

Detailed Syllabus

Subject Code	15B11CI511	Semester: Odd (specify Odd/Even)	Semester V Session 2018-2019 Month from JUL'18 to DEC'18
Subject Name	Computer Networks		
Credits	4	Contact Hours	3+1

Faculty (Names)	Coordinator(s)	Dr K. Rajalakshmi, Rupesh Kumar Koshariya
	Teacher(s)	Dr. GagandeepKaur Dr. Kavita pandey Dr K. Rajalakshmi Ms Kriti Agarwal Dr. Prakash Kumar Dr. Charu Gandhi Mr. Bansidhar Joshi Miss Pushp Mr. Rupesh Kumar Koshariya

COURSE OUTCOMES		COGNITIVE LEVELS
C310.1	Defining the basics of networking, delay components and underlying technologies	Remembering (Level 1)
C310.2	Illustrate the various key protocols in OSI model and TCP/IP protocol suite and explain various application protocols.	Understanding (Level 2)
C310.3	Examine various transport protocols and its performance enhancing mechanisms.	Analyzing (Level 4)
C310.4	Assess the performance of the network under various routing mechanisms and IP addressing schemes.	Evaluating (Level 5)
C310.5	Identify various multiple access protocol and perform error detection and correction in data communication	Applying (Level 3)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction	Network terminologies, Clients and Servers, Network Models, Protocol layers and their services, Connection Oriented and Connectionless services, Switching Techniques, Physical Media. Network Vulnerability and security	8
2.	The Application Layer	Principles of Application-Layer Protocols, The World Wide Web: HTTP, File Transfer: FTP, The Internet's Directory Service: DNS, Electronic Mail in the	6

		Internet, Introduction to Sockets, Security Aspects in Application layer, HTTPS, SFTP etc., Multimedia Aspects of the Application Layer	
3.	The Transport Layer	Transport-Layer Services and Principles, Multiplexing and Demultiplexing Applications, UDP and TCP, Connection Establishment, Transport Layer Protocols (go back N, stop and wait, selective repeat), Flow Control and Error Control, Principles of Congestion Control, TCP Congestion Control, Attack and vulnerability issues in Transport layer: Denial of Service (DoS), Distributed Denial of Service (DDoS) etc., Transport layer Security aspects, SSL, TLS etc., Multimedia aspects of the Transport layer	8
4.	The Network Layer	Introduction and Network Service Model, Routing Principles, Hierarchical Routing, IP: the Internet Protocol, Routing in the Internet, Broadcast and multicast routing, IPSec Architecture: Authentication Header (AH) and Encapsulating Security Payload (ESP), Multimedia networking aspects and applications	10
5.	The Link Layer and Local Area Networks	The Data Link Layer: Introduction, Services, Error Detection and Correction, Multiple Access Protocols and LANs, LAN Addresses and ARP, Ethernet, PPP: the Point-to-Point Protocol, Introduction to ATM, MPLS and Sonet, IEEE MAC Security Standard, MACSec (802.1AE), Multimedia aspects of the DL layer	8
6.	Wireless Networks	Introduction, Wireless links and characteristics, Architecture, AODV and DSR wireless routing protocols	2
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Assignments, Quiz, 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	James Kurose, Keith Ross,” Computer Networking: A Top-Down Approach Featuring the Internet “, Addison Wesley
2	Andrew S. Tanenbaum ,”Computer Networks “, Prentice-Hall Publishers
3	Larry Peterson , Bruce Davie ,”Computer Networks a Systems Approach “, Morgan Kaufmann
4	William Stallings ,”Data and Computer Communications”, Prentice Hall
5	K. Thramboulidis, A. Mikroyannidis, “Using UML for the Design of Communication Protocols: The TCP Case Study” 11th International Conference on Software, Telecommunications and Computer Networks, October 7-10, 2003.
6	JuhaParssinen, Niklas von Knorring,JukkaHeinonen, MarkkuTurunen, “UML for Protocol Engineering-Extensions and Experiences”, Proceedings of the Technology of Object-Oriented Languages and Systems (TOOLS),. IEEE Computer Society, page 82, 2000

Detailed Syllabus

Course Code	15B17CI571	Semester : Odd	Semester V Session 2018 -2019 Month: from July to Dec
Course Name	Computer Networks Lab		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Mr. Bansidhar Joshi, Kirti Aggarwal
	Teacher(s) (Alphabetically)	Mr. Bansidhar Joshi, Ms. Kriti Agarwal, Dr. Charu, Mr. Gaurav Nigam, Mr. Rupesh, Mr. Himanshu Agrawal, Ms. Kavita Pandey, Ms. K. Rajalakshmi, Ms. Nisha Chaurasia

COURSE OUTCOMES		COGNITIVE LEVELS
C370.1	Classify all the wired/wireless technologies and the basic network building blocks	Level 2 (Understanding)
C370.2	Visualize and analyze the data packets of different TCP/IP layers. Store the data packets as *.pcap files.	Level 3 (Applying)
C370.3	Create client and server applications using the "Sockets" and the implementation of various protocols at Data link and TCP layer	Level 4 (Analyzing)
C370.4	Model a communication network and Estimate the delay caused in the network due to congestions and link breakages.	Level 5 (Evaluating)
C370.5	Simulate and compare different routing algorithms, error detection and correction and buffer management techniques	Level 3 (Applying)

Module No.	Title of the Module	List of Experiments	CO
1.	Basics of Networking	To Classify all the wired/wireless technologies and the basic network building blocks	CO1
2.	Wireshark	To make some simple packet captures and observations.	CO2
3.	Wireshark	To explore several other aspects of the HTTP protocol	CO2
4.	Socket Programming	To create a socket and bind it to a specific address and port	CO3
5.	Socket Programming	To send and receive a HTTP packet and learn some basics of HTTP header format.	CO3
6.	NS2	Write program to create network Topologies in NS2	CO4
7.	NS2	To send some traffic/data in the network topologies created and reading the trace file.	CO4
8.	NS2	Using Trace File and Plotting using AWK scripts and Xgraph-Trace Analysis	CO4
9.	NS2	To Route the packets in the network and study about Network Dynamics	CO4
10.	Routing	Implementation of Routing Algorithms	CO5
11.	Error Correction & Detection	To Implement various Error Correction and Detection Algorithms	CO5

Evaluation Criteria

Components	Maximum Marks
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Lab Test 1	20
Lab Test 2	20
Day to Day Evaluation	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.	Kurose, J. F., Computer networking: A top-down approach featuring the internet, 3/E. Pearson Education India, (2005).
2.	Forouzan, A. B., Data Communication and Networking, (2007).
3.	Issariyakul, T., & Hossain, E. Introduction to Network Simulator 2 (NS2). In Introduction to network simulator NS2(pp. 1-18). Springer, (2009).
4.	Orebaugh, A., Ramirez, G., & Beale, J., Wireshark & Ethereal network protocol analyzer toolkit. Elsevier, (2006).
5.	Goerzen, J., Foundations of Python network programming. Apress, (2004).

Detailed Syllabus

Subject Code	15B11CI513	Semester Odd (specify Odd/Even)	Semester 5 Session 2018-2019 Month from July 18 to December 18
Subject Name	Software Engineering		
Credits	4	Contact Hours	4(L+T)

Faculty (Names)	Coordinator(s)	Dr. Shruti Jaiswal and Dr. Amarjeet Prajapati
	Teacher(s) (Alphabetically)	Dr. Chetna Gupta, Mr. Himanshu Mittal, Ms. Sangeeta

COURSE OUTCOMES		COGNITIVE LEVELS
C311.1	Explain software engineering principles and software process models for project development	Remember Level (Level 1)
C311.2	Identify functional and non-functional requirements of a software project and design document software requirements specification	Understand Level (Level 2)
C311.3	Design, represent and document software requirements specification. Plan and execute activities for a software project	Create Level (Level 6)
C311.4	Apply UML modeling for software design from software requirements specification.	Apply Level (Level 3)
C311.5	Analyze code checklist. Perform code Reviews, Code Refactoring, and Code optimization	Analyze Level (Level 4)
C311.6	Apply testing principles, develop and implement various manual and automated testing procedures	Apply Level (Level 3)
C311.7	Evaluate software in terms of general software quality attributes and possible trade-offs presented within the given problem	Evaluate Level (Level 5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module	Labs
1.	Introduction to Software Engineering	Introduction to software engineering Principles, Software process models(build and fix model, waterfall model, Incremental process model, Evolutionary- Prototype and Spiral models, Agile Models, PSP, TSP, Software Reengineering. Project planning, Project Scheduling: network diagram, Gant Chart, CPM and PERT.	7	PSP, Reengineering (2)
2.	Requirement Engineering	Types of requirement, Requirement Elicitation, Analysis, Specification, SRS, Requirement Verification and Validation.	4	SRS (1)

3.	Software Design	Use case diagram, State diagram, Activity Diagram, Class Diagram, Sequence diagram, Collaboration diagram, Deployment Diagram, Component Diagram and Package diagram. Design Modularity: Coupling Cohesion.	7	UML Diagrams (4)
4.	Software Construction	Coding standards and guidelines, Code checklist, Code Reviews, Code Refactoring, Code optimization. Modern programming environments (Code search, Programming using library components and their APIs), Program comprehension; Program correctness, Defensive programming	8	Code Optimization & Designing of a System from Low-Level to High Level (2)
5.	Software Metrics	Size-Oriented Metric, Functional Point metric, Function-oriented Metric, Halstead's Software Metric, Information Flow Metric, Object-oriented Metric, Class-Oriented Metric, COCOMO Model.	7	Costar Tool (2)
6.	Software Testing	White-Box Testing, Basis Path Testing, Control Structure Testing: Condition Testing, Data Flow Testing, Loop Testing, Black-Box Testing: Equivalence class partitioning, Boundary Value Analysis, Decision table testing, Cause effect graphing, Mutation Testing and regression Testing.	9	JUNIT Testing Tool And JMeter (3)
Total number of Lectures			42	14

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.	Roger S. Pressman, "Software Engineering: A practitioner approach", Fifth Edition-TMH International .
2.	Sommerville , "Software Engineering" , Seventh Edition - Addison Wesley
3.	GRADY BOOCH, JAMES RUMBAUGH, IVAR JACOBSON, The Unified Modeling Language User Guide, Addison Wesley, Reading, Massachusetts, May 2005
4.	Richard Thayer , "Software Engineering Project Management", Second Edition -Wiley-IEEE Computer Society Press.
5.	B. Bezier, "Software Testing Techniques", Second Edition- International Thomson Computer Press.
6.	Pankaj Jalote, "An Integrated Approach to Software Engineering" Third addition , Springer Press
7.	Watt S. Humphrey, Introduction to Personal Software Process, Pearson Education.
8.	Watt S. Humphrey, Introduction to Team Software Process, Pearson Education.
9.	International Journal on Software Tools for Technology Transfer, Springer

10.	IEEE Transactions on Software Engineering
11.	ACM Transactions on Software Engineering Methodology
12.	Springer Journal of Empirical Software Engineering
13.	Springer Journal of Software and Systems Modeling

Detailed Syllabus

Course Code	15B17CI573	Semester Even (specify Odd/Even)	Semester 5 Session 2018 -2019 Month from July to December
Course Name	Software Engineering Lab		
Credits	0-0-1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Mr. Himanshu Mittal
	Teacher(s) (Alphabetically)	Chetna Gupta, Himanshu Mittal, Mukta Goyal, Shruti Jaiswal

COURSE OUTCOMES		COGNITIVE LEVELS
C371.1	Explain software engineering principles and software process models for project development, software requirements specification for a software project	Understand Level (Level II)
C371.2	Apply Software Design and modeling.	Apply Level (Level III)
C371.3	Apply Software Optimizing and Refactoring	Apply Level (Level III)
C371.4	Apply testing principles and implement various testing procedures	Apply Level (Level III)
C371.5	Creation of software using software engineering principals	Create (level VI)

Module No.	Title of the Module	List of Experiments	CO
1.	Introduction to Software Engineering Principals	Introduction to software engineering Principles (evolution, failures, changing nature of software, software myths, product, process, software crisis and need of testing), Software process models (build and fix model, waterfall model, Incremental process model, Evolutionary- Prototype and Spiral models, Agile models – extreme programming and scrum, selection of a life cycle model), PSP, TSP. Types of requirement, Feasibility studies, Requirement Elicitation, Analysis, Specification, SRS, Requirement Verification and Validation.	1
2.	Software Design and modeling.	Use case diagram, State diagram, Activity Diagram, Class Diagram, Sequence diagram, Collaboration diagram, Deployment Diagram, Event trace diagram. Size oriented metrics, LOC, token count, Function Count, cost estimation, data structure metrics, Halstead's Software Metric, Information Flow Metric, Overview of Quality Standards like ISO 9001, SEI-CMM, COCOMO, COCOMO-II, Software risk management	2
3.	Software Optimizing and Refactoring	Coding standards and guidelines, Code checklist, Code Refactoring and Code optimization	3
4.	Software Testing	Black box testing techniques: Equivalence class testing, Boundary value analysis, Decision table testing, Cause effect graphing, White box testing: Path testing, Data flow and mutation testing, Levels of testing- unit testing, integration and system testing, Debugging- techniques, approaches, tools & standards.	4

Evaluation Criteria			
Components	Maximum Marks		
Lab Test 1	20		
Lab Test 2	20		
Day-to-Day(Evaluations, Viva, Attendance, Project)	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.	Pressman, Roger S. Software engineering: a practitioner's approach. Palgrave Macmillan, 2005.
2.	Jalote, Pankaj. An integrated approach to software engineering. Springer Science & Business Media, 2012.
3.	KK Aggarwal, Software Engineering, 2001.
4.	David Solomon and Mark Russinovich ,” Inside Microsoft Windows 2000”, Third Edition, Micorosoft Press
5.	https://www.tutorialspoint.com/software_engineering/
6.	ACM/IEEE transactions on Software Engineering
7.	ACM Transactions on Software Engineering Methodology
8.	Springer Journal of Empirical Software Engineering
9.	Springer Journal of Software and Systems Modeling

Detailed Syllabus

Subject Code	15B11CI514	Semester: Odd (specify Odd/Even)	Semester 5 Session 2018-2019 Month from June 18 to Dec 18
Subject Name	ARTIFICIAL INTELLIGENCE		
Credits	3	Contact Hours	3+1

Faculty (Names)	Coordinator(s)	Dr. Shikha Jain, Dr. Shikha Mehta
	Teacher(s) (Alphabetically)	Ms. Dhanlakshmi, Dr. GaganmeetKaur, Dr. Satish Chandra, Dr. Shikha Jain

COURSE OUTCOMES		COGNITIVE LEVELS
C312.1	Design, implement and analyze the problem solving agents using various informed, uninformed search strategies.	Analyzing [Level 4]
C312.2	Analyze and apply algorithms to solve problems requiring evolutionary search strategies, constraint satisfaction and game theory.	Analyzing [Level 4]
C312.3	Represent knowledge and Apply inference mechanisms using propositional logic (PL) and first order predicate logic (FOPL).	Apply [Level 3]
C312.4	Apply model of probabilistic reasoning in incomplete and uncertain environment.	Apply [Level 3]
C312.5	Develop the agents with natural language processing and learning capabilities.	Apply [Level 3]

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction	History and foundations of AI	01
2.	Problem solving and intelligent agents	PEAS, Structure of agents, nature of environments, concept of rationality	03
3.	Problem solving-I	Problem solving agents, Uninformed search strategies (BFS, UCS, DFS, DLS, IDS)	04
4.	Problem solving-II	Informed Search and Exploration (GBFS, Heuristic function, A*, RBFS, Hill climbing, Genetic Algorithms)	06
5.	Problem solving-III	Constraint satisfaction problems (backtracking search), Adversarial Search (optimal decision in games, alpha beta pruning)	05
6.	Propositional Logic	Knowledge based agents, Propositional Logic, First order Logic, Syntax and Semantics), Inference in FOPL (Unification, forward and backward chaining, resolution)	05
7.	Knowledge representation	Ontology, actions, situations and events, time and event calculus, mental events,	03
8.	Uncertainty	Inference using full joint distribution,	04

		Probabilistic reasoning, Bayesian rule, Bayesian network, Maximum likelihood estimation	
9.	Learning	decision tree, ensemble learning, K-Nearest Neighbor, K-Means algo, Reinforcement Learning	07
10.	Natural Language Processing	Preprocessing, POS tagging using MLE, Parsing using CYK	04
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25	
Total		100	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Artificial Intelligence – A modern approach by Stuart Russel and Peter Norvig, PHI, 2008.
2.	Artificial Intelligence: foundations of computational agents, Cambridge University Press, 2017
3.	Artificial Intelligence Review: An International Science and Engineering Journal, Springer
4.	Minds and Machines: Journal for Artificial Intelligence, Philosophy and Cognitive Science, Springer
5.	IEEE Intelligent Systems

Detailed Syllabus

Course Code	15B17CI574	Semester Odd (specify Odd/Even)	Semester 5th Session 2018 -2019 Month from June 18 to Dec 18
Course Name	Artificial Intelligence Lab		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Dhanalekshmi G
	Teacher(s) (Alphabetically)	Ankita Verma, Dhanalekshmi ,Satish Chandra, Shikha Jain

COURSE OUTCOMES		COGNITIVE LEVELS
C372.1	Construct problem solving agent using various Informed and uninformed search strategies	Apply Level (C3)
C372.2	Utilize evolutionary search algorithms to solve the real world complex problems	Apply Level (C3)
C372.3	Analyze and apply algorithms to solve problems requiring constraint satisfaction and game theory	Analyze Level (C4)
C372.4	Demonstrate and understand the inference mechanisms using propositional and first order logic	Understand(C2)

Module No.	Title of the Module	List of Experiments	No. of Lab hours for the module	CO
1	<u>Introduction to Programming in Python</u>	Familiarize the following concepts of Python programming language like Arrays, Lists, functions, Tuples, Dictionary, Sets, Objects and classes	2	C2
2	Problem solving	Problem solving agents, Uninformed search strategies (BFS, UCS, DFS, DLS, IDS) Informed Search and Exploration (BFS, A*, IDA*, SMA*,IDA*)	4	C3
3	Evolutionary Algorithms	Genetic Algorithms	2	C3
4	Constraint satisfaction problems	Formulating Problems as constraint satisfaction problems	2	C4
5	Adversial Search problems	Adversarial Search (optimal decision in games, alpha beta pruning)	3	C3
6	Knowledge representation	Inference using Prolog	2	C2

Evaluation Criteria

Components	Maximum Marks
Evaluation 1	20
Lab Test 1	20

Quiz 1	20
Day to Day evaluation	10
Evaluation 2	10
Lab Test 2	20
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.	Artificial Intelligence – A modern approach by Stuart Russel and Peter Norvig, PHI, 2008.
2.	Artificial Intelligence: foundations of computational agents, Cambridge University Press, 2017
3.	Artificial Intelligence Review: An International Science and Engineering Journal, Springer
4.	Minds and Machines: Journal for Artificial Intelligence, Philosophy and Cognitive Science, Springer
5.	IEEE Intelligent Systems

Detailed Syllabus

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

Faculty (Names)	Coordinator(s)	Dr. Adwitiya Sinha, Shariq Murtuza
	Teacher(s) (Alphabetically)	Dr. Adwitiya Sinha, Purtee Kohli, Anubhuti Mohindra, Prof. Krishna Asawa, Dr.Mukta Goel

COURSE OUTCOMES		COGNITIVE LEVELS
C373.1	Demonstrate use of common Unix/Linux commands	Understanding Level (Level 2)
C373.2	Apply Unix/Linux file redirection and pipelining to combine utilities to perform complex tasks	Apply Level (Level 3)
C373.3	Develop shell scripting using Selection, Case & Conditional Statements	Apply Level (Level 3)
C373.4	Build shell scripts to solve various problems using commands like grep, line number, test, expressions, compare, command line input, etc.	Apply Level (Level 6)
C373.5	Create and manage files and directories, file permissions, and navigate the Unix/Linux file system	Create Level (Level 6)

Module No.	Title of the Module	List of Experiments	CO
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)	
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.	Sumitabha Das, UNIX Concepts & Applications, 4 th 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 nd Edition, Pearson Education, 2004
5.	Evi Nemeth, Garth Snyder, Trent R. Hein, Unix and Linux System Administration Handbook, 4 th Edition Pearson Education India, 2011
6.	Richards Stevens, Unix Network Programming, Addison-Wesley Professional, 2004

Detailed Syllabus

Course Code	15B28CI582	Semester ODD (specify Odd/Even)	Semester V Session 2018 -2019 Month from July – Dec 2018
Course Name	Multimedia Development Lab		
Credits	1	Contact Hours	0-0-2

Faculty (Names)	Coordinator(s)	Dr. Suma Dawn
	Teacher(s) (Alphabetically)	Dr. Suma Dawn

COURSE OUTCOMES		COGNITIVE LEVELS
C372.1	Illustrate aesthetics of visual composition.	Understanding Level (Level 2)
C372.2	Demonstrate various operations in Adobe Photoshop CS5 such as, applying filters and effects, colour and tonal adjustments, automating tasks, image editing, image enhancement, image restoration, etc.	Understanding Level (Level 2)
C372.3	Design graphics & user interfaces using Adobe Photoshop CS5	Creating Level (Level 6)
C372.4	Demonstrate various operations in Adobe Illustrator CS5 such as, adding typography, creating, editing & using brushes, applying filters & effects, etc.	Understanding Level (Level 2)
C372.5	Create graphics layouts, illustrations and vector drawing using Adobe Illustrator CS5.	Creating Level (Level 6)
C372.6	Design 2D animations using key framing, interactive animation using action scripting, and fun games.	Creating Level (Level 6)

Module No.	Title of the Module	List of Experiments	CO
1	Introduction to Digital Graphics	<ul style="list-style-type: none"> • Photoshop, Illustrator, Flash tool study • Poster Design, Game Design, UI Design, Logo Design, Doodle Design • Understanding Storyline 	Understanding Level (Level 2)
2	Adobe Photoshop CS5	<ul style="list-style-type: none"> • Poster Creation • Logo Creation • Collage Creation • Brochure Creation • Photograph Manipulations • UI design in Photoshop 	Understanding Level (Level 2) Creation Level (Level 6)
3	Adobe Illustrator CS5	<ul style="list-style-type: none"> • 3D Logo Designing • Stylizing Text • Brush designing • Making Illustrative Drawing • Scene Design as per requirement specification • Designing a Comic Strip based on a given Storyline 	Understanding Level (Level 2) Creation Level (Level 6)

4	Animation Concepts & Design	<ul style="list-style-type: none"> • Introduction to Keyframing, timeline headers, symbols and other Flash Concepts, Extracting a drawing from a picture, Buttons and their usage: Rolling dice, Invisible button, Masking, Zooming, Depth Management With the Display List in AS3, Actionscript usage for simple projects • Designing small games • Designing Animation based on given storyline. 	Understanding Level (Level 2) Creation Level (Level 6)
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Evaluation Criteria

Components

Maximum Marks

Lab Test 120

Lab Test 220

Day-to-Day- Evaluation45

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Day-to-Day- Attendance15

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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)

Multimedia, Photoshop and Illustrator

1. "Multimedia – An Introduction" by John Villamil and Louis Molina.
2. "Multimedia Magic" by Gokul, S.
3. "Real World Illustrator 9" by Deke McClelland and Sandee Cohen.
4. "Photoshop 6 Primer" by Jason I. Miletsky.
5. "Mastering Photoshop 6" by Steve Romaniello.

Flash & ActionScript

6. **Adobe Flash CS3 Professional Bible** by Robert Reinhardt and Snow Dowd
 7. **ActionScript 3.0 in Flash CS3 Professional Beyond the Basics** by Todd Perkins
- Web links Links:
<http://www.flashandmath.com/flashcs5/index.html>
<http://helpx.adobe.com/flash/topics.html>
<http://www.republicofcode.com/tutorials/flash/>
- Flash CS4/CS5 Platform Game Tutorials -
 8. <http://www.entheosweb.com/flash/default.asp>

Additional reading material may be given to the students as and when required.

Detailed Syllabus

Course Code	15B29CI590	Semester Odd (specify Odd/Even)	Semester V Session 2018 -2019 Month from July-December
Course Name	Minor Project (CSE)		
Credits	5	Contact Hours	

Faculty (Names)	Coordinator(s)	Prakash Kumar
	Teacher(s) (Alphabetically)	Archana Purwar, Indu Chawla, Parul Agarwal, Prakash Kumar, Sakshi Agarwal, Satish Chandra, Suma Dawn

COURSE OUTCOMES		COGNITIVE LEVELS
C350.1	Analyze chosen literature addressing real world research problem to identify the requirements	Analyze Level (Level 4)
C350.2	Build technical report detailing the software specification, design, test plan, and implementation details.	Apply Level (Level 3)
C350.3	Build a practicable solution for the research problem	Create Level (Level 6)
C350.4	Evaluate results to test the effectiveness of the proposed solution	Evaluate Level (Level 5)
C350.5	Develop effective communication skills for presentation of project related activities	Apply Level (Level 3)

Module No.	Title of the Module	List of Experiments	CO
1.
2.
3.
4.
5.
...
<i>n.</i>

Evaluation Criteria

Components	Maximum Marks
Synopsis	10
Mid-Term evaluation	30
Final evaluation	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)

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Detailed Syllabus

Course Code	15B17CI576	Semester Odd (specify Odd/Even)	Semester 5th Session 2018 -2019 Month from July 2018 to December 2018
Course Name	Information Security Lab		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Kritika Rani	
	Teacher(s) (Alphabetically)	Himanshu Agrawal, Sanjeev Patel	

COURSE OUTCOMES		COGNITIVE LEVELS
C374.1	Demonstrate and illustrate the different cipher techniques	Understand (C2)
C374.2	Develop and make a code to implement the Symmetric key and Public key cryptography.	Apply (C3)
C374.3	Apply a client server programming for DES and RSA algorithm.	Apply (C3)
C374.4	Examine and analyze the packet information for different protocols using Wireshark.	Analyze (C4)

Module No.	Title of the Module	List of Experiments	CO
1.	Cryptography	Introduction to Cryptography	CO1
2.	Ciphers	Implementation of Cipher using Transposition techniques and Caesar Cipher	CO1
3.	Ciphers	Implementation of Substitution Cipher: Hill Cipher and Polyalphabetic Cipher	CO1
4.	Symmetric key cryptography	Introduction to Symmetric key cryptography	CO2
5.	Data Encryption Standard	Implementation of Data Encryption Standard (DES)	CO2
6.	Public key cryptography	Introduction to Public key cryptography and Digital signature	CO2
7.	Public key cryptography	Implementation of Public key cryptography: RSA	CO2
8.	Client server programming	Client server programming using TCP	CO3
9.	Client server programming	Implementation of DES and RSA using Client server programming	CO4
10.	Steganography	Introduction to Steganography	CO4
11.	Antivirus and Anti-Worms	Introduction to Antivirus and Anti-Worms, and Wireshark tool	CO4

12.	Wireshark	Understanding of Secure-socket layer, Application Layer (HTTP, FTP, DNS) using Wireshark tool	CO4
Evaluation Criteria			
Components		Maximum Marks	
Lab Test -1		20	
Lab Test -2		20	
Quiz		20	
Assignment		10	
Project		15	
Attendance		15	
Total		100	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Information Security, Principles and Practice, Mark Stamp, Wiley
2.	Security in Computing 5thEdition , Charles P Fleegeer et. al. - Prentice Hall
3.	The InfoSec Handbook: An Introduction to Information Security- Apress Open
4.	Information Security: The Complete Reference, Second Edition- Mark Rhodes Ousley
5.	Cracking Codes with Python: An Introduction to Building and Breaking Ciphers- Al Sweigart

Detailed Syllabus

Course Code	15B17CI575	Semester ODD (specify Odd/Even)	Semester V Session 2019-2020 July-December
Course Name	Open Source Software Lab		
Credits	1	Contact Hours	2 hours

Faculty (Names)	Coordinator(s)	Mr. Himanshu Mittal
	Teacher(s) (Alphabetically)	Dr. Amritpal Singh, Dr. Chetna Gupta, Mr. Rupesh Koshariya, Ms. Ambalika Sarkar

COURSE OUTCOMES		COGNITIVE LEVELS
C375.1	Demonstrate the working of Git repository hosting service through git commands to manage files, support version control and contribute to open source community by providing enhanced versions.	Understand level (Level 2)
C375.2	Apply a mix of Client, Server and Database technologies to solve Open Source Software issues/ to enhance projects.	Apply Level (Level 3)
C375.3	Develop Server-side programs using python with Database Servers-SQL, MongoDB	Apply Level (Level 3)
C375.4	Analyze baseline methods for pre-processing, clustering and classification algorithms using scikit-learn python libraries	Analyze Level (Level 4)
C375.5	Build J2EE Programs using JDBC Connectivity with SQL Database and Apache/ Glassfish as web servers.	Create Level (Level 6)

Module No.	Title of the Module	List of Experiments	CO	#Labs
1.	Introduction to GitHub & Sustainable Development Goals (SDG's)	<ul style="list-style-type: none"> Read and explore the Github and Sustainable Development Goals. Create a simple program and upload it on Github. Extract one open source project from Github. Perform the reverse engineering of the same. 	CO1	1
2.	Introduction To Python	<ul style="list-style-type: none"> Making use of lists, tuples, and dictionaries, indexing and slicing to access data 	CO2	1
3.	Python	<ul style="list-style-type: none"> Create user defined functions using built-in functions such as filter (f, a) from python libraries. 	CO3	1
4.	Numpy, SciPy, Matplotlib (Python)	<ul style="list-style-type: none"> Write python programs using various functions of Numpy, SciPy and Matplotlib library. 	CO4	2
5.	Beautiful Soup (Python), Pandas, MongoDB	<ul style="list-style-type: none"> Write a program using Beautiful Soup for scrapping data from web, store in csv files and process them. Write a program for processing data stored in MongoDB using Pandas. 	CO5	2

6.	Java Script, Java Servlet and Java Server Pages.	<ul style="list-style-type: none">• Write programs for building web-pages using java script.• Buildweb-based applications using server-side programming – Java Server Pages (JSP) and Java Servlet.	CO5	2
7.	Scikit-Learn (Python)	<ul style="list-style-type: none">• Write python programs for data analysis, feature engineering, clustering and classification.	CO4	2
Evaluation Criteria				
Components		Maximum Marks		
LabTest1		20		
LabTest2		20		
Quiz1		10		
Quiz2		10		
Quiz3		10		
Attendance		15		
Lab record maintenance and submission		15		

Total		100		

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	https://guides.github.com/
2.	https://sustainabledevelopment.un.org/
3.	Python Cookbook by David Beazley and Brian K. Jones
4.	Head First Servlets & Java Server Pages byBryan Basham, Kathy Sierra, and Bert Bates
5.	Python for Data Analysis,by Wes McKinney

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B1NHS434	Semester: Odd	Semester V Session 2018 -2019 Month from July 2018 to December 2018
Course Name	PRINCIPLES OF MANAGEMENT		
Credits	3	Contact Hours	2-1-0

Faculty (Names)	Coordinator(s)	Dr. Shirin Alavi (Sector 62) and Dr. Ruchi Gautam (Sector 128)
	Teacher(s) (Alphabetically)	Dr. Praveen Sharma , Dr. Ruchi Gautam and Dr. Shirin Alavi

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to 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.	7
4.	Directing	Scope, Human Factors, Creativity and Innovation, Harmonizing Objectives, Leadership, Types of Leadership	4

		Motivation, Hierarchy of Needs, Motivation theories, 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
Total number of Lectures			28
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Project: Report & Viva)	
Total		100	

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Robbins, S.P. & Coulter, Mary, Management, 14 th ed., Pearson , 2009
2.	Robbins, S.P. & Decenzo, David A., Fundamentals of Management, 7 th ed., Pearson, 2010
3.	Principles of Management Text and Cases, Pravin Durai, Pearson ,2015

Detailed Syllabus
Lecture-wise Breakup

Subject Code	18B12HS311	Semester ODD	Semester 5 Session 2018-19 Month from July 2018 to December 2018
Subject Name	STRATEGIC HUMAN RESOURCE MANAGEMENT		
Credits	3	Contact Hours	2-1-0
Faculty (Names)	Coordinator(s)	Praveen Sharma (Sec-128), Santoshi Sengupta (Sec-62)	
	Teacher(s) (Alphabetically)	Praveen Sharma, Santoshi Sengupta	

COURSE OUTCOMES		COGNITIVE LEVELS
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)

Module No.	Subtitle of the Module	Topics in the module	No. of Hours for the module
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

Total number of Lectures		28
Evaluation Criteria		
Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25 (Projects -Report and Viva, Oral Questions)	
Total	100	

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

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NHS531	Semester ODD (specify Odd/Even)	Semester 5 Session 2018 -2019 Month from July 2018-Dec2018
Course Name	Technology and Culture		
Credits	3	Contact Hours	(2-1-0)

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

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C303-5.1	Understand and apply the main theories in cultural management,	Applying (C4)
C303-5.2	Identify 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 choosing appropriate concepts, logic and selecting the apt IT tools.	Analyzing(C4)
C303-5.4	Application of the theoretical knowledge to adapt to cultural differences in global work environment.	Evaluating(C 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	<ul style="list-style-type: none"> ▪ Genealogy of the concept ▪ The Information Technology Revolution ▪ The concept of Network societies 	5
2.	Dimensions of Culture	<ul style="list-style-type: none"> ▪ Evolution of Culture ▪ Principal theories of Culture: Kluckhohn and Strodtbeck, Hofstede, Trompenaars and Schwartz ▪ Cultural Diversity and cross cultural literacy 	8
3.	Cross cultural communication in physical and virtual teams	<ul style="list-style-type: none"> ▪ The Communication Process ▪ Language and Culture ▪ Non Verbal Communication ▪ Barriers to Cross Cultural Understanding ▪ Marketing and Culture 	8
4.	Negotiation and Decision Making	<ul style="list-style-type: none"> ▪ Theories of Negotiation ▪ Negotiation and Intercultural Communication ▪ Decision making in cross cultural environment 	2
5.	Cross Culture and Leadership	<ul style="list-style-type: none"> ▪ Leadership and Culture ▪ Theories of Culture centric leadership and their Global Relevance ▪ Developing Competencies for Global citizens 	5

		<ul style="list-style-type: none"> ▪ Women as International Leaders ▪ Cross Cultural Training ▪ Ethical Guidelines for Global Citizens 	
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Total number of Lectures			28
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Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Project, and Oral Viva)	
Total		100	

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

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS532	Semester: Odd	Semester V Session 2018-2019 Month from: July 2018 –Dec 2018
Course Name	Planning and Economic Development		
Credits	03	Contact Hours	2-1-0

Faculty (Names)	Coordinator(s)	Dr. Amba Agarwal (JIIT-128), Dr. Monica Chaudhary (JIIT-62)
	Teacher(s) (Alphabetically)	Dr. Amba Agarwal, Dr. Monica Chaudhary, Mr. Manas R. Behera

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
C303-4.1	Understand the issues and approaches to economic development.	Understanding Level (C2)
C303-4.2	Evaluate National income accounting, human development index and sustainable development.	Evaluating Level (C5)
C303-4.3	Apply an analytical framework to understand the structural characteristics of development.	Applying Level (3)
C303-4.4	Analyze the role of Macroeconomic stability & policies and Inflation in the development process.	Analyzing Level (C4)
C303-4.5	Evaluate the importance of federal development and decentralization.	Evaluating Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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	PQLI, 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

Evaluation Criteria

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

Recommended Reading material:

1.	Meier, G.M. , Leading Issues in Economic Development, Oxford University Press, New Delhi, 1970
2.	Todaro, M.P., Stephen C. Smith , Economic Development, Pearson Education, 2017
3.	Thirwal, A.P. , Economics of Development, Palgrave, 2011
4.	Ghatak, S. , An Introduction to Development Economics, Allen and Unwin, London, 1973
5.	Ahuja, H. L. , Development Economics, S Chand publishing, 2016

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NHS533	Semester: Odd	Semester V Session 2018 -2019 Month from: July 2018 to Dec. 2018
Course Name	Marketing Management		
Credits	3	Contact Hours	2-1-0

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

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

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

4	Consumer and Business Buyer Behavior	Consumer Markets and consumer buyer behavior. The buying decision process. Business Markets and business buyer behavior. 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, Assignment and Verbal questions)
Total	100

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

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

Detailed Syllabus
Lecture-wise Breakup

Subject Code	16B1NHS536	Semester: ODD (specify Odd/Even)	Semester: V Session: 2018-2019 Month: JULY-DECEMBER
Subject Name	TECHNOLOGY AND GOVERNANCE		
Credits	3	Contact Hours	(2-1-0)

Faculty (Names)	Coordinator(s)	Dr. Santosh Dev
	Teacher(s) (Alphabetically)	Dr. Santosh Dev

Co Code	Course Objective	Cognitive Level
C303-3.1	Understand the concepts and processes of governance in Indian context	Understanding (C2)
C303-3.2	Critically appraise the importance of technological intervention in governance	Evaluating (C5)
C303-3.3	Examine and appraise Digital India campaign and design solution	Creating (C6)
C303-3.4	Design technological intervention to solve society problems	Creating (C6)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction to the Course	What is Governance? General Introduction about the importance and usability	3
2.	Relation of Technology and Governance	The beginnings of technology Technology and society Technology and culture Technology and Economy Technology and Individual	4
3.	How Information Technology and the Internet Have Changed the World;	Development of technology and globalization	3
4.	E-Frameworks	A Framework for E-Government: E- Government Principals, E-Services, E- Democracy, E-Management; Strategic Planning	5
5	Digital India	What is Digital India?DeitY, Vision of Digital India, Nine Pillars of Digital India, Institutional Mechanisms at National Level, Composition of Monitoring Committee on Digital India, Challenges & Changes Needed	5
6	Governance Models	Collaborative Governance Model, Good Governance Model	2
7.	Different Uses and the	Governance as Process, Public	

	Governance Analytical Framework	Governance, Private Governance, Global Governance, Non Profit Governance, Corporate Governance.	4
8.	Different Uses and the Governance Analytical Framework	Project Governance, Environmental Governance, Internet Governance, Information Technology Governance, Regulatory Governance, Participatory Governance, Multilevel Governance, Meta-Governance and Collaborative Governance.	2
Total number of Lectures			28

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Mark Bevir, <i>Governance: A very short introduction.</i> , Oxford University Press Oxford, UK (2013)
2.	<p>Research Papers:</p> <p>Alexandra Mateescu, Alex Rosenblat and danah boyd, Policy Body-Worn Cameras http://www.datasociety.net/pubs/dcr/PoliceBodyWornCameras.pdf, February 2015.</p> <p>Fung, Archon; Graham Mary, Weil David, Full Disclosure: The Perils and Promise of Transparency, 2008.</p> <p>Gurstein, M. B., Open data: Empowering the empowered or effective data use for everyone? First Monday, (2011) 16(2)</p> <p>Veeraraghavan, Rajesh, Introduction & Conclusion in Open Governance and Surveillance: A Study of the National Rural Employment Guarantee Program in Andhra Pradesh, India. (2015).</p> <p>Li, Tania, The Will to Improve: Governmentality, Development, and the Practice of Politics. 2007</p> <p>Benjamin, S., Bhuvaneshwari, R., & Rajan, P., Bhoomi : ‘ E-Governance ’, Or , An Anti-Politics Machine Necessary to Globalize Bangalore ? (2007). (January), 1-53.</p>

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS 531	Semester : Odd (specify Odd/Even)	Semester : v Session:2018 -2019 Month from: July to December
Course Name	Sociology of Youth		
Credits	3	Contact Hours	(2-1-0)

Faculty (Names)	Coordinator(s)	Prof Alka Sharma
	Teacher(s) (Alphabetically)	Prof Alka Sharma Ms Shikha

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C303-2.1	Understand youth and youth culture in sociological perspectives	Understanding(C 2)
C303-2.2	Appraise the ethical, cultural& social issues concerning Youth	Evaluating(C 5)
C303-2.3	Appraise the youth culture and interprets the same	Analyzing(C 5)
C303-2.4	Analyze societal problems related to youth in the evolving society.	Evaluating(C 4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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 st century	Role of popular culture and social media, involvement of youth in major decision making institutions, Post-modernity and Youth	3
			...
Total number of Lectures			28

Evaluation Criteria	
Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Presentation, Assignment 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.	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 & 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).

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12HS612	Semester : Odd	Semester: V Session: 2018-19 Month: JULY-DECEMBER
Course Name	Indian Polity and Constitutional Democracy in India.		
Credits	3	Contact Hours	(2-1-0)

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

CO Codes	COURSE OUTCOMES	COGNITIVE LEVELS
C303-7.1	Explain the importance of Polity and Constitution.	Understand(C2)
C303-7.2	Interpret the Fundamental Rights and Duties.	Understand (C2)
C303-7.3	Analyze the unity in diversity concept of our Nation	Analyze(C4)
C303-7.4	Analyze various concepts useful to understand the system of governance	Analyze(C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	The Constituent Assembly and the Constitution.	The formation of the Constituent Assembly; the philosophy of the Constitution and its main features. Fundamental Rights and Directive Principles. Concept of Power and Politics Concept of Nation- State	8
2.	Federalism and Decentralization	Centre - state relations; Constitutional provisions regarding emergency and centre-state relations Special provisions for some states and the fifth and sixth schedule areas Third tier of government: Panchayati Raj; urban local bodies Regionalism Ethnicity Globalizations. Gender and Caste	14
3.	Organs of Government	The Legislature: Parliament	6

		The Executive: President, Prime Minister and Governor The Judiciary: The Supreme Court	
Total number of Lectures			28
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (5- attendance, 20-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.	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.	Bhargava,R. (2008). <i>Politics and Ethics of the Indian Constitution</i> . New Delhi: Oxford University Press
3.	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
4.	Kapur, D.& Mehta, P.B. (ed.) (2005) <i>Public Institutions in India: Performance and Design</i> , New Delhi: Oxford University Press
5.	Shankar, B.L., & Rodrigues, V. (2011) <i>The Indian Parliament: A Democracy at Work</i> , New Delhi: Oxford University Press
6.	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

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NMA531	Semester - Odd	Semester V Session 2018 -2019
Course Name	Basic Numerical Methods		
Credits	4	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Yogesh Gupta	
	Teacher(s) (Alphabetically)	Dr. Puneet Rana Dr. Yogesh Gupta	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C301-5.1	explain the concepts of approximation and errors in computation.	Understanding level (C2)	
C301-5.2	construct numerical methods for algebraic and transcendental equations and their convergence.	Applying Level (C3)	
C301-5.3	outline the methods of interpolation using finite differences and divided difference formulas.	Understanding level (C2)	
C301-5.4	make use of numerical differentiation and integration.	Applying Level (C3)	
C301-5.5	solve the system of linear equations using direct and iterative methods.	Applying Level (C3)	
C301-5.6	solve ordinary differential equations using different numerical methods.	Applying Level (C3)	
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	

TA	25 (Quiz, Assignments, and 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.	C. F. Gerald and P. O. Wheatley , Applied Numerical Analysis, 6 th Ed., Pearson Education, 1999.
2.	M.K. Jain, S.R.K. Iyengar and R. K. Jain , Numerical Methods for Scientific and Engineering Computation 6 th Ed., New Age International, New Delhi, 2014.
3.	R.S. Gupta , Elements of Numerical Analysis by 1st Ed., (2009) Macmillan.
4.	S.D. Conte and C. deBoor , Elementary Numerical Analysis, An Algorithmic Approach, 3 rd Ed., McGraw-Hill, New York, 1980.

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NMA532	Semester Odd (specify Odd/Even)	Semester V Session 2018 -2019 Month from July – Dec 2018
Course Name	Computer Based Numerical Techniques		
Credits	4	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Pankaj Kumar Srivastava	
	Teacher(s) (Alphabetically)	Dr. Pankaj Kumar Srivastava	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C301-6.1	explain the concepts of approximation and errors in computation.	Understanding Level (C2)	
C301-6.2	apply numerical methods for solving algebraic and transcendental equations along with their convergence.	Applying Level (C3)	
C301-6.3	apply divided difference, finite difference and splines formulae for numerical interpolation.	Applying Level (C3)	
C301-6.4	solve ordinary differential and integral equations using numerical methods.	Applying Level (C3)	
C301-6.5	explain the basics of MATLAB software and its applications in finding numerical solutions.	Understanding Level (C2)	

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Errors in numerical computation and Approximation	Accuracy of numbers, Errors and its types, Error in numerical computations, Error in series approximation, Floating point representation of numbers, Arithmetic operations with normalized floating point representation of numbers, Machine computation, Synthetic division of a polynomial, Diminish of the root of equation by a constant value, Horner's method to find positive root, Evaluation of negative root by changing polynomial	9
2.	Solution of Algebraic and Transcendental Equations	Locating roots, Bisection method, Regular-Falsi method, Newton Raphson method, Rate of convergence of Newton Raphson method, Secant method, Comparison of Secant method and Newton Raphson method	8
3.	Interpolation	Forward, Backward and central Finite Difference Operators, Fundamental theorem of finite difference, Finite Difference Tables, Factorial function and Reciprocal factorial function, Approximation of function by Taylor's series, Curve fitting, Spline Interpolation, Cubic Spline and Approximation, Errors in cubic spline and its derivatives.	8
4.	Numerical Solution of Differential and Integral Equations	Runge-Kutta method to solve ODE, Solution of Laplace Equation, Solution of Fredholm equations, Method of degenerate Kernels, Spline method	8
5.	Application using MATLAB	MATLAB Introduction, Matrix operations, Solution of System of Linear Equations, Polynomial evaluation, Polynomial roots and operations, Polynomial Derivatives, Differentiation of functions, Polynomial Curve fitting, Integration, Standard numerical techniques in MATLAB	9
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.	M. K. Jain, S. R. K. Iyengar and R. K. Jain, <i>Numerical Methods for Scientific and Engineering Computations</i>, New Age International Publishers, 2008.	
2.	Gerald and Wheatley, <i>Applied Numerical Analyses</i>, AW, 1970.	
3.	V. Rajaraman, <i>Computer Oriented Numerical Methods</i>, PHI Learning Pvt. Ltd., 2018	
4.	P. Niyogi, <i>Numerical Analysis and Algorithms</i>, Tata McGraw-Hill Education India, 2003	
5.	B. S. Grewal, <i>Numerical methods in Engineering and Science</i>, Khanna Publishers, Delhi, 2013.	
6.	S. S. Ray, <i>Numerical Analysis with Algorithms and Programming</i>, CRC Press, 2016.	

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12MA311	Semester - odd (specify Odd/Even)	Semester V Session 2018 -2019 Month from June 2019 to December 2019
Course Name	Decision making using mathematical and statistical approaches		
Credits	4	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Pinkey Chauhan	
	Teacher(s) (Alphabetically)	Dr. Pinkey Chauhan	
COURSE OUTCOMES			COGNITIVE LEVELS
CO1	Explain the concept of decision making under various environments		Knowledge level C1
CO2	Apply various methods for solving single stage optimal problems in uncertainty and risk environments		Applying Level C3
CO3	Apply decision tree analysis for solving multiple stage optimal problems.		Applying Level C3
CO4	Describe principle of optimality and formulation of dynamic programming problems.		Understanding Level C2
CO5	Identify, formulate and solve problems arising in financial and industrial applications using dynamic programming techniques.		Applying Level C3
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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, Bellman'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 decision analysis	Optimal subdivision problems, Shortest route or network problems, Solving linear programming problems using dynamic programming, Applications of Dynamic Programming to cargo loading problems, employment smoothening problems, capital budgeting problems, inventory control problems, product allocation problems.	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.	Bertsekas, D.P. , Dynamic Programming and Optimal Control, 3 rd Ed., Vol 1, Athena Scientific, 2005.	
2.	Anthony, M. and Biggs, N. , Mathematics for Economics and Finance Methods and Modelling, Cambridge University Press, Cambridge low-priced edition, 2000.	
3.	Sharma, S.D. , Operation Research, fourteenth edition, Kedarnath & Ramnath Publications, 2003-2004.	
4.	Hiller, F. S. and Leiberman, G. J. , Introduction to Operations Research, 7 th ed., 2001	
5	Taha, H.A. , Operations Research	
6.	Pearles, B. and Sullivan, C. , Modern Business Statistics - (Revised)- –Prentice Hall of India.	

Detailed Syllabus

Lecture-wise Breakup

Course Code	16B1NMA532	Semester Odd (specify Odd/Even)	Semester V Session 2018 -2019 Month from July 2018-Dec 2018
Course Name	Finite Element Methods		
Credits	4	Contact Hours	3-1-0

Faculty (Names)	Coordinator(s)	Dr. Lokendra Kumar
	Teacher(s) (Alphabetically)	

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
C301-2.1	explain different numerical methods for the solution of simultaneous linear equations.	Understanding Level (C2)
C301-2.2	solve ordinary differential equations using 4th order Runge-Kutta and finite difference methods.	Applying Level (C3)
C301-2.3	apply methods of weighted residuals for the solutions of boundary value problems.	Applying Level (C3)
C301-2.4	construct the weak formulation and derivation of shape functions for one and two dimensional problems.	Applying Level (C3)
C301-2.5	organise the elementwise assembly to solve the two point boundary value problems using finite element method.	Applying Level (C3)
C301-2.6	apply finite element method on partial differential equations with given boundary conditions.	Applying Level (C3)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Numerical Methods	Gauss-elimination, Gauss Seidel, Thomas algorithm, Gaussian quadrature formula for numerical integration, Runge-Kutta method for IVPs, Finite difference method for BVPs.	10
2.	Finite Element Method	Introduction to finite element method, comparison with finite difference method.	3
3.	Method of Weighted Residuals	Collocation, Subdomain, Method of least squares and Galerkin's method.	8
4.	Variational Formulation	Variational formulation of boundary value problems. Equivalence of Galerkin and Ritz method in some cases. Applications to solve simple problems of ODEs. One dimensional linear, quadratic and higher order elements. Derivation of element equations and their assembly, imposition of boundary conditions and solution of assembled equations.	12
5.	Partial Differential Equations	Two dimensional, triangular, rectangular, quadrilateral, serendipity and isoperimetric elements and their assembly. Discretization with curved boundaries. Solution of two dimensional partial differential equations under different Geometric conditions.	9
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:	
1.	J. N. Reddy , An Introduction to the Finite Element Method, McGraw-Hill, New York, 1993.
2.	L. J. Segerlind , Applied Finite Element Analysis, 2 nd Edition, John Wiley and Sons, 1984.
3.	O. C. Zienkiewicz and R. L. Taylor , The Finite Element Method, 3 rd Edition, McGraw-Hill, 1989.
4.	D. L. Logan , A First Course in the Finite Element Method, 2 nd Edition, PWS Publishing Company, Boston, 1993.
5.	R. D. Cook, D. S. Malkus and M. E. Plesha , Concepts and Applications of Finite Element Analysis, 3 rd Edition, John Wiley and Sons, New York, 1989.
6.	K. J. Bathe , Finite Element Procedures in Engineering Analysis, Prentice-Hall, Englewood Cliffs, NJ, 1982.
7.	Gupta, R.S. , Elements of Numerical Analysis, 1st Ed., Macmillan 2009.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B12MA312	Semester Odd	Semester V Session 2018 -2019 Month from July 2018 to Dec 2018
Course Name	Logical Reasoning and Inequalities		
Credits	4	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Amit Srivastava	
	Teacher(s) (Alphabetically)	Dr. Amit Srivastava	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C301-9.1	interpret the mathematical foundation of various inequalities.		Understanding level(C2)
C301-9.2	examine inequalities in the field of information theory and cryptography.		Analyzing level(C4)
C301-9.3	apply the concepts of permutation and combination of multi sets in combinatorics.		Applying level(C3)
C301-9.4	apply special numbers in combinatorial and number theoretic problems.		Applying level(C3)
C301-9.5	explain the basic concepts of logical reasoning and solve related problems.		Understanding level(C2)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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 Reasoning	Clocks, calendars, binary logic, seating arrangement, blood relations, logical sequence, assumption, premise, conclusion, linear and matrix arrangement, Syllogism, Binary Logic, Logical sequence & Matching, Mathematical Puzzles with applications.	8
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, Tutorials)	
Total		100	
Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)			

1.	Cerone, P. and Dragomir, S. S. , Mathematical Inequalities, CRC Press, Boca Raton, FL, 2011
2.	Praveen, R. V. , Quantitative Aptitude and Reasoning, Second Edition, Prentice Hall India, 2013.
3.	Rosen & Kenneth H , Discrete Mathematics and its Applications, Tata Mc-Graw Hill, New Delhi, 2007.
4.	Kolman B., Busby R. C. and Ross S. , Discrete Mathematical Structures, Prentice Hall, 1996.
5.	Simmons, G. J. , The Great Book of Puzzles & Teasers, 1999.

Detailed Syllabus

Lecture-wise Breakup

Course Code	16B1NMA533	Semester - Odd (specify Odd/Even)	Semester V Session 2018 -2019 Month from July 2018 - Dec 2018
Course Name	Matrix Computations		
Credits	4	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Pato Kumari and Dr. Amita Bhagat	
	Teacher(s) (Alphabetically)	Dr. Amita Bhagat Dr. Pato Kumari	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:			
C301-3.1	explain the basics of matrix algebra and inverse of a matrix by partitioning.		Understanding level (C2)
C301-3.2	solve the system of linear equations using direct and iterative methods.		Applying Level (C3)
C301-3.3	explain the vector spaces and their dimensions, norm of a vector and matrix.		Understanding level (C2)
C301-3.4	apply the concepts of inner product space to construct Q-R decomposition and orthonormal basis using Gram-Schmidt process.		Applying Level (C3)
C301-3.5	construct Gershgorin's circles and solve eigenvalue problems including power and inverse power methods.		Applying Level (C3)
C301-3.6	analyze systems of differential and difference equations arising in dynamical systems using matrix calculus.		Analyzing Level (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Matrix Algebra	Basics of matrices, Submatrices, rank of a matrix, Normal Form, Inverse of a matrix by Gauss Jordan Method, Inverse of a matrix by partitioning method and by elementary matrices	6
2.	Linear System of equations	Existence and uniqueness of solution for system of linear equations, Gauss elimination method, Pivoting strategies, Gauss Jacobi and Gauss Seidel method, LU decomposition, Crout's and Doolittle's method	9
3.	Vector and Inner Product Spaces	Vector spaces, Subspaces, Linearly independent and dependent set of vectors, dimension and basis of vector space, Norms of vectors and matrix, Inner product space, orthogonal and orthonormal sets, Projections, Gram-Schmidt process, Q-R decomposition	10
4.	Eigen value Problems	Eigen values and Eigenvectors, Greshgorin's circle, Power and Inverse power methods, Similar, modal and diagonalizable matrices, Quadratic, positive definite and Canonical forms	9
5.	Matrix Calculus	Powers and functions of matrices, Application to solve discrete dynamical systems, solution of initial value problems	8
Total number of Lectures			42
Evaluation Criteria			
Components		Maximum Marks	
T1		20	
T2		20	
End Semester Examination		35	
TA		25 (Quiz, Assignments, and 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.	Bronson, R. , Matrix Methods an Introduction, Academic Press, 1991.
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2.	Golub, G. H. , Matrix Computations, Johns Hopkins University Press, 1996.
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3.	Datta, K. B., Matrix and Linear Algebra, Prentice Hall of India, 1990.
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	David, W. Lewis., Matrix Theory, World Scientific, 1991.
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Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NMA533	Semester Odd	Semester V Session 2018 -2019 Month from July 2018 to Dec 2018
Course Name	Statistical Information Theory with Applications		
Credits	4	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Priyanka Sangal	
	Teacher(s) (Alphabetically)	Dr. Anuj Dubey and Dr. Priyanka Sangal	
COURSE OUTCOMES			COGNITIVE LEVELS
After pursuing the above mentioned course, the student will be able to:			
CO533.1	explain the notions of information, entropy, relative entropy and mutual information.	Understanding Level(C2)	
CO533.2	explain fuzzy sets and compare the various measures of discrepancy.	Analyzing Level (C4)	
CO533.3	develop and compare Shannon-Fano and Huffman source codes using measures of uncertainty.	Analyzing Level (C4)	
CO533.4	analyse the notion of distance measure in pattern recognition generated in Intuitionistic fuzzy environment.	Analyzing Level (C4)	
CO533.5	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.	Basics of probability and information theory	Review of Probability theory, Average information, Shannon and Renyi Entropy, Mutual information. Introduction to concepts of directed divergence, inaccuracy and information improvement	10
2.	Information theoretic measures on fuzzy sets	Fuzzy Sets and Intuitionistic 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.	Basics of coding theory with source coding techniques	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 Tabulae, Playfair, Hill Cipher, Cryptanalysis of Classical Cryptosystems,	12
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.	Bose, R., Information Theory Coding and Cryptography, 3 rd Ed, Tata McGraw-Hill, 2016.
2.	Jain, K. C., and Srivastava, A., Information Theory & Coding, 3 rd Ed, Genius Publications, 2009
3.	Stallings, W., Cryptography and Network Security Principles and Practices, Prentice Hall, 2003
4.	Cover, T.M. and Thomas, J. A., Elements of Information Theory, 2nd Edition, Wiley, 2006.
5.	Haykin, S., Communication Systems, John Willey & Sons, Inc, Newyork, 4th Ed, 2006
6.	Behrouz, A. F., Introduction to Cryptography and Network Security, McGraw-Hill International Edition, 2008

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NMA731	Semester Odd (specify Odd/Even)	Semester V Session 2018 -2019 Month from July to December
Course Name	Theory of Numbers		
Credits	4	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Himanshu Agarwal	
	Teacher(s) (Alphabetically)	Dr. Himanshu Agarwals	
COURSE OUTCOMES			COGNITIVE LEVELS
C301-4.1	explain Euclid algorithm, linear Diophantine equations and prime numbers.		Explain Level (C2)
C301-4.2	solve system of linear congruences using properties of congruences.		Solve Level(C3)
C301-4.3	explain numbers of special form and number theoretic functions.		Explain Level (C2)
C301-4.4	apply the concepts of order, primitive roots and indices to solve congruences.		Apply Level (C3)
C301-4.5	apply Legendre symbol and quadratic reciprocity theorem to solve quadratic congruences.		Apply Level (C3)
C301-4.6	apply and analyse the concepts of number theory in hashing, cryptography, calendar and ISBN check digits problems.		Analyse Level (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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	8

		factorization, Least common multiple, Prime number theorem(statement only), Goldbach and twin primes conjectures.	
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 Functions and Numbers of Special Form:	Greatest integer function, The number-of-divisors function, The sum-of-divisors function, Multiplicative 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	7
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
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.	James Strayer , <i>Elementary Number Theory</i> , Waveland Press,,2001
2.	Kenneth Rosen , <i>Elementary Number Theory and its Applications</i> , 5th Edition, 2005
3.	I. Niven, H. Zuckerman, H. Montgomery , <i>An Introduction to the Theory of Numbers</i> , 5th Edition, Wiley, 2013.
4.	David M. Burton , <i>Elementary Number Theory</i> , 7 th Edition, McGraw Hill Education (India) Private Limited, 2006

Detailed Syllabus

Lecture-wise Breakup

Course Code	16B1NMA731	Semester Odd (specify Odd/Even)	Semester V Session 2018 -2019 Month from July to December
Course Name	Theory of Numbers		
Credits	4	Contact Hours	3-1-0
Faculty (Names)	Coordinator(s)	Dr. Himanshu Agarwal	
	Teacher(s) (Alphabetically)	Dr. Himanshu Agarwal	
COURSE OUTCOMES			COGNITIVE LEVELS
C301-4.1	explain Euclid algorithm, linear Diophantine equations and prime numbers.		Explain Level (C2)
C301-4.2	solve system of linear congruences using properties of congruences.		Solve Level(C3)
C301-4.3	explain numbers of special form and number theoretic functions.		Explain Level (C2)
C301-4.4	apply the concepts of order, primitive roots and indices to solve congruences.		Apply Level (C3)
C301-4.5	apply Legendre symbol and quadratic reciprocity theorem to solve quadratic congruences.		Apply Level (C3)
C301-4.6	apply and analyse the concepts of number theory in hashing, cryptography, calendar and ISBN check digits problems.		Analyse Level (C4)
Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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	8

		factorization, Least common multiple, Prime number theorem(statement only), Goldbach and twin primes conjectures.	
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 Functions and Numbers of Special Form:	Greatest integer function, The number-of-divisors function, The sum-of-divisors function, Multiplicative 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	7
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
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.	James Strayer , <i>Elementary Number Theory</i> , Waveland Press,,2001
2.	Kenneth Rosen , <i>Elementary Number Theory and its Applications</i> , 5th Edition, 2005
3.	I. Niven, H. Zuckerman, H. Montgomery , <i>An Introduction to the Theory of Numbers</i> , 5th Edition, Wiley, 2013.
4.	David M. Burton , <i>Elementary Number Theory</i> , 7 th Edition, McGraw Hill Education (India) Private Limited, 2006

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH531	Semester : Odd	Semester V Session 2019 -2020 Month from : July to Dec
Course Name	Quantum Mechanics for Engineers		
Credits	04	Contact Hours	04

Faculty (Names)	Coordinator(s)	Dr. Vikas Malik and Dr. Swati Rawal
	Teacher(s) (Alphabetically)	Dr. Vikas Malik and Dr. Swati Rawal

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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
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.	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

Course Code	16B1NPH532	Semester: ODD	Semester: V Session 2018 -2019 Month: July-Dec
Course Name	Materials Science		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Manoj Kumar and Dr. Sandeep Chhoker
	Teacher(s) (Alphabetically)	Dr. Manoj Kumar and Dr. Sandeep Chhoker

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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.	6

		Introduction to Photonic band gap (PBG) materials and its applications	
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
		Total number of Lectures	40

Evaluation Criteria

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

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

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

Course Code	16B1NPH533	Semester Odd	Semester V Session 2018 -2019 Month from July to December
Course Name	Laser Technology and Applications		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Navneet Kumar Sharma and Amit Verma
	Teacher(s) (Alphabetically)	Navneet Kumar Sharma and Amit Verma

COURSE OUTCOMES		COGNITIVE LEVELS
C301-12.1	Define the coherent properties, high brightness of laser, population inversion and optical feedback to laser technology	Remember Level (C1)
C301-12.2	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)
C301-12.3	Apply the optical ray transfer matrix to determine the stability of a laser resonator	Apply Level (C3)
C301-12.4	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)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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 ₂ , N ₂ 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.	
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.	Thyagarajan and Ghatak, <i>Lasers Theory and Applications</i> , Macmilan India.
2.	W. T. Silfvast, <i>Laser Fundmentals</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

Course Code	16B1NPH535	Semester Odd	Semester V Session 2019 -2020 Month from: July-Dec
Course Name	NUCLEAR SCIENCE AND ENGINEERING		
Credits	4	Contact Hours	4

Faculty (Names)	Coordinator(s)	Dr. Vivek Sajal
	Teacher(s) (Alphabetically)	Dr. Vivek Sajal

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

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
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 quadruple 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
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 Class 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.	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 Wesle, London.
6.	Y.R. Waghmare, 1981, Introductory Nuclear Physics, Oxford-IBH, New Delhi.
7.	R.D. Evans, 1955, Atomic Nucleus, McGraw-Hill, New York.

