Dr Akarsh Arora
	Teacher(s) (Alphabetically)	Dr Akarsh Arora

COURSE OUTCOMES		COGNITIVE LEVELS
C305-13.1	Understand the concepts and dimensions of Poverty, Inequality and Human Development	Understand (Level 2)
C305-13.2	Evaluate different approaches to measure Poverty, Inequality and Human Development	Evaluate (Level 5)
C305-13.3	Apply an analytical framework to understand the factual or proximate causes or determinants of Poverty and Inequality	Apply (Level 3)
C305-13.4	Analyze the role of public policy and affirmative action to tackle Poverty and Inequality and strengthen Human Development.	Analyze (Level 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Concepts and Dimensions	Concepts and Dimensions of Poverty, Inequality and Human Development	3
2.	Measurement	Measurement of Poverty and Inequality: Steps and Axioms. Steps to calculate Human Development	4
3.	Data Sources	Census Data, Unit level Household Data, Geospatial Data, Satellite Image Data	2
4.	Determinants	Determinants/ Factors: Demographics, Household, Individual, and Macroeconomic variables Introduction to Stata, Regression- Linear and Binary models	3
5.	Public Policies and Affirmative Actions	Review of different public policies of GOI to eradicate poverty. Role of education and health care policies to strengthen human development	2
Total number of Lectures			14

Module No.	Title of the Module	List of Experiments/Activities	CO
1.	Concepts and Dimensions	Practical sessions on different dimensions of poverty and inequality.	CO1, CO2
2.	Measurement	Practical sessions on STATA software to measure poverty, inequality, and human development.	CO1, CO2
3.	Data Sources	Practical sessions on key survey issues and problems while collecting data on poverty, inequality and human development.	CO2, CO3
4.	Determinants	Practical sessions on STATA software to find and interpret the determinants of poverty using regression analysis.	CO2, CO3
5.	Public Policies and Affirmative Actions	Practical sessions on the impact of different Government of India policies and programmes on poverty, inequality and human development.	CO3, CO4

Evaluation Criteria	
Components	Maximum Marks
Mid Term	30 (Project)
End Term	40 (Written)
TA	30 (Class Mock Activities, Assignment, Quiz)
Total	100

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	A. V. Banerjee and E. Duflo, <i>Poor Economics: A Radical Rethinking of the Way to Fight Global Poverty</i> . New York: Public Affairs, 2011
2.	J. Haughton and S. R. Khandker, <i>Handbook on Poverty and Inequality</i> . Washington, DC: The World Bank, 2009.
3.	A. Tarozzi and A. Deaton, "Using census and survey data to estimate poverty and inequality for small areas," <i>The review of economics and statistics</i> , vol. 91, no. 4, pp. 773-792, 2009.
4.	D. Ray, <i>Development Economics</i> , 19 ed. New Delhi, India: Oxford University Press, 2012
5.	A. Sen, <i>On Economic Inequality</i> . Oxford: Clarendon Press, 1997.
6.	S. Alkire and M. E. Santos, " <i>Acute Multidimensional Poverty: A New Index for Developing Countries</i> ," OPHI WORKING PAPER. 2017.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH633	Semester:Even	Semester:VI Session:2019 -2020 Month: January to June
Course Name	Photovoltaic Techniques		
Credits	3	Contact Hours	3+1

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

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Classify various type of renewable energy sources and explain working of photovoltaic device.	Understand Level (Level 2)
CO2	Demonstrate the use of basic principles to model photovoltaic devices	Understand Level (Level 2)
CO3	Identify challenges and apply strategies to optimize performance of various type of solar cells	Apply Level (Level 3)
CO4	Analyze Solar PV module, mismatch parameter and rating of PV module	Analyze Level (Level 4)
CO5	Evaluate the performance of various stand-alone PV systems with battery and AC and DC load	Evaluate Level (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Review	Energy issues, conventional energy sources, Renewable energy sources, Solar Energy	02
2.	Solar cell fundamentals	Fundamental of semiconductor, charge carriers and their motion in semiconductors, carriers generation and recombination, p-n junction diode, introduction to solar cell, p-n junction under illumination, Current-Voltage (I-V), open circuit voltage (V_{OC}), short circuit current (I_{SC}) Maximum power, current and voltage and Efficiency, Quantum Efficiency	10
3.	Design of solar cells	Upper limits of cell parameters, losses 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,	08

		Photovoltaic safety.	
Total number of Lectures			40
Evaluation Criteria			
Components	Maximum Marks		
T1	20		
T2	20		
End Semester Examination	35		
TA	25 (Quiz+Attendance+PBL+class performance)		
Total	100		

PBL: Students are given the task to design a PV system for the water pump and home appliances. This design can help students in understanding the basic knowledge of PV systems, wiring, load calculation, battery sizing, PV panels, etc. This can help students in getting jobs in the renewable energy sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Textbooks, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Tom Markvart and Luis Castaner, "Solar Cells: Materials, Manufacture and Operations," Elsevier, 2006
2.	Stuart R. Wenhem, Martin A. Green, M.E. Watt, "Applied Photovoltaics," Earthscan, 2007
3.	Jenny Nelson, "The Physics of Solar Cells" Imperial college press," 003.Aatec publications, 1995.
4.	C S Solanki, Solar Photovoltaics, PHI

Detailed Syllabus

Course Code	16B1NPH636	Semester: Even	Semester: VI Session 2020 -2021 Month from: January to June
Course Name	Medical & industrial applications of nuclear radiation		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Manoj Tripathi
	Teacher(s) (Alphabetically)	Dr. Manoj Tripathi

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Nucleus, Radioactivity & Dating	Structure of matter; Nucleus: Nuclear Size, Structure and forces; Binding energy and Nuclear stability, mass defect; Nuclear reaction: Fission, Fusion, chain reaction. Nuclear fusion in stars, Formation of basic elements: proton-proton chain, CNO cycle, Hydrostatic equilibrium; Applications: atom bomb, hydrogen bomb, nuclear power plants, Nuclear reactor problems, precautions. ii) Radioactive decay, kinetics of radioactive decay, Types of radioactive decay and their measurement, Half life, decay constant, Population of states, Production of radionuclides. Radioactive dating, Radiocarbon dating: Formation, mechanism of dating, carbon cycle, radiocarbon clock and applications, advantages, disadvantages, precautions; Other dating techniques, protein dating, accuracy in dating;	17
2.	Radiation and matter interactions	Dosimetry and applications: Interaction of Radiation of matter: Biological effects of radiations; dosimetry, working principles, Tools and radiotherapy, Doses,	09

		Radioisotopes, Radiotracers;	
3.	NMR and MRI	Nuclear Magnetic Resonance: General Introduction to Magnetic Resonance, Reference Frame; RF Pulses, Larmor precession, Basic principles of NMR & ESR Spectroscopy, Nuclear shielding, Chemical shifts; Couplings, Nuclear Imaging; 1D,2D, 3D Images, Application of NMR in medical industry as MRI, working MRI, Types of differen MRI, Applications of NMR in quantum computation;	09
4.	Nuclear Medicine and Nuclear Imaging	Nuclear Medicine and Nuclear imaging techniques, preclinical imaging, detector designing, photon counting, Medical imaging using $\beta+\gamma$ coincidences, SPECT AND PET: Radiation tomography, applications;	05
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.	Basic Sciences of Nuclear Medicine; Magdy M K halil, Springer
2.	Physics and Radibiology of Nuclear Medicine; Gopal B Saha, Springer
3.	A. Beiser, Concepts of Modern Physics, Mc Graw Hill International.
4.	Radionuclide Techniques in Medicine, JM McAlister (Cambridge University Press, 1979).
5.	Nuclear Physics; S.N.Ghosal

Course Description

Course Code	16B1NMA633	Semester :Even	Semester VI Session 2020-21 Month from Jan - Jun 2021
Course Name	Statistics		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)		
	Teacher(s) (Alphabetically)		
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, Tutorials)
Total	100
Project based learning: Students in a group of 4 will collect sample data set and make simple regression models. They will validate the model by hypothesis testing. By this students will be able to make simple linear regression models and validate it.	
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, 10th edition, Pearson Education Asia, 2018.
8.	Meyer, P.L , Introductory Probability and Statistical Applications Addison-Wesley Publishing Company, 1965.

Course Description

Course Code	20B12MA311	Semester Even	Semester VI Session 2020-21 Month from Jan - Jun 2021
Course Name	Applicational Aspects of Differential Equations		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)		
	Teacher(s) (Alphabetically)		
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C302-2.1	solve ordinary differential equations in LCR and mass spring problems.	Applying Level (C3)	
C302-2.2	explain orthogonality of functions and apply it to solve Sturm-Liouville boundary value problems.	Applying Level (C3)	
C302-2.3	apply matrix algebra to find the solution of system of linear differential equations.	Applying Level (C3)	
C302-2.4	formulate and solve first and second order partial differential equations.	Applying Level (C3)	
C302-2.5	evaluate solution of differential equations arising in engineering applications.	Evaluating Level (C5)	
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Theory of Ordinary Differential Equations	Existence and uniqueness of solutions, applications to ordinary differential equations in LCR and mass spring problem.	10
2.	Sturm-Liouville Boundary Value Problem	Sturm-Liouville problems, orthogonality of characteristic functions, the expansion of a function in a series of orthogonal functions, trigonometric Fourier series.	10
3.	Matrix Methods to solve ODE's	Matrix method for homogeneous linear systems with constant coefficients.	4
4.	Basic Theory of Partial Differential Equations	Solution of first order equations: Lagrange's equation, Charpit's method, higher order linear equations with constant coefficients.	4
5.	Applications of Differential Equations	Fourier integrals, Fourier transforms, solution of partial differential equations by Laplace and Fourier transform methods, applications of differential equations in mechanics.	14
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz , Assignments, Tutorials)	
Total		100	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	Ross, S.L. , Differential Equations, 3 rd Ed., John Wiley & Sons, 2004.		
2.	Jain, R.K. and Iyengar, S.R.K. , Advanced Engineering Mathematics, 3 rd Ed., Narosa Publishing House, 2012		
3.	Chandramouli, P.N. , Continuum Mechanics, Yes Dee Publishing India, 2014.		
4.	Kreyszig, E. , Advanced Engineering Mathematics, 10 th Edition, John Wiley& Sons, Inc. 2013.		

Course Description

Course Code	18B12MA611	Semester Even	Semester VI Session 2020-21 Month from Jan - Jun 2021
Course Name	Operations Research		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)		
	Teacher(s) (Alphabetically)		
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 for inequality constraints, Quadratic Programming -Wolfe's Method	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		
Project based learning: Each student in a group of 4-5 will collect literature on transportation, assignment and			

integer programming problem to solve some practical problems. To make the subject application based, the students analyze the optimized way to deal with afore mentioned topics.

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, 2011.
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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11EC613	Semester: Even	Semester: 6th Session: Month from: Jan-Jun
Course Name	Control Systems		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Ruby Beniwal, Mr. Varun Goel	
	Teacher(s) (Alphabetically)		

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.	Modelling 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 Response Analysis and Design	Bodes plot and Nyquist plot , Gain Margin & Phase Margin, stability analysis	7
7.	State Variable Approach to Time Domain Analysis	State variable representation of continuous-time systems; System Response and State Transition Matrix (STM); Applications of STM.	6
Total number of Lectures			42

Evaluation Criteria

Components

Maximum Marks

T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance : 5 Marks, Quiz:10 Marks, Assignment: 10 Marks)
Total	100

Project Based Learning: Students will design simplify the continuous time systems. By determining time response of continuous time systems, application ability will be enhanced in students. Understanding of stability concept for continuous time systems, System Response and State Transition Matrix (STM) with applications of STM, provide basic concept of designing of control systems.

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.	I. J Nagrath and M. Gopal, Control Systems Engineering, Fifth edition, New age International, 5 th Edition, 2009.
2.	Normal S. Nise,, Control Systems Engineering, 7 th Edition, John Wiley,2014
3.	K.Ogata, Modern Control Engineering, 5 th Edition, Prentice Hall, 2010

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17EC671	Semester VI (Even) (specify Odd/Even)	Semester 6th Session 2020 -2021 Month from Jan.-June 2021
Course Name	TELECOMMUNICATION NETWORKS LAB		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Juhi Gupta
	Teacher(s) (Alphabetically)	Ajay Kumar, Juhi Gupta, Neetu Singh, Pankaj K. Yadav, Ruby Beniwal, Shradha Saxena

COURSE OUTCOMES		COGNITIVE LEVELS
CO375.1	Learn about network simulator, and building/installing NS2 for conducting network simulation and summarizing OSI, TCP & UDP	Level-2 (Understanding)
CO375.2	Set up and analysis of the wired and LAN networks and understanding UDP/TCP agents with CBR/FTP traffic source respectively	Level- 4 (Analyzing)
CO375.3	To create and analyze the mobile ad-hoc network and heterogenous networks and routing algorithm.	Level-4 (Analyzing)
CO375.4	To label and explain data trace file (.tr) of Wired, Wireless and LAN Networks and evaluating throughput in Wired networks (with and without errors).	Level-5 (Evaluating)

Module No.	Title of the Module	List of Experiments	CO
1.	Introduction to NS2 and Linux	1. (a) To learn about network simulator, and use NS2 for conducting network simulation including LINUX commands. (b) To learn installing NS2 in Fedora.	CO1
2.	OSI Model	2. (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. 3. 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.	Ethernet	4. To implement wired LAN connection 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.	Wired-cum-Wireless Networks	6. To create a Heterogeneous Network (wired cum wireless network).	CO3
6.	Interpretation of	7. To interpret data trace file (.tr) of Wired, Wireless and	CO4

	Trace Files	LAN Networks.	
7.	Throughput Calculation and Error Analysis	<p>8. Throughput calculation for TCP or UDP in Wired network.</p> <p>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.</p> <p>10. To create a network with 5 nodes, and apply uniform, exponential and constant error model with error rate 1% on 3 different links.</p>	CO4

Project-Based Learning: NS2 provides an interactive and graphical platform for the simulation of wired-cum-wireless networks. The TCL programming to generate any telecommunication networks is taught to the students, allowing further to analyze the performance of the network in the presence and absence of any error due to the channel fading or interference.

Evaluation Criteria

Components	Maximum Marks
Mid-Sem Viva	20
Final Viva	20
Day-to-Day	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.	The ns Manual (formerly ns Notes and Documentation), http://www.isi.edu/nsnam/ns/ns-documentation.html
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

Detailed Syllabus
Lecture-wise Breakup

Subject Code	15B19EC691	Semester	Even	Semester 6th Session 2020-21 Month from January 21 to June 21
Subject Name	Minor Project - 2			
Credits	2	Contact Hours	NA	

Faculty (Names)	Coordinator(s)	Neetu Singh, Raghvendra Kumar Singh,
	Teacher(s) (Alphabetically)	NA

COURSE OUTCOMES		COGNITIVE LEVELS
C351.1	Identifying, planning and initiation of the individual projects in the domain selected by them, respectively.	Applying Level (C3)
C351.2	Analyze the potential research areas in the field of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc.	Analyzing Level (C4)
C351.3	Survey the available literature and gain knowledge of the State-of-Art in the chosen field of study.	Analyzing Level (C4)
C351.4	Evaluate the existing algorithms of the domain selected and improvise the algorithm so that it yields better results than the existing metrics.	Evaluating Level (C5)
C351.5	Design and implement a working model, using various hardware components, which works as a prototype to showcase the idea selected for implementation.	Creating Level (C6)

Evaluation Criteria	
Components	Maximum Marks
Mid Semester Evaluation	40
Final Evaluation	40
Report	20
Total	100

Detailed Syllabus**Lecture-wise
Breakup**

Course Code	16 B19EC691	Semester- Even (specify Odd/Even)	Semester -6 / Session 2020 -2021 Month from Jan to June
Course Name	Renewable Energy		
Credits	2	Contact Hours	2

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

COURSE OUTCOMES		COGNITIVE LEVELS
C305-4.1	Explain the need of renewable sources of energy, impact of renewable energy on environment, challenges in the electric grid, Smart Grid.	Understanding Level (C2)
C305-4.2	Analyze basics of Solar radiation and Solar photovoltaics, Balance of PV systems	Analyzing Level (C4)
C305-4.3	Analyze wind energy resource and designing of Wind Energy Generators	Analyzing Level (C4)
C305-4.4	Illustrate different biomass energy resources, and extraction of biomass energy	Understanding Level (C2)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Overview of energy use and related issues, 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.	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.	Biomass Energy	Biomass resource, extracting biomass energy, landfill gas, waste to energy, energy balances and economics.	6
5.	Electric Grid	Basic operations, performance related issues, new developments and challenges in the electricgrid.	2
Total number of Lectures			30

Project Based Learning: Students will be asked to do the analysis and designing of the solar cell for high efficiency using industry standard simulation tools and the development of the complete system.

Evaluation Criteria

Components	MaximumMarks
Mid-Term	30
EndSemesterExamination	40
TA	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.	Solanki, C.S., <i>Solar Photovoltaics: Fundamental, technologies and applications</i> , 3rd ed., Delhi: Prentice Hall of India, 2015
2.	Momoh, J., <i>Smart Grid: Fundamentals of Design and Analysis</i> , Wiley-IEEE Press, 2012.
3.	Ahmed S., <i>Wind Energy: Theory and Practice</i> , 3rd ed., Delhi: Prentice Hall of India, 2016
4.	Earnest J., <i>Wind Power Technology</i> , 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.

Detailed Syllabus
Lecture-wise Breakup

Subject Code	17B1NEC741	Semester EVEN	Semester-6 Session Even 2021
Subject Name	Digital Hardware Design		
Credits	3	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Shamim Akhter	
	Teacher(s) (Alphabetically)	Ms. Priyanka Kwatra, Dr. Shamim Akhter	
Course Outcomes		Cognitive Levels	
C332-1.1	Design synchronous circuits using Finite State Machine approach	Analyzing Level (C4)	
C332-1.2	Design and analyze asynchronous circuits	Analyzing Level (C4)	
C332-1.3	Understand the advanced adders and multiplier circuit	Understanding Level (C2)	
C332-1.4	Apply the concept of different ways of pulse or pattern generation	Analyzing Level (C4)	
C332-1.5	Design digital circuits using VHDL	Analyzing Level (C4)	
Module No.	Subtitle of the Module	Topics	No. of Lectures
1.	Finite State Machine (FSM)	FSM Design methodology, State Reduction, State Assignment, Implementation, and State Diagram partitioning, Mealy to Moore Conversion and vice-versa.	9
2.	Pulse Generation Technique	Sequence generation using Direct and Indirect Approach, Shift Register Based Approach, Clock Dividers (Integer/Non-Integer)	5
3.	Advanced Topics in Digital Circuits	Different Types of Adders, Parallel Prefix Adders, Multipliers,	9
4.	VHDL based Digital Circuit Design	Importance of HDL, Basic Language elements, VHDL syntax, entities, and architectures, concurrent and sequential constructs, hierarchical design and test benches, FSM modeling and simulation	10
5.	Asynchronous Finite State Machines	Asynchronous Analysis, Design of Asynchronous Machines, Flow table realization, reduction, state assignments and design, Cycle and race analysis. Hazards, Essential Hazards, and its	9

		removal	
Total Number of Lectures			42

Evaluation Criteria

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

Project Based Learning: Student will design and synthesize combinational and sequential circuits using VHDL.

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	William Fletcher: An Engineering approach to digital design, PHI, 2012
2.	Z.Kohavi: Switching and Finite Automata Theory, 2nd Edition, Tata Mc-Graw Hill, 2001
3.	A. Anand Kumar : Fundamental of Digital Circuits, PHI, 4 th Edition 2016
4.	J. M. Rabaey, A. Chandrakasan, B. Nikolic: Digital Integrated Circuits: A Design Perspective, 2 nd Edition, Pearson Education Inc., 2016.
5.	Volnei A. Pedroni: Circuit Design with VHDL, 2 nd Edition, MIT Press 2020

Detailed Syllabus
Lecture-wise Breakup

Subject Code	18B11EC315	Semester (Even)	Semester 6 Month from Jan to May	Session Even 2021
Subject Name	VLSI Design			
Credits	4	Contact Hours	4	
Faculty (Names)	Coordinator(s)	Dr. Satyendra Kumar, Dr. Garima Kapur		
	Teacher(s) (Alphabetically)	Dr. Kirmender Singh, Mr. Vinay A. Tikkiwal		

Course Objectives: This course aims to convey knowledge of basic concepts of circuit design using CMOS with emphasis on the design, optimization and layout. Special attention will be devoted to the most important challenges facing digital circuit designers today and in the coming decade, being the impact of scaling, deep submicron effects and timing.

S. No.	Course Outcomes	Cognitive Levels/ Blooms Taxonomy
CO1	Understand VLSI design flow, VLSI design styles, digital systems modeling using Verilog-HDL	Understanding (Level II)
CO2	Demonstrate the operation of MOSFET, understanding technology scaling and its effects	Analyzing (Level IV)
CO3	Develop the concepts of static and dynamic characteristic of MOS inverters, combinational and sequential circuits	Analyzing (Level IV)
CO4	Understand the dynamic logic circuits, stick diagram, layout and working principle of different types of semiconductor memories	Analyzing (Level IV)

Module No.	Subtitle of the Module	Topics	No. of Lectures
1.	Introduction to VLSI	Overview of VLSI design methodologies, VLSI design flow, Design hierarchy, VLSI design styles.	3
2.	MOS Transistor Theory	MOS structure and operation, MOSFET I-V characteristics, Scaling and small-geometry effects, MOSFET capacitances, MOSFET models for circuit simulation	9
3.	MOS Inverters	Static and switching characteristics, Delay-time definitions, calculation of delay times, Inverter design with delay constraints, Static and switching power	9

		dissipation of CMOS inverter	
4.	MOS Logic Circuits	CMOS logic circuits, Complex logic circuits, Pass transistor logic, CMOS transmission gates, Sequential logic circuits, Dynamic logic circuits, Stick diagram, Layout, Layout design rules	13
5.	Semiconductor Memories	Working of Dynamic and Static Random Access Memory (DRAM, SRAM)	4
6.	System Design using HDL	Language fundamentals, Different modeling techniques using Verilog-HDL	4
Total number of Lectures			42

Evaluation Criteria

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

PBL Component: Knowledge of VLSI Design industry, Basic of CMOS technology, CMOS circuits, power and delay calculations, CMOS technology layout and design rules, designs of memory and HDL language, all these topics develop designing and analysis ability in students.

Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)	
1.	Sung-Mo Kang, ; Yusuf Leblebici ; Chulwoo Kim, “CMOS Digital Integrated Circuits: Analysis and Design”, 4 th Edition, McGraw-Hill Higher Education, Indian Edition,2019.
2.	J. M. Rabaey, A. Chandrakasan, B. Nikolic, “Digital Integrated Circuits: A Design Perspective”, 2 nd Edition, Pearson Education Inc., 2016.
3.	Neil Weste and David Harris, “CMOS VLSI Design: A Circuits and Systems Perspective”, 4 th Edition, Pearson Education India, 2015.
4.	M.Morris Mano, Michael D.Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6 th Edition, Pearson , 2018.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12EC311	Semester Even (specify Odd/Even)	Semester 6th Session 2020 -2021 Month from Jan to June
Course Name	Advanced Radio Access Networks		
Credits	3	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Bajrang Bansal
	Teacher(s) (Alphabetically)	Dr. Bajrang Bansal

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Recall the basic concepts of Digital Communication, Antenna and Wave Propagation, and Wireless Communication.	Remembering (Level I)
CO2	Identify the different components of wireless network based on the 3GPP reference network model.	Applying (Level III)
CO3	Analyze the architecture and channel structure of LTE and also examine the LTE call flow.	Analyzing (Level IV)
CO4	Explain the importance of Optimization and Pre-Launch Optimization in radio access network.	Evaluating (Level V)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Overview and evolution of Mobile Telephony, Telecom team structure, Generic network architecture, RAN network components, RAN life cycle.	6 [CO2]
2.	RF Basics	Concepts related to baseband signal processing, Microwave theory fundamentals, Concepts of radio propagation, Antenna Concepts, Fading in wireless communication.	6 [CO1]
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 [CO2]
4.	Radio Access Network- LTE	Architecture of LTE, LTE Bearer, LTE QoS, LTE Radio Interface, Channel structure, Scheduling in LTE, Idle mode behavior, Power control in LTE, LTE mobility, LTE call flow.	18 [CO3]
5.	Radio Access Network Optimization	Optimization basics, RAN tuning and RAN optimization, Introduction to KPIs and Counters, Pre-launch optimization, Post-launch optimization.	6 [CO4]
Total number of Lectures			42

Evaluation Criteria	
Components	Maximum Marks
T120	
T220	
End Semester Examination	35
TA	25 (Attendance, PBL/Assignment)
Total	100

Project based learning: Here, students will learn the process of radio network planning as it is of the utmost importance to plan the radio network as efficiently as possible. Radio network planning comprises of services relevant to network operators, regulatory organizations, and system suppliers, including: coverage analysis, frequency planning, network design, network implementation, network optimization in terms of coverage or capacity. By using propagation tools (like TEMS that is widely used by telecom operators) or some simulation tool like MATLAB, students will learn to measure, analyze, and optimize the mobile networks. In particular, they will learn the simulations for RF coverage predictions, field-strength measurements in wireless propagation.

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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B13EC314	Semester Even	Semester VI Session 2020 -2021 Month Jan to Jun 21
Course Name	Machine Learning for Signal Processing		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Neetu Singh
	Teacher(s) (Alphabetically)	Neetu Singh

COURSE OUTCOMES		COGNITIVE LEVELS
C331-3.1	Illustrate various machine learning approaches.	Understanding Level (C2)
C331-3.2	Experiment with the different techniques for feature extraction and feature selection.	Applying Level (C3)
C331-3.3	Apply and analyze various classifier models for typical machine learning applications.	Analyzing Level (C4)
C331-3.4	Make use of deep learning techniques in real life problems.	Applying Level (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 Decomposition, Types 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 Networks	Convolutional Neural Networks and its Applications	4
Total number of Lectures			43
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA25 (Attendance, Performance, Assignments/Quiz, Project)			
Total		100	
<p>Project based learning: Students will apply machine learning frameworks for the classification problems with the help of programming assignments. Additionally, students in group sizes of two-three will prepare a review of the one CNN application using current research papers.</p>			

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.

**Detailed Syllabus
Lab-wise Breakup**

Course Code	18B15EC314	Semester Odd (specify Odd/Even)	Semester 5th Session 2020 -2021 Month from Aug- Dec
Course Name	Python for Signal processing and Communication		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	B. Suresh, Neetu Singh
	Teacher(s) (Alphabetically)	B. Suresh, Kapil Dev Tyagi, Neetu Singh, Nisha Venkatesh, Parul Arora, Pankaj Kumar Yadav, Vivek Dwivedi

COURSE OUTCOMES: At the completion of the course, students will be able to:		COGNITIVE LEVELS
C310.1	Understand applications of Python in signal processing and communication.	Understanding Level (C2)
C310.2	Apply Python for implementing signal operations and transformations on 1-D signals.	Applying Level (C3)
C310.3	Apply Python for implementing signal operations and transformations on images.	Applying Level (C3)
C310.4	Analyze the different blocks of communication systems using Python.	Analyzing Level (C4)

Module No.	Title of the Module	List of Experiments	CO
1.	Introduction to Python	Introduction to Python and its various applications.	C310.1
2.	CT Signals	Generating Continuous time signals.	C310.1
3.	DT Signals	Generating Discrete time signals.	C310.1
4.	Signal Operations	Writing codes for generating various signal operations.	C310.2
5.	DT Convolution	To calculate the convolution sum of two discrete time signals.	C310.2
6.	CT Convolution	To calculate the convolution integral of two continuous - time signals.	C310.2
7.	Signal Transformations	Writing codes to compute DFT (Discrete Fourier Transform) and IDFT (Inverse Discrete Fourier Transform) for the spectral analysis of signals.	C310.2
8.	Image Data	To read, write, display and explore image data.	C310.3
9.	Image Enhancement	To perform image enhancement in spatial domain.	C310.3
10.	Image Arithmetic	To perform arithmetic operations on the images.	C310.3
11.	Image Geometric Transformations	To apply geometric transformations to the images.	C310.3
12.	Sampling	Analysis of sampling techniques.	C310.4

13.	Pulse Modulation Code	To perform pulse code modulation and demodulation.	C310.4
14.	Digital Modulation Techniques	Analysis of digital modulation techniques.	C310.4
15.	Error Control Coding	Analysis of effect of various Data Encoding and Decoding Techniques on BER of digital communication systems.	C310.4

Evaluation Criteria

Components	Maximum Marks
Viva 1(Mid Sem Viva)	20
Viva 2(End Sem Viva)	20
Assessment Components	30
Attendance	15
Lab Record	15
Total	100

Project based learning: Students in group sizes of two-three will realize any one application of machine learning using Python programming.

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.	J. UNPINGCO: Python for Signal Processing, Springer International Publishing Switzerland, 2014.
2.	M. WICKERT: Signal Processing and Communications: Teaching and Research Using IPython Notebook, In Proc. of the 14th python in science conf., (scipy. 2015).
3.	B. P. LATHI: Modern Digital and Analog Communication System: Python textbook Companion, Oxford University Press Inc.

Detailed Syllabus
Lab Breakup

Course Code	18B15EC315	Semester Even	Semester VI Session 2020-2021 Month: June
Course Name	VLSI Design Lab-II		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Dr. Satyendra Kumar, Dr. Shruti Kalra
	Teacher(s) (Alphabetically)	Atul Srivastava, Priyanka Kwatra, Satyendra Kumar, Saurabh Chaturvedi, Shamim Akhter, Shruti Kalra

COURSE OUTCOMES		COGNITIVE LEVELS
C374.1	Relate the concepts of basic electronics circuits and recall the use/working of circuit simulation tools.	Remembering (Level I)
C374.2	Understand and explain the current-voltage characteristics of NMOS and PMOS transistors and extraction of MOSFET parameters	Understanding (Level II)
C374.3	Apply the MOSFET theory in MOS-based circuits, e.g. MOS inverters, combinational and sequential MOS logic circuits.	Applying (Level III)
C374.4	Analyze the static and switching characteristics of MOS inverters and examine the delay times Analyze and simulate the schematic and layout of CMOS Combinational and sequential logic circuits and examine their responses.	Analyzing (Level IV)

Exp No.	Title of the Module	Description	CO
1	Introduction to CAD/EDA tool	Introduction to Tanner tools: T-Spice, S-Edit and L-Edit.	C374.1
2	MOS Transistors	To study the I-V characteristics of NMOS and PMOS transistors.	C374.2
3	MOS Layout	Layout design and simulation of NMOS and PMOS transistors.	C374.4
4	MOS Inverter	Experiments related to CMOS inverter: -Simulation of CMOS inverter with arbitrary value of W/L -Analysis of VTC -Observe the effect on VTC by changing the W/L of NMOS and PMOS transistors -Observe the effect on VTC by changing the supply voltage	C374.3
5	MOS Inverter (Transient Characteristics)	To analyze and calculate the propagation delay, rise time and fall time of a CMOS inverter.	C374.4
6	MOS combinational logic circuits	Simulate the logic gates and verify the truth tables: Two-input NAND, two-input NOR	C374.3

Due to Corona Virus pandemic, the number of experiments has been reduced to 6.

Evaluation Criteria

Components	Maximum Marks
Mid Sem Viva	20
End Sem Viva	20
D2D 60	
Total	100

Project Based Learning: Students will learn EDA/CAD tools, MOS/CMOS logic layout design, which is the utmost requirement to design a VLSI chip. Therefore, students with the knowledge of CMOS combinational logics, can design and analyze VLSI system/sub-system based projects.

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

1.	S -M Kang and Y. Leblebici, "CMOS digital integrated circuits: Analysis and design," 3rd edition, TMH, 2003 TMcGraw-Hill, 2003.
2.	N. H. E. Weste and D. M. Harris, "CMOS VLSI design: A circuits and systems perspective," 3rd edition, Addison-Wesley, 2005.

Detailed Syllabus
Lab-wise Breakup

Course Code	18B15EC313	Semester: Odd	Semester: IIIrdSession 2020 Month from: June-December
Course Name	Embedded Systems and IOT Lab		
Credits	1	Contact Hours	2 per week

Faculty (Names)	Coordinator(s)	Dr. Gaurav Verma (CCC) and Dr.Alok Joshi (CC-128)
	Teacher(s) (Alphabetically)	Dr.Rachna Singh, Mr.Ritesh Kumar, Mr.Mandeep Singh and Mr.Abhay Kumar

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Recall the basic of digital electronics and relate its use in microprocessors and microcontrollers.	Remembering (Level I)
CO2	Relate the architecture of Microprocessors and Microcontrollers and its requirements in the area of embedded system and IOT with the help of algorithm.	Understanding (Level II)
CO3	Apply the skills and proficiency in the programming to demonstrate the use of instructions in microprocessors, microcontrollers and IOT Devices.	Applying (Level III)
CO4	Analyze the use of assemblers, cross compilers and real time hardware to program the microprocessors, microcontrollers, IOT boards and achieve the real time solutions to the problem.	Analyzing (Level IV)

Module No.	Title of the Module	List of Experiments	CO
1.	8085 Microprocessors	To perform addition and subtraction of two 8-bit numbers using 8085 microprocessor.	1,2,3
2.	8085 Microprocessors	To perform multiplication & division of two 8-bit numbers using 8085 microprocessor.	1,2,3
3.	8085 Microprocessors	To find out the smallest & largest number in an array of 'N' 8-bit numbers using 8085 microprocessor.	1,2,3
4.	8051 Microcontrollers	Familiarization with 8051 Software Toolsthrough examples of: a. LED Blinking. b. Varying square wave generation on any pin (with and without timers).	2,4
5.	8051 Microcontrollers	Design a token display system that has a seven segment display and switches. Whenever any switch is pressed corresponding number is displayed on the segment.	3,4
6.	8051 Microcontrollers	Design a traffic light controller system that has three LEDs – RED, YELLOW, GREEN. The sequence in which the LEDs are turned on is as follows: RED for 10 count, YELLOW for 5 count, GREEN for 10 count. Interface a light-dependent resistor (LDR) to select manual and automatic mode using interrupt.	3,4
7.	8051 Microcontrollers	Display a) JIIT on LCD b) Sum of two 8 bit numbers on LCD.	3,4
8.	8051 Microcontrollers	Establish the serial communication between PC and	3,4

		microcontroller using RS232 protocol to send and receive the data.	
9.	8051 Microcontrollers	Interface a DC motor and two IR sensors with the microcontroller. The IR sensors are used to control the direction of rotation of the motor.	3,4
10.	Microcontrollers	Design an IOT based system to sense the humidity and temperature using DHT11 sensor and send it to cloud.	3,4
11.	Microcontrollers	Design an IOT based system using microcontroller for controlling of home appliances using or ESP8266.	3,4
12.	Microcontrollers	Design a RFID based attendance system using LCD and microcontroller.	3,4
13.	Microcontrollers	Controlling of different household devices using an Android based application through bluetooth communication and microcontroller.	3,4
14.	Microcontrollers	Design a DTMF based wireless system using microcontroller for controlling of home appliances.	3,4

Evaluation Criteria

Components

Maximum Marks

Viva 1(Mid Sem Viva) Quiz 20

Viva 2(End Sem Viva) Quiz 20

Assessment Components 30

Attendance 15

Lab Record

15

Total

100

Project Based Learning Component: This lab teaches embedded system design using a building block approach, which allows one to visualize the requirement of an embedded system and then to design it efficiently. Learning out Embedded Systems will give the skills to design and manufacture embedded system products of the future which will help participants towards better employability. The lab will teach embedded system design using a microcontroller, namely Intel Corporation 8051 (AT89S51) microcontroller and also introduced the concept of IoT. The lab will teach IoT based system design using IoT boards, namely Arduino and ESP8266. The lab will introduce various interfacing techniques for popular input devices including sensors, output devices and communication protocols. It will also teach effective embedded programming techniques in C using Keil cross compiler. It will have a significant practical component in almost every lab exercise.

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. Manish k. Patel, "The 8051 Microcontroller Based Embedded Systems", 1st Edition, McGraw Hill Education, 2014.

2. DivyahBala, ESP8266: Step by Step Tutorial for ESP8266 IOT, Arduino NodemcuDev Kit, 2018.

Detailed Syllabus Lecture-wise Breakup

Subject Code	15B11EC611	Even-Semester	Semester: 6 th Session 2020-21 Month from Jan 2021 to June 2021
Subject Name	Telecommunication Networks		
Credits	4	Contact Hours	40

Faculty (Names)	Teacher(s) (Alphabetically)	1. Dr. Pankaj Kr. Yadav 2. Dr. Juhi Gupta 3. Dr. Sajal Agarwal
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COURSE OUTCOMES		COGNITIVE LEVELS
C315.1	Understand the basic concepts of Telecommunication network model, Traffic Engineering and Switching technologies.	Understanding (Level II)
C315.2	Understand the concepts of OSI model and analyze the various error and flow control mechanisms introduced by data link layer.	Analyzing (Level IV)
C315.3	Understand the TCP/IP protocol, routing algorithm and apply the concept of subnetting to allocate and distribute the logical addresses in a network.	Apply (Level III)
C315.4	Understand concept of LAN access protocols, ISDN, B-ISDN and ATM, their implementation and performance issues.	Understanding (Level II)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Telecommunication network model	Telecommunication network model, Different networks types	2
2.	Switching technologies	Switched Communication Networks, Circuit Switching networks, Time Division Switching-Time Division Space Switching, Time Division Time Switching, Time Multiplexed Time Switching and TSI, Packet Switching Principles-Datagram and Virtual Circuit Approach, Message switching. Traffic engineering.	12

3	Computer Networks	Seven layered OSI model, Functions of different layers, primitives and services. Physical layers.	2
4	Detailed working of data link	Data link Control, Flow Control, Stop and Wait flow Control, Sliding Window Flow Control, Error Control, Go-Back-N ARQ, Selective-Reject ARQ, Performance Analysis, HDLC.	6
5.	Network Layer and Internet Protocol (IP)	Basic Principles of Network layer, IPv4, IPv6, IP Addressing, Subnetting, Supernetting, Routing Schemes-Distance Vector routing, Link-State routing, Hierarchical routing.	6
6	Transport and TCP/UDP description	Basic Principles of Transport Layer and TCP/UDP description. Congestion control and Quality of Service (QoS)	6

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25
a) Attendance and Performance	= 10
b) Class Test/Quiz	= 10
c) Assignment	= 5

7	Local area networks	LAN Protocols-ALOHA, CSMA, CSMA-CD, Implementation and performance issues.	4
8	ISDN, B-ISDN, ATM.	Introduction to ISDN, B-ISDN and ATM.	2
Total number of Lectures			40

Project based learning: Here, students will learn the basic concepts of circuit switched Telephony and packet switched data networks (TCP/IP). These concepts are utmost importance for designing, implementing and testing of telecommunication networks. Students will be will doing assignments on different topics of switching systems and different TCP/IP layers.

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 & Computer Communication, PHI
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2.	B. A Forouzan, DATA COMMUNICATIONS AND NETWORKING, 4 th Edition TMH
3.	A.S. Tanenbaum, Computer Networks, PHI
4.	John C. Bellamy, Digital Telephony, 3 rd Edition, Wiley.
5.	Thiagarajan Viswanathan, Telecommunication Switching Systems and Networks, PHI

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS631	Semester Even	Semester 6th Session 2020 -2021 Month from January 2021to June 2021
Course Name	PROJECT MANAGEMENT		
Credits	3	Contact Hours	2-1-0

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

COURSE OUTCOMES		COGNITIVE LEVELS
C304-5.1	Apply the basic concepts of project management such as features, objectives, life cycle, model and management, in a given context	Apply Level (C3)
C304-5.2	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)
C304-5.3	Evaluate the stages of project management and identify and determine correct techniques for planning and scheduling	Evaluate Level (C5)
C304-5.4	Evaluate management processes for budgeting, controlling and terminating projects in order to achieve overall project success	Evaluate Level (C5)

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

	and Project Termination	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.	
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	

Project Based Learning: Students are supposed to form a group (Maximum 5 students in each group) and identify a real-life project. They are supposed to do the in-depth study of this project and assess it in terms and Time, cost, performance and client satisfaction. They are supposed to do the detailed study of project planning, organizing, scheduling, leading and controlling. They must highlight the various tools and techniques which are used in their chosen project. The project provides understanding to students that how organizations are managing their projects and what is the relevance and appropriate usage of the concepts, tools and techniques that they are studying in this subject. The fundamentals of Project management are very important in today's corporate world and certainly this subject enhances student's employability in every sector.

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,2017
2.	Timmothy Kloppenborg, Contemporary Project Management, 5th ¹ Edition, Cengage Learning, 2017
3.	Harold Kerzner,Project Management: A Systems Approach to Planning, Scheduling, and Controlling,12 th Edition,Wiley Publications,2017
4.	Wysocki,R.K., Effective Project Management: Traditional, Agile, Extreme, Hybrid, 8th Edition,Wiley Publications,2018
5.	Vohra, N. D., Quantitative Techniques in Management, 5 th Edition, Tata McGraw Hill Publishing Company, 2017