

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	15B1NHS434	<b>Semester Odd</b> (specify Odd/Even)	<b>Semester V Session</b> 2019 -2020 <b>Month from</b> Jan to June 2019
<b>Course Name</b>	Principles of Management		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	(2-1-0)

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Ms Puneet Pannu ( Sect 62) Dr Deepak Verma ( Sect 128)
	<b>Teacher(s)</b> (Alphabetically)	Dr Deepak Verma, Ms Puneet Pannu

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C303-1.1</b>	Describe the functions, roles and skills of managers and illustrate how the manager's job is evolving	Understand Level (C2)
<b>C303-1.2</b>	Examine the relevance of the political, legal, ethical, economic and cultural environments in global business.	Analyze Level (C4)
<b>C303-1.3</b>	Evaluate approaches to goal setting, planning and organizing in a variety of circumstances.	Evaluate Level (C5)
<b>C303-1.4</b>	Evaluate contemporary approaches for staffing and leading in an organization.	Evaluate Level (C5)
<b>C303-1.5</b>	Analyze contemporary issues in controlling for measuring organizational performance.	Analyze Level (C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction to Managers and Management	Management an Overview: Introduction, Definition of Management, Role of Management, Functions of Managers, Levels of Management, Management Skills and Organizational Hierarchy, Social and Ethical Responsibilities of Management: Arguments for and against Social Responsibilities of Business, Social Stakeholders, Measuring Social Responsiveness and Managerial Ethics, Omnipotent and Symbolic View, Characteristics and importance of organizational culture, Relevance of political, legal, economic and Cultural environments to global business, Structures and techniques organizations use as they go international .	7
2.	Planning	Nature & Purpose, Steps involved in Planning, Objectives, Setting Objectives, Process of Managing by Objectives, Strategies, Policies & Planning Premises, Competitor Intelligence, Benchmarking, Forecasting, Decision-Making.	5
3.	Organizing	Nature and Purpose, Formal and Informal Organization, Organization Chart, Structure and Process, Departmentalization by difference strategies, Line and Staff authority- Benefits and Limitations-De-Centralization and Delegation of Authority Versus, Staffing, Managerial Effectiveness.	6
4.	Directing	Scope, Human Factors, Creativity and Innovation, Harmonizing Objectives, Leadership, Types of Leadership Motivation, Hierarchy of Needs, Motivation theories,	5

		Motivational Techniques, Job Enrichment, Communication, Process of Communication, Barriers and Breakdown, Effective Communication, Electronic media in Communication.	
5.	Controlling	System and process of Controlling, Requirements for effective control, The Budget as Control Technique, Information Technology in Controlling, Productivity, Problems and Management, Control of Overall Performance, Direct and Preventive Control, Reporting, The Global Environment, Globalization and Liberalization, International Management and Global theory of Management.	5
<b>Total number of Lectures</b>			<b>28</b>

**Evaluation Criteria**

<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Oral Questions)
<b>Total</b>	<b>100</b>

**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.	Robbins S.P., Coulter M & Fernandez A, <i>Management</i> , Fourteenth Edition, Pearson Education India (2019)
2.	Robbins S.P., Coulter M & DeCenzo D., <i>Fundamentals of Management</i> , Ninth Edition, Pearson Education India (2016)
3.	Durai P., <i>Principles of Management Text and Cases</i> , Pearson Education India(2015)
4.	Aryasi A.R., <i>Fundamentals of Management</i> , McGraw Hill Education (2018)
5.	Stoner J, Freeman R.E & Gilbert D.R., <i>Management</i> , Sixth Edition, Pearson Education India (2018)
6.	Wehrich H, Cannice M.V.& Koontz H., <i>Management A Global, Innovative &amp; Entrepreneurial Perspective</i> , Fourteenth Edition, McGraw Hill Education (2017)

**Department of Computer Science and Engineering & Information Technology,  
JIT, Noida**

**Detailed Syllabus**

*Lab-wise Breakup*

<b>Course Code</b>	15B17CI579	<b>Semester Odd (specify Odd/Even)</b>	<b>Semester 5<sup>th</sup> (ECE) Session 2018 -2019 Month from Jul-Dec 2019</b>
<b>Course Name</b>	UNIX Programming Lab		
<b>Credits</b>	1	<b>Contact Hours</b>	2 per week (Total 14 weeks)

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Chetna Dabbas
	<b>Teacher(s) (Alphabetically)</b>	Dr. Chetna Dabbas

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>CO 1</b>	Demonstrate use of common Unix/Linux commands	Understanding Level (Level 2)
<b>CO 2</b>	Apply Unix/Linux file redirection and pipelining to combine utilities to perform complex tasks	Apply Level (Level 3)
<b>CO 3</b>	Develop shell scripting using Selection, Case & Conditional Statements	Apply Level (Level 3)
<b>CO 4</b>	Build shell scripts to solve various problems using commands like grep, line number, test, expressions, compare, command line input, etc.	Apply Level (Level 6)
<b>CO 5</b>	Create and manage files and directories, file permissions, and navigate the Unix/Linux file system	Create Level (Level 6)

<b>Module No.</b>	<b>Title of the Module</b>	<b>List of Experiments</b>	<b>CO</b>
1.	The UNIX File System & Basic Commands	History of UNIX, Introduction, UNIX file system, Executing commands & options	CO1
2.	UNIX Editor & Operations	UNIX Processes, Process Utilities, Pipes and Signals	CO2
3.	UNIX File Handling & Regular Expressions	File Handling, File commands, Basic Filters (cat, head, tail, sort, uniq), Use of Regular Expressions, Field Matching, grep, fgrep, egrep	CO2
4.	UNIX Advanced Filters	Advanced Pattern Matching, Stream-oriented & Non-Interactive Text Editor (Sed), Programmable Filters, Awk, Gnu Awk (Gawk), Text Processing, Practical Extraction and Report Language (Perl)	CO3

5.	UNIX Shell Scripting	UNIX Scripting, Variables, Naming Conventions, Conditional Constructs, Looping Statements, Arrays, Functions, Document Handling, Quoting, Arithmetic Operations & Executions, Parsing	CO4
6.	UNIX Administration	UNIX Administration, Overview of Linux, Login Process, Users & Permission (chmod, su, mount, cron, NFS), Process Management	CO5
7.	UNIX Case Studies	Projects, Application-based Extensions, Security	CO5

#### Evaluation Criteria

##### Components

##### Maximum Marks

Lab Test-1	20
Lab Test-1	20
Day-to-Day	60 (Quiz + Evaluative Assignment + Class Test + Attendance)
<b>Total</b>	<b>100</b>

**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.	Sumitabha Das, UNIX Concepts & Applications, 4 <sup>th</sup> Edition, Tata McGraw-Hill Education, 2008
2.	Maurice J. Bach, Design of UNIX Operating System, Prentice-Hall, 1986
3.	Richards Stevens, Advanced Programming in the UNIX Environment, Pearson Education India, 2005
4.	Marc J. Rochkind, Advanced UNIX Programming, 2 <sup>nd</sup> Edition, Pearson Education, 2004
5.	Evi Nemeth, Garth Snyder, Trent R. Hein, Unix and Linux System Administration Handbook, 4 <sup>th</sup> Edition Pearson Education India, 2011
6.	Richards Stevens, Unix Network Programming, Addison-Wesley Professional, 2004

**Module Coordinator:** Dr. Suma Dawn & Dr. Taj Alam

**Course Coordinator:** Dr. Chetna Dabbas

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	<b>16BINHS 531</b>	<b>Semester : Odd</b> <b>(specify Odd/Even)</b>	<b>Semester : v Session:2019 -2020</b> <b>Month from: July2019 to Dec 2019</b>
<b>Course Name</b>	<b>Sociology of Youth</b>		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>(2-1-0)</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	<b>Prof Alka Sharma</b>
	<b>Teacher(s) (Alphabetically)</b>	<b>Prof Alka Sharma</b> <b>Ms Shikha Kumari</b>

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
C303-2.1	Understand Youth and youth culture in sociological perspectives	Understanding(C 2)
C303-2.2	Explain the ethical, cultural& social issues concerning Youth	Evaluating(C 5)
C303-2.3	Understand and interpret the youth culture	Analyzing(C 4)
C303-2.4	Analyze societal problems related to youth in the evolving society.	Evaluating(C 5)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction to Youth	Meaning, characteristics, Youth for Development, Challenges faced by Youth, Youth's roles and responsibilities in society	2
2.	Youth Culture	Concept of Youth Culture	2
3.	Perspectives on Youth Culture	Functionalist, Conflict, Interactionist and Feminist Perspective on Youth Culture, Youth and Gender	3
4.	Youth Development	Principles of Youth Development, Learning theory, Constructivist theory, collaborative learning , Relationships theories, Theories as a tool to understand Youth Culture	6
5.	Socialization of Youth	Role of family, Community, religion, kin and neighborhood, Changing social structures in family, marriage, Youth and changing identities	6
6.	Emerging problems of Youth	Role and Value conflicts, Generation Gap, Career decisions and Unemployment, Emotional adjustment, Coping with pressures of living, Unequal Gender norms, Crime (Social Strain theories),	6
7.	Changing perceptive of Youth and Youth Culture in 21 <sup>st</sup> century	Role of popular culture and social media, involvement of youth in major decision making institutions, Post-modernity and Youth	3
<b>Total number of Lectures</b>			<b>28</b>

<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>

T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Presentation, Assignment)
<b>Total</b>	<b>100</b>

**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.	Tyyskä, V. <i>Youth and Society: The long and winding road</i> , 2nd Ed., Canadian Scholars' Press, Inc. (2008).
2.	White, Rob, Johanna Wyn and Patrizia Albanese. <i>Youth &amp; Society: Exploring the Social Dynamics of Youth Experience</i> . Don Mills, ON: Oxford University Press. (2011).
3.	Bansal, P. <i>Youth in contemporary India: Images of identity and social change</i> . Springer Science & Business Media. (2012).
4.	Furlong, Andy. <i>Youth studies: An introduction</i> . Routledge, (2012).
5.	Blossfeld, Hans-Peter, et al., eds. <i>Globalization, uncertainty and youth in society: The losers in a globalizing world</i> . Routledge, (2006).
6.	Ruhela, Satya Pal, ed. <i>Sociology of the teaching profession in India</i> . National Council of Educational Research and Training, (1970).
7.	Frith, S. "The sociology of youth. Themes and perspectives in sociology." Ormskirk, Lancashire: Causeway Books (1984).

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	16B1NHS532	<b>Semester: Odd</b>	<b>Semester V Session 2019-2020</b> <b>Month from: July 2019 –Dec 2019</b>
<b>Course Name</b>	Planning and Economic Development		
<b>Credits</b>	03	<b>Contact Hours</b>	2-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Amba Agarwal (JIIT-128), Mr. Manas R. Behera (JIIT-62)
	<b>Teacher(s) (Alphabetically)</b>	Dr. Amba Agarwal, Mr. Manas R. Behera

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
After pursuing the above mentioned course, the students will be able to:		
<b>C303-4.1</b>	Understand the issues and approaches to economic development.	Understanding Level (C2)
<b>C303-4.2</b>	Apply the concepts of national income accounting, human development index and sustainable development.	Applying Level (C3)
<b>C303-4.3</b>	Analyze the structural characteristics of the economy.	Analyzing Level (C4)
<b>C303-4.4</b>	Analyze the role of Macroeconomic policies in the development process.	Analyzing Level (C4)
<b>C303-4.5</b>	Assess the importance of federal development and decentralization	Evaluating Level (C5)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Economic Development and its Determinants	Economic growth and development. Indicators of development. Rostows Stages of Growth. Approaches to economic development.	2
2.	National Income Accounting	National Income Accounting, Green GNP and Sustainable development	4
3.	Indicators of development	Physical Quality Life Index, Human Development Index (HDI) and gender development indices.	3
4.	Demographic Features, Poverty and Inequality	Demographic features of Indian population; Rural-urban migration; Growth of Primary, Secondary and Tertiary Sector.	3
5.	Inflation and Business Cycles	Inflation. Business cycle. Multiplier and Accelerator Interaction.	4
6.	Macro Economic Stability & Policies	Monetary Policy. Fiscal Policy. Role of Central Bank & Commercial banks in the development of the country. Balance of payments; currency convertibility and Issues in export-import policy.	5
7.	Federal Development	The Federal Set-up - The Financial Issues in a Federal Set-up, Principles for Efficient Division of Financial Resources between Governments. Financial Federalism under Constitution. Finance Commissions in India, Terms of References and its Recommendations	4
8.	Planning and Development	Need for planning-Niti Aayog, Decentralisation, Rural and Urban local bodies.	3

Total number of Lectures		28
<b>Evaluation Criteria</b>		
<b>Components</b>	<b>Maximum Marks</b>	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Assignment, Quiz)	
<b>Total</b>	<b>100</b>	

<b>Recommended Reading material:</b>	
1.	<b>Todaro, M.P., Stephen C. Smith,</b> Economic Development, Pearson Education, 2017
2.	<b>Thirwal, A.P.,</b> Economics of Development, Palgrave, 2011
3.	<b>Ahuja, H. L.,</b> Development Economics, S Chand publishing, 2016
4.	<b>Ray, Debraj,</b> Development Economics, Oxford University Press, 2016



**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	17B1NHS531	<b>Semester ODD</b> (specify Odd/Even)	<b>Semester V Session 2019 -2020</b> <b>Month from July - Dec</b>
<b>Course Name</b>	Technology and Culture		
<b>Credits</b>	3	<b>Contact Hours</b>	<b>2-1-0</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr Swati Sharma
	<b>Teacher(s)</b> (Alphabetically)	Dr Swati Sharma

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
C303-5.1	Understand the main theories in cultural management,	Applying (C 2)
C303-5.2	Appraise technological convergence and cultural divergence, relate the differences to the literature and suggest solutions	Evaluating(C 5)
C303-5.3	Interpret and communicate effectively in physical and virtual teams by evaluating appropriate concepts, logic and selecting the apt IT tools.	Evaluating (C5)
C303-5.4	Evaluation of the theoretical knowledge to adapt to cultural differences in global work environment.	Evaluating(C 5)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	<ul style="list-style-type: none"> <li>▪ Genealogy of the concept</li> <li>▪ The Information Technology Revolution</li> <li>▪ The concept of Network societies</li> </ul>	5
2.	Dimensions of Culture	<ul style="list-style-type: none"> <li>▪ Evolution of Culture</li> <li>▪ Principal theories of Culture: Kluckholn and Strodbeck, Hofstede, Trompenaars and Schwartz</li> <li>▪ Cultural Diversity and cross cultural literacy</li> </ul>	8
3.	Cross cultural communication in physical and virtual teams	<ul style="list-style-type: none"> <li>▪ The Communication Process</li> <li>▪ Language and Culture</li> <li>▪ Non Verbal Communication</li> <li>▪ Barriers to Cross Cultural Understanding</li> </ul>	8
4.	Negotiation and Decision Making	<ul style="list-style-type: none"> <li>▪ Theories of Negotiation</li> <li>▪ Negotiation and Intercultural Communication</li> <li>▪ Decision making in cross cultural environment</li> </ul>	2
5.	Cross Culture and Leadership	<ul style="list-style-type: none"> <li>▪ Leadership and Culture</li> <li>▪ Theories of Culture centric leadership and their Global Relevance</li> <li>▪ Developing Competencies for Global citizens</li> <li>▪ Women as International Leaders</li> <li>▪ Cross Cultural Training</li> <li>▪ Ethical Guidelines for Global Citizens</li> </ul>	5
<b>Total number of Lectures</b>			<b>28</b>
<b>Evaluation Criteria</b>			
<b>Components</b>	<b>Maximum Marks</b>		

T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Assignment and Oral Viva )
<b>Total</b>	<b>100</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Maidenhead.Riding the Waves of Culture: Understanding Cultural Diversity in Business (2012).3rd edition. McGraw Hill.
2.	Edgar, Andrew and Peter Sedgwick (eds.) Key concepts in Cultural Theory. London. Routledge.1999
3.	Gerard Bannon, J. (red.). Mattock, Cross-cultural Communication: The Essential Guide to International Business.2003
4.	Grossberg, L., C. Nelson and P. Treichler (eds.) Cultural Studies. London. 1992
5.	Robertson, Ronald. Globalization: Social theory and global culture, London: Sage, 1992.
6.	Madhavan,S., Cross Cultural Management: Concepts and Cases(2 <sup>nd</sup> Ed),Oxfor University Press 2016.
7.	Coyle,D., The Culture Code: The Secrets of Highly Successful Groups, Bantam, 2018



**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	18B12HS311	<b>Semester ODD</b>	<b>Semester 5 Session 2019-20</b> <b>Month from July 2019 to December 2019</b>
<b>Subject Name</b>	STRATEGIC HUMAN RESOURCE MANAGEMENT		
<b>Credits</b>	3	<b>Contact Hours</b>	2-1-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Ruchi Gautam (Sec-128), Santoshi Sengupta (Sec-62)	
	<b>Teacher(s) (Alphabetically)</b>	Ruchi Gautam (Sec-128), Santoshi Sengupta (Sec-62)	

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
C303-6.1	Understand human resource management from a strategic perspective and analyze environmental challenges that impact HRM of an organization	Analyze Level (C4)
C303-6.2	Assess the human resource needs of the organization and design recruitment and selection strategies for an organization	Evaluate Level (C5)
C303-6.3	Evaluate the processes of training and development, mentoring, performance management, compensation and reward management in an organization and design effective strategies for the same	Evaluate Level (C5)
C303-6.4	Critically assess career management system, work-life initiatives and other HRM practices of the organization	Evaluate Level (C5)

<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Hours for the module</b>
1.	Introduction	Role of HR in strategy; Evolution of SHRM; Strategic fit: Conceptual Framework; Theoretical Perspectives on SHRM; SHRM approaches in Indian context	4
2.	Strategic Human Resource Environment and Evaluation	Overview of the environment; SHRM in Knowledge Economy; HRM and Firm Performance; Rationale for HR Evaluation; Approaches to HR Evaluation	4
3.	Strategic Human Resource Planning and Acquiring	Overview of HRP; Objectives of HRP; Job Analysis and SHRM; External and Internal Influences on Staffing; Recruitment: Sources, Methods and Approaches; Selection: Methods and Approaches; Strategic Recruitment and Selection	6
4.	Training, Development, Mentor Relationships	Basic Concepts, Purposes & Significance of Training and Development; HRM Approaches; Linkage between Business Strategy and training; Process; new Developments; Concept and outcomes of mentoring; Strategic approach of Mentoring relationships	4
5.	Strategic Performance Management; Compensations and Reward Management; Career Management	Developing performance management systems; Technology and performance management; Strategic Linkage of performance management; Determinants and approaches of compensation and rewards; New Developments; Business Strategy and compensation; Career Management systems; SHRM approach to career management	6
6.	Work Life Integration and International HRM	HRD Approaches to work-life integration; Development of work-life initiatives; Strategic approach to work-life integration; External HRM; IHRM practices	4
<b>Total number of Lectures</b>			28

<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 [Assignments (10) Project (10) Attendance (5)]
<b>Total</b>	<b>100</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Tanuja Agarwala, Strategic Human Resource Management, 1 <sup>st</sup> edition, Oxford University Press, 2007
2.	Stephen J. Perkins, Susan M. Shortland, Strategic International Human Resource Management: Choices and Consequences, Kogan Page, 2010
3.	John storey, Patrick Wright and Dave Ulrich, Strategic Human Resource Management, Routledge Taylor and Francis Group, 2009
4.	Amberg, J. J., & McGaughey, S. L. (2019). Strategic human resource management and inertia in the corporate entrepreneurship of a multinational enterprise. <i>The International Journal of Human Resource Management</i> , 30(5), 759-793.
5.	Stewart, G. L., & Brown, K. G. (2019). <i>Human resource management</i> . Wiley.
6.	Deshati E. Social media, a strategic tool for the recruitment process. J Fin Mark. 2017;1(1):3-4.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	<b>18B12HS612</b>	<b>Semester : Odd</b>	<b>Semester: V Session: 2019-20</b> <b>Month: JULY-DECEMBER</b>
<b>Course Name</b>	<b>Indian Polity and Constitutional Democracy in India.</b>		
<b>Credits</b>	<b>3(2-1-0)</b>	<b>Contact Hours</b>	<b>3</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Chandrima Chaudhuri
	<b>Teacher(s) (Alphabetically)</b>	Dr. Chandrima Chaudhuri

<b>CO Code</b>	<b>COURSE OUTCOMES</b>	<b>COGNITIVE LEVELS</b>
C303-7.1	Demonstrate an understanding about the current Indian political scenario by knowing about the structure of government in place	Understand(C2)
C303-7.2	Demonstrate an understanding of the role of Indian President, Prime Minister, Governor and other members of the legislature as representatives of the common masses	Understand (C2)
C303-7.3	Analyze the working of Indian federalism with reference to centre-state relations	Analyze(C4)
C303-7.4	Analyze the impact of the contemporary challenges such as caste, gender, regionalism to the working of Indian democracy	Analyze(C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	The Indian Constitution	<ul style="list-style-type: none"> <li>• Background to the Constitution</li> <li>• Fundamental Rights and Duties</li> <li>• Directive Principles</li> </ul>	6
2.	Organs of the Government	<ul style="list-style-type: none"> <li>• The Executive: President, Prime Minister and Governor- appointment, powers and functions</li> <li>• The Legislature: Parliament and its components- Lok Sabha and Rajya Sabha (composition and functions)</li> <li>• The Judiciary: Supreme Court-composition, functions and jurisdiction</li> </ul>	6

3.	Nature of Federalism	<ul style="list-style-type: none"> <li>• Centre-State Legislative Relations</li> <li>• Centre-State Administrative Relations</li> <li>• Centre-State Financial Relations</li> <li>• Special Provisions of some state and the 5<sup>th</sup> and 6<sup>th</sup> schedule</li> </ul>	8
4.	Local Governments	<ul style="list-style-type: none"> <li>• Municipality- Structure &amp; Functions</li> <li>• Panchayat-Organization and Powers</li> </ul>	4
4.	Challenges to Indian Democracy	<ul style="list-style-type: none"> <li>• Caste</li> <li>• Gender</li> <li>• Ethnicity</li> <li>• Politics of regionalism</li> </ul>	4
<b>Total number of Lectures</b>			<b>28</b>

#### Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz and assignment)
<b>Total</b>	<b>100</b>

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Austin, G. (1979). <i>The Constituent Assembly: Microcosm in Action in The Indian Constitution: Cornerstone of a Nation.</i> New Delhi:Oxford University Press
2.	Awasthi, A. &Awasthi, A.P. (2017). <i>Indian Administration.</i> Agra: L.N. Aggarwal Educational Publishing
3.	Basu, D.D. (2018). <i>Introduction to the Constitution of India.</i> 23 <sup>rd</sup> Edition. Gurgaon: LexisNexis
4.	Bhargava,R. (2008). <i>Politics and Ethics of the Indian Constitution.</i> New Delhi: Oxford University Press
5.	Jha, S. (2008). Rights versus Representation: Defending Minority Interests in the Constituent Assembly, in R. Bhargava. (ed.), <i>Politics and Ethics of the Indian Constitution,</i> New Delhi: Oxford University Press
6.	Johari, J.C. (2013). <i>The Constitution of India: A Politico-Legal Study.</i> Noida: Sterling Publishers
7.	Kapur, D.& Mehta, P.B. (ed.) (2005) <i>Public Institutions in India: Performance and Design,</i> New Delhi: Oxford University Press
8.	Maheshwari, S.R. (2001). <i>Indian Administration.</i> Hyderabad: Orient Blackswan
9.	Manor, J. (1994). The Prime Minister and the President, in B.D. Dua, and J. Manor (eds.) <i>Nehru to the Nineties: The Changing Office of the Prime Minister in India.</i> Vancouver: University of British Columbia Press
10.	Pylee, M.V. (1962). <i>India's Constitution.</i> Bombay: Asia Publishing House
11.	Shankar, B.L., &Rodrigues, V. (2011) <i>The Indian Parliament: A Democracy at Work,</i> New Delhi: Oxford University Press
12.	Sharma, B.K. (2002). <i>Introduction to the Constitution of India.</i> New Delhi: Prentice Hall of India
13.	Singh, M.P. & Saxena, R. (2008). <i>Indian Politics: Contemporary Issues and Concerns.</i> New Delhi: PHI Learning
14.	Singh, M.P. & Roy, H. (2018). <i>Indian Political System.</i> 4 <sup>th</sup> Edition. Bengaluru: Pearson Education



**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	<b>19B12HS311</b>	<b>Semester: ODD</b>	<b>Semester V Session 2019-20</b> <b>Month from July 2019 to December 2019</b>
<b>Subject Name</b>	<b>ENTREPRENEURIAL DEVELOPMENT</b>		
<b>Credits</b>	<b>3</b>	<b>Contact Hours</b>	<b>2-1-0</b>

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	<b>Dr Badri Bajaj</b>
	<b>Teacher(s) (Alphabetically)</b>	<b>Dr Badri Bajaj</b>

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C303-8.1</b>	Understand basic aspects of establishing a business in a competitive environment	Understand Level (C2)
<b>C303-8.2</b>	Apply the basic understanding to examine the existing business ventures	Apply Level (C3)
<b>C303-8.3</b>	Examine various business considerations such as marketing, financial and teaming	Analyze Level (C4)
<b>C303-8.4</b>	Assessing strategies for planning a business venture	Evaluate Level (C5)

<b>Module No.</b>	<b>Subtitle of the Module</b>	<b>Topics in the module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	Entrepreneurial perspective	Foundation, Nature and development of entrepreneurship, importance of entrepreneurs, Entrepreneurial Mind, Individual entrepreneur Types of entrepreneurs	4
<b>2.</b>	Beginning Considerations	Creativity and developing business ideas; Legal issues; Creating and starting the venture; Building a competitive advantage	7
<b>3.</b>	Developing Marketing Plans	Developing a powerful Marketing Plan, E-commerce, Integrated Marketing Communications	7
<b>4.</b>	Developing Financial Plans	Sources of Funds, Managing Cash Flow, Creating a successful Financial Plan Developing a business plan	6
<b>5.</b>	Leading Considerations	Developing Team, Leading the growing company, Resources for growth	4
<b>Total number of Lectures</b>			<b>28</b>
<b>Evaluation Criteria</b>			
<b>Components</b>	<b>Maximum Marks</b>		
T1	20		
T2	20		
End Semester Examination	35		
TA	25 (Assignment 1, Assignment 2, Attendance)		
<b>Total</b>	<b>100</b>		

**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.	Robert D Hisrich, Michael P Peters & Dean A Shepherd, "Entrepreneurship" 10 <sup>th</sup> Edition, McGraw Hill Education, 2018
2.	Norman M. Scarborough and Jeffery R. Cornwell, "Essentials of entrepreneurship and small business management" 8th Edition, Pearson, 2016
3.	Rajiv Roy, "Entrepreneurship", 2 <sup>nd</sup> Edition, Oxford University Press, 2011
4.	Sangeeta Sharma, "Entrepreneurship Development", 1 <sup>st</sup> Edition, Prentice-Hall India, 2016

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	16B1NPH531	<b>Semester : ODD</b>	<b>Semester: 5<sup>th</sup> Session: 2019 -2020</b> <b>Month from July 19 to December 19</b>
<b>Course Name</b>	<b>Quantum Mechanics for Engineers</b>		
<b>Credits</b>	4	<b>Contact Hours</b>	3+1

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Vikas Malik and Anuraj Panwar
	<b>Teacher(s) (Alphabetically)</b>	Vikas Malik and Anuraj Panwar

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C301-10.1</b>	Remember basics of Quantum Mechanics and its applications.	Remembering (C1)
<b>C301-10.2</b>	Explain postulates of quantum mechanics, Dirac notation, Schrödinger Equation, Perturbation theory and Qubits.	Understanding (C2)
<b>C301-10.3</b>	Solve various problems related to different quantum systems and construct quantum circuits using quantum gates.	Applying (C3)
<b>C301-10.4</b>	Analyse the results obtained for various physical systems and to establish the advantages of some simple protocols of quantum information processing.	Analyzing (C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	Wave particle duality, quantum physics (Planck and Einstein's ideas of quantized light), postulates of quantum mechanics, time dependent and time independent Schrodinger equation, operators, probability theory, expectation values, and uncertainty principle and its implications, no cloning applications	8
2.	Measurement Theory with Applications	Matrix and linear algebra, Eigen values and eigenfunctions Hilbert space, Kets, Bras and Operators, Bras Kets and Matrix representations, Measurements, Stern Gerlach Experiment, Observables and Uncertainty Relations, No-cloning theorem, Pauli Spin Matrices.	10
3.	Potential problems	1-D, 2-D, and 3-D potential problems (including infinite and finite square well). Tunneling, harmonic oscillator, separation in spherical polar coordinates, hydrogen atom, etc.),	08
4.	Approximation methods	Time independent perturbation theory for nondegenerate and degenerate energy levels.	4
5.	Advanced Applications	Kronig Penny model, Basic ideas of quantum computing, Qubit, Gate model of quantum computing : H, CNOT, Pauli Gates, BB84 protocol, Advantages of quantum computing, Quantum wire, Quantum dot and realization of CNOT using Quantum dot.	10
<b>Total number of Lectures</b>			<b>40</b>

<b>Evaluation Criteria</b>	<b>Maximum Marks</b>
<b>Components</b>	

T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
<b>Total</b>	<b>100</b>

**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 new quantum universe by Toney Hey and Patrick Walters, Cambridge University Press.
2.	Quantum mechanics a new introduction by Kenichi Konishi and G Paffuti, OUP., 2009
3.	Quantum physics by Eyvind H Wichman (Berley Physics course Vol 4) Tata McGraw Hill 2008
4.	Elements of quantum computation and quantum communication by A Pathak, CRC Press 2013.
5.	Introduction to Quantum Mechanics by David J. Griffiths, Second Edition, Pearson, 2015.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	16B1NPH532	<b>Semester: ODD</b>	<b>Semester: 5<sup>th</sup> Session: 2019 -2020</b> <b>Month from July 19 to December 19</b>
<b>Course Name</b>	Materials Science		
<b>Credits</b>	4	<b>Contact Hours</b>	3+1

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	R. K. Dwivedi and Sandeep Chhoker
	<b>Teacher(s) (Alphabetically)</b>	R. K. Dwivedi and Sandeep Chhoker

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C301-11.1</b>	Recall variety of engineering materials for their applications in contemporary devices	Remembering (C1)
<b>C301-11.2</b>	Explain dielectric, optical, magnetic, superconducting, polymer and thermoelectric properties	Understanding (C2)
<b>C301-11.3</b>	Apply properties of dielectric, optical, magnetic, superconducting, polymer and thermoelectric materials to solve related problems	Applying (C3)
<b>C301-11.5</b>	Prove and estimate solution of numerical problems using physical and mathematical concepts involved with various materials	Evaluating (C5)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Dielectric Materials	Polarization mechanism & Dielectric Constant, Behavior of polarization under impulse and frequency switching, Dielectric loss, Spontaneous polarization, Ferroelectrics, Piezoelectric effect; Applications of Dielectric Materials	10
2.	Magnetic Materials	Concept of magnetism, Classification – dia-, para-, ferro-, antiferro- and ferri-magnetic materials, Their properties and Applications; Hysteresis; Magnetic Storage and Surfaces.	10
3.	Super conducting Materials	Meissner effect, Critical field, type-I and type-II superconductors; Field penetration and London equation; BCS Theory, High temperature Superconductors and their Applications	5
4.	Polymers and Ceramics	Various types of Polymers and their applications; Mechanical behavior of Polymers, synthesis of polymers; Structure, Types, Properties and Applications of Ceramics; Mechanical behavior and Processing of Ceramics.	6
5.	Optical Materials	Basic Concepts, Light interactions with solids, Optical properties of nonmetals: refraction, reflection, absorption, Beer-Lambert law, transmission, Photoconductivity. Drude Model, relation between refractive index and relative dielectric constant, Optical absorption in metals, insulators and semiconductors. Introduction to Photonic band gap (PBG) materials and its applications	6

6.	Thermoelectric Materials	Thermoelectric (TE) effects and coefficients (Seebeck, Peltier, Thompson); TE materials and devices, Heat conduction, Cooling, Figure of Merit; TE power generation (efficiency), refrigeration (COP), Examples and applications.	3
		<b>Total number of Lectures</b>	<b>40</b>

**Evaluation Criteria**

**Components**

**Maximum Marks**

T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (10), Attend. (10) and Class performance (5 )]
<b>Total</b>	<b>100</b>

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

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|----|--|
| 1. | S.O. Pillai, Solid State Physics, New Age International Publishers.                |
| 2. | B. B. Laud, Laser and Non-linear Optics, John Wiley & Sons                         |
| 3. | Van Vlack, Elements of Material Science and Engineering, Pearson Education.        |
| 4. | Srivastava and Srinivasan, Material Science and Engineering,                       |
| 5  | W.D. Callister Jr., Material Science and Engineering: An Introduction, John Wiley. |

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	16B1NPH533	<b>Semester: ODD</b>	<b>Semester: 5<sup>th</sup> Session: 2019 -2020</b> <b>Month from July 19 to December 19</b>
<b>Course Name</b>	Laser Technology and Applications		
<b>Credits</b>	4	<b>Contact Hours</b>	3+1

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Navneet Kumar Sharma and Amit Verma
	<b>Teacher(s) (Alphabetically)</b>	Navneet Kumar Sharma and Amit Verma

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C301-12.1</b>	Define the coherent properties, high brightness of laser, population inversion and optical feedback to laser technology	Remember Level (C1)
<b>C301-12.2</b>	Extend the knowledge of lasers in some applications like LIDAR, laser tracking, bar code scanner, lasers in medicine and lasers in industry	Understand Level (C2)
<b>C301-12.3</b>	Apply the optical ray transfer matrix to determine the stability of a laser resonator	Apply Level (C3)
<b>C301-12.4</b>	Distinguish the operational principles of CW, Q-switched, mode locked lasers; laser rate equations for three & four level lasers; different types of laser systems	Analyze Level (C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Fundamentals of Lasers	Laser idea and properties; Monochromaticity, directionality, brightness, Temporal and spatial Coherence. Interaction of radiation with matter; Absorption, spontaneous and stimulated emission of radiation, Rates equations, Einstein's A and B coefficients. Laser rate equations: Four level and three level systems. Conditions for producing laser action, population inversion, saturation intensity, threshold condition and gain optimization. Experimental techniques to characterize laser beam.	12
2.	Types of Lasers	Pumping processes; optical and electrical pumping. Optical Resonators; The quality factor, transverse and longitudinal mode selection; Q switching and Mode locking in lasers. Confocal, planar and spherical resonator systems. Types of Lasers; Solid state Lasers; Ruby Laser, Nd:YAG laser. Gas lasers; He-Ne laser, Argon laser, CO <sub>2</sub> , N <sub>2</sub> and Excimer Laser. Dye (liquid) Laser, Chemical laser (HF), Semiconductor Lasers; Heterostructure Lasers, Quantum well Lasers. Free electron laser, X-ray laser and Ultrafast Laser.	16
3.	Applications of Lasers	Image processing; Spatial frequency filtering and Holography, Laser induced fusion; Fusion reactor, creation of Plasma. Lightwave communications. Use in optical reader (CD player) and writer. Nonlinear optics; harmonic generation, self focusing. Lasers in industry; Material processing, Cutting, welding and whole drilling. Precision	12

		length measurement, velocity measurement, Laser Tracking, Metrology and LIDAR. Lasers in medicines and surgery. Lasers in defense, Lasers in space sciences, Lasers in sensors.	
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<b>Total number of Lectures</b>		<b>40</b>
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<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)]
<b>Total</b>	<b>100</b>

**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.	Thyagarajan and Ghatak, <i>Lasers Theory and Applications</i> , Macmilan India.
2.	W. T. Silfvast, <i>Laser Fundamentals</i> , Cambridge Univ-Press.
3.	O. Svelto, <i>Principles of Lasers</i> , Springer.
4.	Saleh and Teich, <i>Fundamentals of Photonics</i> , John Wiley & Sons.



**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	16B1NPH535	<b>Semester: ODD</b>	<b>Semester: 5<sup>th</sup> Session: 2019 -2020</b> <b>Month from July 19 to December 19</b>
<b>Course Name</b>	NUCLEAR SCIENCE AND ENGINEERING		
<b>Credits</b>	4	<b>Contact Hours</b>	3+1

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Vivek Sajal
	<b>Teacher(s) (Alphabetically)</b>	Vivek Sajal

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C301-14.1</b>	Relate terminology and concepts of nuclear science with various natural phenomenon and engineering applications.	Remembering (C1)
<b>C301-14.2</b>	Explain various nuclear phenomenon, nuclear models, mass spectrometers, nuclear detectors, particle accelerators. and classify elementary particles.	Understanding (C2)
<b>C301-14.3</b>	Solve mathematical problems for various nuclear phenomenon and nuclear devices.	Applying (C3)
<b>C301-14.4</b>	Analyze the results obtained for various physical problems and draw inferences from the results.	Analyzing (C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Nuclear Constituents and their properties, Nuclear Forces	Rutherford scattering and estimation of nuclear size, Constituents of the nucleus and their properties, Nuclear Spin, Moments and statistics, Magnetic dipole moment, Electric quadrupole moment. Nuclear forces, Two body problem - Ground state of deuteron, Central and non-central forces, Exchange forces: Meson theory, Yukawa potential, Nucleon-nucleon scattering, Low energy n-p scattering, Effective range theory, Spin dependence, charge independence and charge symmetry of nuclear forces, Isospin formalism.	07
2.	Nuclear Models	Binding energies of nuclei, Liquid drop model: Semi-empirical mass formula, Mass parabolas, Prediction of Nuclear stability, Bohr-Wheeler theory of fission, Shell model, Spin-orbit coupling. Magic numbers, Angular momenta and parities of nuclear ground state, Magnetic moments and Schmidt lines, Collective model of a nucleus.	05
3.	Nuclear decay and Nuclear reactions	Alpha decay, Beta decay, Pauli's Neutrino hypothesis-Helicity of neutrino, Theory of electron capture, Non-conservation of parity, Fermi's theory, Gamma decay: Internal conversion, Multipole transitions in nuclei, Nuclear isomerism, Artificial radioactivity, Nuclear reactions and conservation laws, Q-value equation, Centre of mass frame in nuclear Physics, Scattering and reaction cross sections, compound nucleus, Breit-Wigner one level formula	08

4.	Interaction of nuclear radiation with matter	Interaction of charge particles with matters: Bohr's ionization loss formula and estimation of charge, mass and energy. Interaction of electromagnetic radiation with matter, Linear absorption coefficient. Nuclear particle detectors and neutron counters.	07
5.	Accelerator and reactor Physics	Different types of reactors, tracer techniques, activation analysis. Radiation induced effects and their applications: Accelerators: Linear accelerators, Van de Graff generator, LINAC, Cyclotrons, Synchrotrons, Colliders.	06
6.	Cosmic radiation and Elementary Particles	Cosmic radiation: Discovery of cosmic radiation, its sources and composition, Latitude effect, altitude effect and east-west asymmetry, secondary cosmic rays, cosmic ray shower, variation of cosmic intensity and Van Allen radiation belt. Elementary particles: Classification of particles, K-mesons, Hyperons, particles and antiparticles, fundamental interactions, conservation laws, CPT theorem, resonance particles and hypernucleus, Quark model.	07
<b>Total number of Lectures</b>			<b>40</b>

#### 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)]
<b>Total</b>	<b>100</b>

**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.	K.S. Krane, 1987, Introductory Nuclear Physics, Wiley, New York.
2.	I. Kaplan, 1989, Nuclear Physics, 2nd Edition, Narosa, New Delhi.
3.	B.L. Cohen, 1971, Concepts of Nuclear Physics, TMH, New Delhi.
4.	R.R. Roy and B.P. Nigam, 1983, Nuclear Physics, New Age International, New Delhi.
5.	H.A. Enge, 1975, Introduction to Nuclear Physics, Addison Wesley, London.
6.	Y.R. Waghmare, 1981, Introductory Nuclear Physics, Oxford-IBH, New Delhi.
7.	R.D. Evans, 1955, Atomic Nucleus, McGraw-Hill, New York.

## Detailed Syllabus

### Lab-wise Breakup

**NOTE: All the entries (...) must be in Times New Roman 11.**

<b>Course Code</b>	15B17EC571	<b>Semester: Odd</b> (specify Odd/Even)	<b>Semester 5<sup>th</sup> Session</b> 2019 -2020 <b>Month from</b> June19 to Dec 19
<b>Course Name</b>	Digital Communication Lab		
<b>Credits</b>	1	<b>Contact Hours</b>	2

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Parul Arora, Reema Budhiraja
	<b>Teacher(s)</b> (Alphabetically)	Akansha Aggarwal, Ankit Garg , Atul Kumar, Bhawna Gupta , Juhi Gupta, Megha Agarwal, Neeti, Neetu Joshi, Pankaj Yadav, Raghvendra Singh, Richa Gupta, Sajal Aggarwal , Yogesh Kumar

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C370.1</b>	Learning about DSO functioning, Function Analyzer, bread board, and circuit connection. Sampling and quantization of an analog signal. Generation & detection of ASK, FSK & PSK using trainer kit.	Understanding Level(C2)
<b>C370.2</b>	Design circuits for Amplitude Shift Keying, Frequency Shift Keying and Phase Shift Keying using IC LF 398. Understanding of the concept of different line coding schemes and draw corresponding waveforms.	Analyzing Level(C4)
<b>C370.3</b>	Understanding the concept of modulation and demodulation.	Understanding Level(C2)
<b>C370.4</b>	Implement Pulse Code Modulation, Differential Pulse Code Modulation, Delta Modulation, Adaptive Delta Modulation, Quadrature Amplitude Modulation and their demodulation on trainer kit.	Analyzing Level(C4)

Module No.	Title of the Module	List of Experiments	CO
1.	Introduction to Sampling process	Study of various sampling techniques and the effect of sampling frequency.	C370.1
		Study of various sampling techniques (natural sampling, sample and hold, flat top sampling) using MATLAB	C370.1
2.	Study of Baseband Pulse Transmission	To study various data encoding and decoding techniques.	C370.2
3.	Study of Digital Passband Transmission	Design of Amplitude Shift Keying modulation circuit using IC LF398, to vary the parameters and to study its waveform.	C370.2, C370.3
		Design of Frequency Shift Keying modulation circuit using IC LF398, to vary the parameters and to study its waveform.	C370.2, C370.3
		Design of Phase Shift Keying modulation circuit using IC LF398, to vary the parameters and to study its waveform.	C370.2, C370.3
		Design of Amplitude Shift Keying modulation circuit using IC LF398, to vary the parameters and to study its waveform using MATLAB.	C370.2, C370.3
		To generate and study the Quadrature Amplitude Modulated	C370.2,

		signal and demodulate the same.	C370.3
4.	Study of Waveform coding techniques	Study of Pulse Code Modulator (PCM) and Demodulator.	C370.4
		Study of TDM with different receiver synchronization techniques.	C370.4
		To generate and study the Delta Modulated signals and demodulate the same.	C370.4
		To generate and study the Adaptive Delta Modulated signals and demodulate the same.	C370.4

**Evaluation Criteria**

Components	Maximum Marks
Mid Term Performance	20
End Term Performance	20
Day-to-day performance	60
(Lab record, experiment performance, discipline etc.)	

**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.	H. Taub & D. L. Schilling, Principles of Communication Systems, 2nd edition, McGraw-Hill Higher Education
2.	S. Haykin, Digital Communications, John Wiley & Sons, 2001.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	15B11EC511	<b>Semester ODD</b> (specify Odd/Even)	<b>Semester 5<sup>th</sup> Session 2019 -2020</b> <b>Month July 19 to December 19</b>
<b>Course Name</b>	Digital Communication		
<b>Credits</b>	4	<b>Contact Hours</b>	3+1

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Megha Agarwal, Bhawna Gupta
	<b>Teacher(s)</b> (Alphabetically)	Ankit.Garg, Atul Kumar, Parul Arora, Reema Budhiraja, Yogesh Kumar

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C310.1</b>	Understand the concepts of Sampling process, time division multiplexing and GSOP.	Understanding (Level II)
<b>C310.2</b>	Understand the concepts of waveform coding techniques, PSD of different line coding schemes and analysis of ISI Mitigation Techniques	Analyzing (Level IV )
<b>C310.3</b>	Understand the concepts of digital modulation techniques and evaluate their probability of error and bandwidth efficiency.	Evaluating (Level V)
<b>C310.4</b>	Understand the concepts of error control coding schemes.	Understanding (Level II)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction	Merits and demerits of digital signals, sampling theorem in frequency domain and time domain, Nyquist criteria, reconstruction using interpolation filters, ideal, natural and flat top sampling, aperture effect	8
2.	Waveform coding techniques	PCM generation and detection, quantization, quantization error, non uniform quantization, companding, differential PCM, Delta modulation, Adaptive delta modulation, Data encoding formats, PSD of Line codes, ISI, ISI Mitigation Techniques. GSOP.	8
3.	Digital Modulation Techniques	Binary & M-ary modulation techniques: FSK, PSK, DPSK, M-ary PSK, Minimum Phase Shift Keying (MSK) and Quadrature Amplitude Modulation	10
4.	Performance Analysis of Digital Systems	Probability of error analysis – Optimum filter, Matched filter, Coherent & Non – Coherent Reception, Probability of error for FSK, PSK, DPSK, M-ary PSK, Minimum Phase Shift Keying (MSK). Introduction to bit Vs symbol error probability & Bandwidth	10
5.	Digital Systems and error control	Digital radio, Plesiochronous and Digital Synchronous Hierarchy standards, introduction to error control	4
<b>Total number of Lectures</b>			<b>40</b>

**Evaluation Criteria**

<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25
<b>Total</b>	<b>100</b>

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

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|----|--|
| 1. | S. Haykin, Digital Communications, John Wiley & Sons, 2013.  |
| 2. | H. Taub & D. L. Schilling, Principles of Communication Systems, 2nd edition, McGraw-Hill Higher Education, 2016. |

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	15B11EC612	<b>Semester</b> Odd (specify Odd/Even)	<b>Semester</b> 5th <b>Session</b> 2019 -2020 <b>Month from</b> July-December
<b>Course Name</b>	Electromagnetic Engineering		
<b>Credits</b>	4	<b>Contact Hours</b>	3+1

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Ashish Gupta, Neetu Joshi
	<b>Teacher(s) (Alphabetically)</b>	Bhagirath Sahu, Dharmendra Kumar Jhariya, Hemant Kumar, Monika, Raghvendra Kumar Singh, Vishal Narain Saxena.

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C312.1</b>	Recall concepts of vector calculus to solve complex problems and relate among different coordinate systems. Explain the basic principles of electrostatics and magnetostatics and relate the electric and magnetic fields using Maxwell's Equations.	Understanding Level (C2)
<b>C312.2</b>	Illustrate the propagation of electromagnetic waves in different medium and their reflection and transmission parameters. Distinguish among different wave polarizations.	Applying Level (C3)
<b>C312.3</b>	Estimate the current, voltage and power for the different types of transmission lines, determine reflection parameters. Demonstrate the Waveguide theory, Wave equations, and evaluate different waveguide parameters.	Evaluating Level (C5)
<b>C312.4</b>	Classify and compare the different parameters associated with the antenna and also interpret the radiation mechanism.	Understanding Level (C2)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introductory material	Review of scalar, vector fields and coordinate systems and transformation, vector calculus, (cylindrical and spherical coordinate) Electrostatic and Magnetostatic Fields	8
2.	Maxwell's Equations	Inconsistency of Amperes law, Continuity equation, Displacement current, Maxwell's equations, Electric and Magnetic Boundary conditions.	4
3.	Electromagnetic Waves	Wave propagation in free space, Conductors and dielectrics, Polarization, Plane wave propagation in conducting and non conducting media, Phase velocity, Group velocity; Reflection at the surface of the conductive medium, Surface Impedance, Depth of penetration.	11
4.	Poynting Vector and Power	Poynting theorem, Poynting Vectors, Average power and power loss in a plane conductor.	2
5.	Transmission Lines	Transmission line equations, characteristic impedance, open and short circuited lines, standing wave and reflection losses. Impedance matching.	7
6.	Wave guides	Rectangular wave guides Modes in rectangular coordinates, characteristics, power transmission and losses.	6
7.	Radiation and Antennas	Scalar and Vector Fields, Radiation from a current filament, Antenna characteristics, radiation pattern, radiation intensity, directivity and power gain.	4

<b>Total number of Lectures</b>		<b>42</b>
<b>Evaluation Criteria</b>		
<b>Components</b>	<b>Maximum Marks</b>	
T1	20	
T2	20	
End Semester Examination	35	
TA	25	
<b>Total</b>	<b>100</b>	

<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
<b>1.</b>	M.N.O. Sadiku, S.V. Kulkarni, <i>Principles of Electromagnetics</i> , Oxford Press, 6 <sup>th</sup> Edition, 2016.
<b>2.</b>	W. H. Haytt, J.A. Buck, M. J. Akhtar, <i>Engineering Electromagnetics</i> , McGraw Hill Education, 8 <sup>th</sup> Edition, 2014.
<b>3.</b>	S. Salivahanan, S. Karthie, <i>Electromagnetic Field Theory</i> , McGraw-Hill Education, 2 <sup>nd</sup> Edition, 2019.
<b>4.</b>	C.A. Balanis, <i>Advanced Electromagnetics</i> , Wiley Publishers, 2 <sup>nd</sup> Edition, 2012.
<b>5.</b>	S.C. Mahapatra, S. Mahapatra, <i>Principles of Electromagnetic</i> , McGraw Hill Education, 2 <sup>nd</sup> Edition, 2015.
<b>6.</b>	A.R. Harish, M.Sachidananda, <i>Antennas and Wave Propagation</i> , Oxford University Press, 2015.



**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Subject Code</b>	<b>15B19EC591</b>	<b>Semester</b>	<b>Odd</b>	<b>Semester 5th Session</b> 2019-20 <b>Month from</b> Jul 19 to Dec 19
<b>Subject Name</b>	<b>Minor Project - I</b>			
<b>Credits</b>	<b>5</b>	<b>Contact Hours</b>	<b>NA</b>	

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Neetu Singh, Mr. Raghvendra Kumar Singh
	<b>Teacher(s) (Alphabetically)</b>	NA

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C350.1</b>	Identifying, planning and initiation of the individual projects in the domain selected by them, respectively.	Applying [Level 3]
<b>C350.2</b>	Analyze the potential research areas in the field of Embedded Systems, Signal Processing, VLSI, Communication, Artificial Intelligence and Machine Learning/Deep Learning etc.	Analysing [Level 4]
<b>C350.3</b>	Survey the available literature and gain knowledge of the State-of-Art in the chosen field of study.	Analysing [Level 4]
<b>C350.4</b>	Evaluate the existing algorithms of the domain selected and improvise the algorithm so that it yields better results than the existing metrics.	Evaluating [Level 5]
<b>C350.5</b>	Design and implement a working model, using various hardware components, which works as a prototype to showcase the idea selected for implementation.	Creating Level [Level 6]

<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>
Mid Sem Evaluation	40
Final Evaluation	40
Report	20
<b>Total</b>	<b>100</b>

## Detailed Syllabus

### Lecture-wise Breakup

<b>Course Code</b>	18B12HS814	<b>Semester</b> Even	<b>Semester VIII Session</b> 2019 -2020 <b>Month from</b> Jan 2020 to June 2020
<b>Course Name</b>	Knowledge Management		
<b>Credits</b>	3	<b>Contact Hours</b>	3-0-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Anshu Banwari	
	<b>Teacher(s) (Alphabetically)</b>	Dr. Anshu Banwari	

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

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

		techniques	
5.	Knowledge Codification and System Implementation	Codification Tools and Procedures, The knowledge Developer's Skill set, Quality assurance, Approaches to Logical testing and Acceptance testing, Issues related to deployment	6
6.	Knowledge Transfer and Knowledge Sharing	Transfer strategies, Inhibitors of Knowledge transfer, Role of Internet in Knowledge Transfer	5
7.	Managing Knowledge Workers	Business Roles in the Learning Organizations, Work adjustment and the Knowledge Worker, Technology and the Knowledge worker, Role of the CKO, Managing Considerations, Managing Knowledge Projects	5
8.	Ethical, Legal and Managerial Issues	Knowledge Owners, Legal Issues, Ethical Decision cycle, Major threats to Ethics, The Privacy factor	5
<b>Total number of Lectures</b>			<b>42</b>

<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Project)
<b>Total</b>	<b>100</b>

<b>Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)</b>	
1	<b>D. Hislop</b> , Knowledge Management in Organizations, Oxford University Press, 2013
2.	<b>E. M. Awad and H. M. Ghaziri</b> , Knowledge Management, Pearson Education, 2007
3.	<b>S. Warier</b> , Knowledge Management, Vikas Publishing House, 2011

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	18B12HS815	<b>Semester Even</b>	<b>Semester 8<sup>th</sup> Session 2019 -2020</b> <b>Month from January 2020 to May 2020</b>
<b>Course Name</b>	QUALITY ISSUES IN ENGINEERING		
<b>Credits</b>	3	<b>Contact Hours</b>	3-0-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Santoshi Sengupta
	<b>Teacher(s) (Alphabetically)</b>	Dr. Santoshi Sengupta

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
C402-11.1	Apply the concepts of quality within quality management systems by understanding various perspectives, historical evolution; and contributions of key gurus in the field of quality	Apply Level (C3)
C402-11.2	Determine the effectiveness of acceptance sampling using single and double sampling plans and operating characteristic curves	Evaluate Level (C5)
C402-11.3	Determine quality by employing a wide range of basic quality tools, lean concepts and process improvement techniques such quality function deployment	Evaluate Level (C5)
C402-11.4	Examine the importance of six sigma, various quality standards, awards, certifications	Analyze Level (C4)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Fundamentals of Quality	Perspectives and Definitions of Quality, Dimensions Of Quality for Product and Service, History of Quality, Phases of Quality Assurance, Alignment, Linkage, Reengineering, Contribution of Gurus – Shewhart, Deming, Ishikawa, Juran	6
2.	Cost of Quality and Quality Function Deployment	Cost of Quality, Voice Of Customers: Kano's Model, House Of Quality, QFD Process	6
3.	Basic Tools of Quality	Checksheets, Cause and Effect Diagrams, Histograms, Flowcharts, Pareto Analysis, Scatter Diagrams, Run Charts	9
4.	Statistical Thinking And Applications	Acceptance Sampling, Single Sampling Plan, Double Sampling Plan, Statistical Process Control, Specification And Control Limits, Control Charts For Attributes, Control Charts For Variables	9
5.	Six Sigma, Benchmarking and Lean Concepts	Six Sigma, Capability Of A Process/Product/Service, DMAIC Process, Benchmarking Meaning, Process, Methods; JIT, Andon, Kanban, Kaizen, Poka-Yoke, 5-S, 7 Mudas	9
6.	Quality Standards and Awards	ISO Standards, MBNQA, RGNQA, Deming Prize	3
<b>Total number of Lectures</b>			<b>42</b>

**Evaluation Criteria**

<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Assignment, Case Study, Quiz, Oral Questions)
<b>Total</b>	<b>100</b>

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

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|----|--|
| 1. | NVS Raju, Total Quality Management, 1 <sup>st</sup> Edition, Cengage Learning, 2018                  |
| 2. | Kanishka Bedi, Quality Management, 1 <sup>st</sup> Edition, Oxford University Press, 2006            |
| 3. | D.H. Besterfield, Total Quality Management, Revised 3 <sup>rd</sup> Edition, Pearson Education, 2011 |

## Detailed Syllabus

### Lecture-wise Breakup

<b>Course Code</b>	<b>16B1NMA531</b>	<b>Semester Odd</b> (specify Odd/Even)	<b>Semester V Session 2018 -2019</b> <b>Month from</b> July 2019- Dec2019
<b>Course Name</b>	<b>DISCRETE MATHEMATICS</b>		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Anuj Bhardwaj	
	<b>Teacher(s)</b> (Alphabetically)	Dr. Anuj Bhardwaj	
<b>COURSE OUTCOMES:</b> After the successful completion of this course, the student will be able to			<b>COGNITIVE LEVELS</b>
<b>C301-1.1</b>	explain partial order relations, Hasse diagram, lattices and recursive functions.		Understanding Level (C2)
<b>C301-1.2</b>	solve the difference equations using generating function and Z-transform.		Applying Level (C3)
<b>C301-1.3</b>	explain the propositional and predicate calculus to check the validity of arguments.		Understanding Level (C2)
<b>C301-1.4</b>	demonstrate graphs, digraphs, trees and use it to solve the different problems of graph theory.		Applying Level (C3)
<b>C301-1.5</b>	illustrate various algebraic structures and their properties.		Understanding Level (C2)
<b>C301-1.6</b>	explain the theory of formal languages and solve the related problems of automata.		Applying Level (C3)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
<b>1.</b>	Relations and Lattices	Relations and their composition. Pictorial representation, matrix and graphical representations. Equivalence relations and partitions. Partial ordered relations and Hasse diagram. Lattices.	5
<b>2.</b>	Functions	Functions and Recursively defined functions, generating functions, solution of recurrence relations by generating function. Z transforms, solution of difference equations by Z transform.	8
<b>3.</b>	Propositional Calculus	Propositions- simple and compound. Basic logical operators. Implication. Truth tables. Tautologies and contradictions. Valid arguments and fallacy. Propositional functions and quantifiers.	4
<b>4.</b>	Graphs	Graphs and related definitions, subgraphs, isomorphism, paths and connectivity. Eulerian graph and Konigsberg	7

		problem. Hamiltonian graph. Labelled and weighted graphs. Tree Graphs-Minimum spanning Tree (Prim's algorithm). Graph colorings. Four color problem.	
5.	Directed Graphs	Trees, Digraphs and related definitions. Rooted trees. Algebraic expressions and Polish notation. Sequential representation. Adjacency matrix. Path matrix. Shortest path. Linked representation of directed graphs. Binary trees.	5
6.	Algebraic Structures	Groups- definitions and examples, order of elements, subgroup, condition for subgroups. Quotient groups, Lagrange theorem and applications, Rings, integral domains and Fields- definition and examples.	7
7.	Languages and Grammars	Strings (words) and languages, grammars, types of grammars, Finite state machines, finite state automata, regular languages and regular expressions.	6
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, Tutorials)	
<b>Total</b>		<b>100</b>	
<b>Recommended Reading material:</b>			
1.	Lipschutz, S. and Lipson, M., Discrete Mathematics, 2 <sup>nd</sup> Edition, Tata McGraw-Hill, 1997.		
2.	Rosen, K. H., Discrete Mathematics and its Application, 5 <sup>th</sup> Edition, Tata McGraw-Hill, 2003.		
3.	Liu, C. L., Elements of Discrete Mathematics, 2 <sup>nd</sup> Edition, Tata McGraw-Hill, 1985.		
4.	Kolman, B., Busby, R. C. and Ross, S., Discrete Mathematical Structures, 3 <sup>rd</sup> Edition, Prentice Hall, 1996.		
5.	Deo, N., Graph Theory, Prentice Hall, 1980.		
6.	Grimaldi, R.P., Discrete and Combinatorial Mathematics, 4 <sup>th</sup> Edition, Pearson Education, 2005.		

### Course Description

<b>Course Code</b>	16B1NMA533	<b>Semester - Odd</b> (specify Odd/Even)	<b>Semester 5<sup>th</sup> Session</b> 2019 -2020 <b>Month from</b> July 2019 - Dec 2019
<b>Course Name</b>	Matrix Computations		
<b>Credits</b>	4	<b>Contact Hours</b>	3+1

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Pato Kumari and Dr. Amita Bhagat
	<b>Teacher(s)</b> (Alphabetically)	Dr. Amita Bhagat Dr. Neha Singhal Dr. Pato Kumari

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C301-3.1</b>	explain the basics of matrix algebra and inverse of a matrix by partitioning.	<b>Understanding level (C2)</b>
<b>C301-3.2</b>	solve the system of linear equations using direct and iterative methods.	<b>Applying Level (C3)</b>
<b>C301-3.3</b>	explain the vector spaces and their dimensions, inner product space, norm of a vector and matrix.	<b>Understanding level (C2)</b>
<b>C301-3.4</b>	apply the Gram-Schmidt process to construct orthonormal basis and Q-R decomposition of a matrix.	<b>Applying Level (C3)</b>
<b>C301-3.5</b>	construct Gershgorin's circles and solve eigenvalue problem using Jacobi, Givens, Householder, power and inverse power methods.	<b>Applying Level (C3)</b>
<b>C301-3.6</b>	analyze systems of differential and difference equations arising in dynamical systems using matrix calculus.	<b>Analyzing Level (C4)</b>

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Matrix Algebra	Review of matrices, partitioning, block diagonal matrix, elementary matrices, Inverse of a matrix by partitioning	6
2.	Linear System of equations	Existence and uniqueness of solution for system of linear equations, Gauss Siedel, Gauss Jacobi and partial pivoting	6
3.	Vector and Inner Product Spaces	Vector spaces, Subspaces, dimension and basis, $p$ -norms of vector, Inner product, Norm using inner product and norms of a matrix	6
4.	Eigen value Problems	Eigen values and Eigenvectors, spectral radius, Greshgorin's theorem, Jacobi method, Givens rotations method and Householder's method, Power and Inverse power methods, LU decomposition, Crout's and Doolittle's method, Cholesky factorization.	10
5.	Orthogonality	Orthogonal and orthonormal sets, Gram-Schmidt process, QR factorization, Q-R algorithm	6
6.	Matrix Calculus	Powers and functions of matrices, application to solve discrete dynamical systems $x(t+1) = Ax(t)$ , $x(0) = \alpha$ and a system of differential equations of the form $dx/dt = Ax$ , $x(0) = \alpha$ .	8
<b>Total number of Lectures</b>			<b>42</b>



**Evaluation Criteria**

<b>Components</b>	<b>Maximum Marks</b>
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Quizzes and Tutorial)
<b>Total</b>	<b>100</b>

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

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|-----------|--|
| <b>1.</b> | <b>Bronson, R.</b> , Matrix Methods an Introduction, Academic Press, 1991.       |
| <b>2.</b> | <b>Golub, G. H.</b> , Matrix Computations, Johns Hopkins University Press, 1996. |
| <b>3.</b> | <b>Datta, K. B.</b> , Matrix and Linear Algebra, Prentice Hall of India, 1990.   |
| <b>4.</b> | <b>David, W. Lewis.</b> , Matrix Theory, World Scientific, 1991.                 |

## Detailed Syllabus

### Lecture-wise Breakup

<b>Course Code</b>	16B1NMA731	<b>Semester</b> Odd (specify Odd/Even)	<b>Semester V Session</b> 2019 -2020 <b>Month from</b> June 2019- Dec 2019
<b>Course Name</b>	Theory of Numbers		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Puneet Rana	
	<b>Teacher(s) (Alphabetically)</b>	Dr. Puneet Rana	
<b>COURSE OUTCOMES</b>			<b>COGNITIVE LEVELS</b>
<b>C301-4.1</b>	explain Euclid algorithm, linear Diophantine equations and prime numbers.		Understanding level (C2)
<b>C301-4.2</b>	solve system of linear congruences using properties of congruences.		Applying Level (C3)
<b>C301-4.3</b>	explain numbers of special form and number theoretic functions.		Understanding level (C2)
<b>C301-4.4</b>	apply the concepts of order, primitive roots and indices to solve congruences.		Applying Level (C3)
<b>C301-4.5</b>	apply Legendre symbol and quadratic reciprocity theorem to solve quadratic congruences.		Applying Level (C3)
<b>C301-4.6</b>	apply and analyse the concepts of number theory in hashing, cryptography, calendar and ISBN check digits problems.		Analyzing (C4)
<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Divisibility and Primes	Division algorithm, Greatest common divisor, Euclid's algorithm, gcd as a linear combination of coprime integers, Linear Diophantine equations, primes, The fundamental theorem of arithmetic, The Sieve of Eratosthenes, Canonical prime factorization, Least common multiple, Prime number theorem(statement only), Goldbach and twin primes conjectures.	8
2.	Theory of Congruences	Definitions and basic properties, Residue classes, complete residue systems, reduced residue systems, Linear congruences in one variable, Simultaneous linear congruences, Chinese remainder theorem and its applications, Linear congruences in more than one variable, Fermat's theorem, Pseudoprimes and Carmichael numbers, Wilson's Theorem	8
3.	Number Theoretic	Greatest integer function, The number-of-divisors function, The sum-of-divisors function, Multiplicative	7

	Functions and Numbers of Special Form:	function, The Mobius function, Mobius inversion formula, The Euler's totient function, Euler's theorem, Perfect numbers, characterization of even perfect numbers, Mersenne primes, Fermat primes	
4.	Primitive Roots and Indices	The order of an integer, Primitive roots, Theory of indicies, Solution of non-linear congruences.	7
5.	Quadratic Residues	Quadratic residues and non-residues, Euler's Criterion, The Legendre symbol, Gauss Lemma, Quadratic reciprocity, Solution of quadratic congruences.	6
6.	Applications	Hashing functions, Cyptosystem, Calendar problem, ISBN check digits	6
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, Tutorials)	
<b>Total</b>		<b>100</b>	
<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	<b>James Strayer</b> , <i>Elementary Number Theory</i> , Waveland Press,,2001		
2.	<b>Kenneth Rosen</b> , <i>Elementary Number Theory and its Applications</i> , 5th Edition, 2005		
3.	<b>I. Niven, H. Zuckerman, H. Montgomery</b> , <i>An Introduction to the Theory of Numbers</i> , 5th Edition, Wiley, 2013.		
4.	<b>David M. Burton</b> , <i>Elementary Number Theory</i> , 7 <sup>th</sup> Edition, McGraw Hill Education (India) Private Limited, 2006		

### Lecture-wise Breakup

<b>Course Code</b>	17B1NMA531	<b>Semester - Odd</b>	<b>Semester V Session 2019 - 2020</b> <b>Month from July 2019 - Dec 2020</b>
<b>Course Name</b>	Basic Numerical Methods		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Prof. Sanjeev Sharma and Dr. Pankaj Kumar Srivastava	
	<b>Teacher(s) (Alphabetically)</b>	Dr. Pankaj Kumar Srivastava, Prof. Sanjeev Sharma, Dr. Yogesh Gupta	
<b>COURSE OUTCOMES</b>			<b>COGNITIVE LEVELS</b>
After pursuing the above mentioned course, the students will be able to:			
<b>C301-5.1</b>	explain the concepts of approximation and errors in computation.		Understanding level (C2)
<b>C301-5.2</b>	apply numerical methods for solving algebraic and transcendental equations along with their convergence.		Applying Level (C3)
<b>C301-5.3</b>	explain finite and divided difference formulae for numerical interpolation.		Understanding level (C2)
<b>C301-5.4</b>	apply numerical differentiation and integration in engineering applications.		Applying Level (C3)
<b>C301-5.5</b>	solve a system of linear equations using direct and iterative methods.		Applying Level (C3)
<b>C301-5.6</b>	solve ordinary differential equations using numerical methods.		Applying Level (C3)
<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Approximation and Errors in Computation	Errors, relative error, absolute error, order of approximation.	02
2.	Algebraic and Transcendental Equations	Bisection Method, Regula- Falsi Method, Secant Method, Iterative method, Newton-Raphson Method, convergence, Horner's method	07
3.	Interpolation	Finite Differences, Relation between difference operators, Newton's Forward and Backward Interpolation, Gauss Backward Interpolation, Bessel's and Sterling's central difference operators, Laplace-Everett's formula, Newton's divided difference formula	08

4.	Numerical Differentiation and Integration	Derivatives using Newton's Forward and Backward Interpolation, Bessel's and Sterling's central difference operators, Maxima and minima of a tabulated function. Boole's and Weddle's rule, Romberg's method, Euler-Maclaurin formula, Gaussian Integration.	11
5.	System of Equations	Gauss Elimination method, Given's method, Gauss-Seidel Method, House holder's method.	05
6.	Numerical Solution of Ordinary Differential Equations	Picard's method, Euler's method, Modified Euler's method, Fourth order Runge-Kutta method, Milne's method for fixed order, second order and simultaneous differential equations, Finite-Difference Method	09
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, and Tutorials)	
<b>Total</b>		<b>100</b>	
<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
1.	<b>C. F. Gerald and P. O. Wheatley</b> , Applied Numerical Analysis, 6 <sup>th</sup> Ed., Pearson Education, 1999.		
2.	<b>M.K. Jain, S.R.K. Iyengar and R. K. Jain</b> , Numerical Methods for Scientific and Engineering Computation 6 <sup>th</sup> Ed., New Age International, New Delhi, 2014.		
3.	<b>R.S. Gupta</b> , Elements of Numerical Analysis by 1st Ed., (2009) Macmillan.		
4.	<b>S.D. Conte and C. deBoor</b> , Elementary Numerical Analysis, An Algorithmic Approach, 3 <sup>rd</sup> Ed., McGraw-Hill, New York, 1980.		

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	18B12MA311	<b>Semester - Odd</b> (specify Odd/Even)	<b>Semester V Session</b> 2019 -2020 <b>Month from</b> June 2019- Dec2019
<b>Course Name</b>	<b>Decision making using mathematical and statistical approaches</b>		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Pinkey Chauhan
	<b>Teacher(s)</b> (Alphabetically)	Dr. Pinkey Chauhan

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
<b>C301-7.1</b>	explain the concepts of decision making under various environments.	Understanding Level (C2)
<b>C301-7.2</b>	apply various methods for solving single stage optimal problems in uncertainty and risk environments.	Applying Level (C3)
<b>C301-7.3</b>	apply decision tree analysis for solving multiple stage optimal problems.	Applying Level (C3)
<b>C301-7.4</b>	explain principle of optimality and formulation of dynamic programming problems.	Understanding Level (C2)
<b>C301-7.5</b>	solve problems arising in financial and industrial applications using dynamic programming techniques.	Applying Level (C3)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Introduction to decision making under different environments	Introduction to decision making process, Components of decision making with examples: Courses of action, States of nature, Pay-off and Pay-off matrix; Definition and examples of decision making under certainty, uncertainty and risk environments.	4
2.	Optimal Decision analysis for Single stage problems	Decision making under uncertainty: Maximin, Maximax, Minimax regret, Laplace Criteria and Hurwitz criterion, Decision making under Risk: Formulation of Payoff Matrix. Expected Monetary Value (EMV); Examples based on EMV, Expected Opportunity Loss (EOL), Expected Value under Perfect Information (EVPI) , Expected Profit under Perfect Information (EPPI), Expected Cost under Perfect Information (ECPI).	12
2.	The Scientific Approach and its applications	Introduction to decision tree analysis for multiple stages, Construction of decision tree diagram, Applications for optimal decision making of multi point decision problems.	6
3.	Introduction to dynamic programming	Introduction to optimization and dynamic programming, Bellmen's principle of optimality: definition with examples, Formulation of dynamic programming problems for continuous and discrete variables.	6
4.	Applications of dynamic programming for	Optimal subdivision problems, Shortest route or network problems, Solving linear programming problems using dynamic programming, Applications of Dynamic	14

	optimal decision analysis	Programming to cargo loading problems, employment smoothening problems, capital budgeting problems, inventory control problems, product allocation problems.	
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**Total number of Lectures**      **42**

**Evaluation Criteria**

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz , Assignments, Tutorials)
<b>Total</b>	<b>100</b>

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

1.	<b>Bertsekas, D.P.</b> , Dynamic Programming and Optimal Control, 3 <sup>rd</sup> Ed., Vol 1, Athena Scientific, 2005.
2.	<b>Anthony, M. and Biggs, N.</b> , Mathematics for Economics and Finance Methods and Modelling, Cambridge University Press, Cambridge low-priced edition, 2000.
3.	<b>Sharma, S.D.</b> , Operation Research, fourteenth edition, Kedarnath & Ramnath Publications, 2003-2004.
4.	<b>Hiller, F. S. and Leiberman, G. J.</b> , Introduction to Operations Research, 7 <sup>th</sup> ed., 2001
5.	<b>Taha, H.A.</b> , Operations Research
6.	<b>Pearles, B. and Sullivan, C.</b> , Modern Business Statistics - (Revised)- –Prentice Hall of India.

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	17B1NMA533	<b>Semester</b> ODD	<b>Semester 5<sup>th</sup> Session</b> 2019-2020 <b>Month from</b> July 2019 to December 2019
<b>Course Name</b>	STATISTICAL INFORMATION THEORY WITH APPLICATIONS		
<b>Credits</b>	4	<b>Contact Hours</b>	3+1

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. AMIT SRIVASTAVA
	<b>Teacher(s) (Alphabetically)</b>	Dr. AMIT SRIVASTAVA

COURSE OUTCOMES		COGNITIVE LEVELS
<b>C301-8.1</b>	explain the notions of information, entropy, relative entropy and mutual information.	Understanding Level(C2)
<b>C301-8.2</b>	explain fuzzy sets and compare the various measures of discrepancy.	Analyzing Level (C4)
<b>C301-8.3</b>	develop and compare Shannon-Fano and Huffman source codes using measures of uncertainty.	Analyzing Level (C4)
<b>C301-8.4</b>	analyse the notion of distance measure in pattern recognition generated in Intuitionistic fuzzy environment.	Analyzing Level (C4)
<b>C301-8.5</b>	apply information theoretic concepts in encryption and decryption.	Applying Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Information Theoretic Measures	Review of Probability theory, Average information, Shannon and Renyi Entropy, Mutual information. Introduction to concepts of directed divergence, inaccuracy and information improvement	10
2.	Fuzzy Sets and Measures of Fuzzy Uncertainty.	Fuzzy Sets. Fuzzy Uncertainty and Fuzzy Information Measure, Similarity Measures, Fuzzy Measures of Directed Divergence, Total Ambiguity and Information Improvement, R-Norm Fuzzy Information Measure and its Generalizations.	10
3.	Source Coding	Data compression, Kraft-McMillan Equality and Compact Codes, Encoding of the source output, Shannon-Fano coding, Huffman coding, Lempel-Ziv (LZ) coding, Shannon-Fano-Elias Coding and Introduction to Arithmetic Coding. rate distortion theory, Lossy Source coding.	10
4.	Applications of information theory in Cryptography	Basic concepts of cryptography and secure data, Mathematical Overview and Shannon theory of Cryptography, perfect secrecy and the one time pad, Spurious Keys & Unicity Distance, Classical and Product Cryptosystems. semantic security and Stream ciphers, Characteristics for perfect security, Limitations of perfectly secure encryption, Block and Stream ciphers, Cipher Modes, Substitution Ciphers, Mono-alphabetic Substitution and Poly-alphabetic Substitution, Polygram, Transposition Ciphers, Rail Fence, Scytale, Book cipher, Vernam cipher, Vigenere Tablae, Playfair, Hill Cipher, Cryptanalysis of Classical Cryptosystems,	12
<b>Total number of Lectures</b>			<b>42</b>

<b>Evaluation Criteria</b>	
<b>Components</b>	<b>Maximum Marks</b>



T1	20
T2	20
End Semester Examination	35
TA	25 (Quiz , Assignments, Tutorials)
<b>Total</b>	<b>100</b>

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

1.	<b>Bose, R.</b> , Information Theory Coding and Cryptography, 3 <sup>rd</sup> Ed, Tata McGraw-Hill, 2016.
2.	<b>Jain, K. C., and Srivastava, A.</b> , Information Theory & Coding, 3 <sup>rd</sup> Ed, Genius Publications, 2009
3.	<b>Stallings, W.</b> , Cryptography and Network Security Principles and Practices, Prentice Hall, 2003
4.	<b>Cover, T.M. and Thomas, J. A.</b> , Elements of Information Theory, 2nd Edition, Wiley, 2006.
5.	<b>Haykin, S.</b> , Communication Systems, John Willey & Sons, Inc, Newyork, 4th Ed, 2006
6.	<b>Behrouz, A. F.</b> , Introduction to Cryptography and Network Security, McGraw-Hill International Edition, 2008

## Detailed Syllabus

### Lecture-wise Breakup

<b>Course Code</b>	18B12MA312	<b>Semester</b> Odd	<b>Semester V Session</b> 2019-2020 <b>Month from</b> July 2019 to Dec 2019
<b>Course Name</b>	Logical Reasoning and Inequalities		
<b>Credits</b>	4	<b>Contact Hours</b>	3-1-0
<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Dr. Neha Ahlawat	
	<b>Teacher(s) (Alphabetically)</b>	Dr. Neha Ahlawat	
<b>COURSE OUTCOMES</b>			<b>COGNITIVE LEVELS</b>
After pursuing the above mentioned course, the students will be able to:			
<b>C301-9.1</b>	interpret the mathematical foundation of various inequalities.		Understanding level(C2)
<b>C301-9.2</b>	examine inequalities in the field of information theory and cryptography.		Analyzing level(C4)
<b>C301-9.3</b>	apply the concepts of permutation and combination of multi sets in combinatorics.		Applying level(C3)
<b>C301-9.4</b>	apply special numbers in combinatorial and number theoretic problems.		Applying level(C3)
<b>C301-9.5</b>	explain the basic concepts of logical reasoning and solve related problems.		Understanding level(C2)
<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	Inequalities	Basic Inequalities, Inequalities between means with special reference to AGM inequality, Jensen inequality for concave and convex functions, Hermite hadamard inequality, Karamata's inequality, Popoviciu's inequality, Weighted AGM inequality and Young's inequality.	12
2.	Basics of Counting	Pigeon Hole Principle, Binomial Theorem, Properties of binomial coefficients, combinatorial identities, Permutation of Multisets, Multinomial Theorem, Combinations of Multisets, Sterling's Formula, Generalization of Binomial coefficients, Inclusion exclusion principle.	12
3.	Special numbers	Catalan numbers, Partition numbers, difference sequences, Sterling Numbers, Perfect numbers.	10
4.	Logical	Clocks, calendars, binary logic, seating arrangement,	8

	Reasoning	blood relations, logical sequence, assumption, premise, conclusion, linear and matrix arrangement, Syllogism, Binary Logic, Logical sequence & Matching, Mathematical Puzzles with applications.	
<b>Total number of Lectures</b>			<b>42</b>
<b>Evaluation Criteria</b>			
<b>Components</b>		<b>Maximum Marks</b>	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, Tutorials)	
<b>Total</b>		<b>100</b>	
<b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			
<b>1.</b>	<b>Cerone, P. and Dragomir, S. S.</b> , Mathematical Inequalities, CRC Press, Boca Raton, FL, 2011		
<b>2.</b>	<b>Praveen, R. V.</b> , Quantitative Aptitude and Reasoning, Second Edition, Prentice Hall India, 2013.		
<b>3.</b>	<b>Rosen &amp; Kenneth H</b> , Discrete Mathematics and its Applications, Tata Mc-Graw Hill, New Delhi, 2007.		
<b>4.</b>	<b>Kolman B., Busby R. C. and Ross S.</b> , Discrete Mathematical Structures, Prentice Hall, 1996.		
<b>5.</b>	<b>Simmons, G. J.</b> , The Great Book of Puzzles & Teasers, 1999.		

**Detailed Syllabus**  
**Lecture-wise Breakup**

<b>Course Code</b>	<b>15B11GE301</b>	<b>Semester Odd</b> <b>(specify Odd/Even)</b>	<b>Semester V Session 2019 -2020</b> <b>Month from: July to December</b>
<b>Course Name</b>	Environment Sciences		
<b>Credits</b>	3	<b>Contact Hours</b>	3

<b>Faculty (Names)</b>	<b>Coordinator(s)</b>	Prof. Krishna Sundari S
	<b>Teacher(s)</b> <b>(Alphabetically)</b>	1. Ekta Bhatt 2. Dr. Garima Mathur 3. Prof. Krishna Sundari S 4. Manisha Singh 5. Dr. Susinjan Bhattacharya

<b>COURSE OUTCOMES</b>		<b>COGNITIVE LEVELS</b>
C309.1	Explain different aspects of environment, ecosystem and associated concerns	Understand Level (C2)
C309.2	Identify various practices that can impact the environmental resource management	Apply Level(C3)
C309.3	Apply modern techniques including sustainable solutions and green technologies for a better environment	Apply Level(C3)
C309.4	Survey ground situation on specific environmental aspects, examine risks involved, make a field report and present the findings	Analyze Level(C4)
C309.5	Recall environment related Government regulations, policies, safety norms and Laws.	Remember Level(C1)

<b>Module No.</b>	<b>Title of the Module</b>	<b>Topics in the Module</b>	<b>No. of Lectures for the module</b>
1.	The Multidisciplinary nature of environmental studies & Biodiversity	Definition, scope and importance, Need for public awareness, Types of Ecosystems, World Biomes, Ecosystem functioning, Biogeochemical cycles, Diversity of flora and fauna, species and wild life diversity, Biodiversity hotspots, threats to biodiversity Case studies.	5
2.	Natural resources, Energy consumption & conservation, Global Conventions	Water, Land Energy (Renewable, non-renewable, wind, solar, hydro, Biomass), Mineral, Forest, & Food resources, Role of an individual in conservation of natural resources, Equitable use of resources, Global Conventions on Energy, Kyoto protocol, Case studies .	8
3.	Pollution, hazardous waste management	Air, Water & Land pollution, sources & causes, Space pollution, causes & effects, Electronic waste, Radioactive materials, toxicity limits of pollutants. Critical issues concerning Global environment (Urbanization, population growth, global warming, climate change, acid rain, ozone depletion etc.) and their roots in: cultural, social, political, commercial, industrial, territorial domains, Case studies.	9
4.	Urban planning, Disaster	Sustainable building, Analyses of seismic data including magnitude and epicenters of earthquakes, Disaster	6

	management	Management and Contingency Planning, Modern safety systems, Case studies.	
5.	Environmental Impact assessment, Use of Satellite Imaging	Objectives of impact assessment, Study of impact parameters, Methods for impact identification, Economics, Remote sensing imagery from satellite sensors and role in environmental impact studies, Case studies.	5
6.	Sustainability & Planned reversal of human destruction to environment	Redevelopment of brown fields, energy plantations, social forestry, engineering aspects of Re-use & Recycling, biogas for marginal income groups, organic farming, eco-consumerism, dematerialization, green technologies, eco-tourism, Case studies.	5
7.	Environmental Laws & Regulations	Regulation of technology and innovation, Policy and laws, Different Acts such as: Environmental Protection Act, Air and Water Acts, Wildlife and Forest Acts), US-EPA, National Environmental Policy; Function of pollution control boards (SPCB and CPCB), their roles and responsibilities, Eco-mark Scheme, Laws relating to Urban and Rural land use, Ethics, Case studies.	4
8.	Field Work	Explore the surrounding flora & fauna (Study of common plants, insects, birds document environmental assets), documentation of industries in local region and their possible effects, measure of water, air and land quality, Visit to a local polluted site-Urban/Rural /Industrial / Agricultural, Study of simple ecosystems-pond, river, hill slopes etc	5

**Total number of Lectures**

**47**

**Evaluation Criteria**

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Attendance)
<b>Total</b>	<b>100</b>

**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.	Chiras D D.(Ed.). 2001. Environmental Science – Creating a sustainable future. 6 <sup>th</sup> ed. Jones &Barlett Publishers.
2.	<b>Joseph, B., 2005, Environmental Studies, Tata McGraw Hill, India</b>
3.	<b>Textbook of Environmental Studies for UG Courses - ErachBharucha, University Press</b>
4.	Jogdanand S N 2004. Environmental Biotechnology: Industrial Pollution Management. Himalaya Pub. House, Delhi 284p
5.	David P Lawrence. 2003. Environment Impact assessment, Wiley publications
6.	Issues of the Journal: Down to Earth, published by Centre for Science and Environment