Detailed Syllabus

Course Code	15B11CI373	Semester ODD (specify Odd/Even)	Semester Second	Session 2023-2024
Course Name	Computer Organization and Architecture Lab			
Credits	1	Contact Hours	2	

Faculty (Names)	Coordinator(s)	Amarjeet Kaur(J62)
	Teacher(s) (Alphabetically)	Amarjeet Kaur, Dipty Tripathi, Hema N , Pawan Upadhyay

COURSE OUTCOMES		COGNITIVE LEVELS
C273.1	Realizing basic 2-bit and 4-bit ALU using hardwired simulation tool	Understand (Level 2)
C273.2	Initialization and fetching of data from specific memory using various addressing mode of 8085	Understand (Level 2)
C273.3	Experiments to use the software interrupts and various assembler directives for 8085 programming.	Apply (Level 3)
C273.4	Demonstrate to use the software interrupts and various assembler directives for MIPS programming.	Apply (Level 3)
C273.5	Design of a basic systems using RISC/CISC architecture based processor and to develop applications using microprocessor or microcontrollers.	Create (Level 6)

Module No.	Title of the Module	List of Experiments	CO
1.	COA Hardwired simulation tool	Realize the truth table of various gates like as AND, OR, NOT, XOR, NAND and NOR., Conversion of universal gates, Design the half adder and full adder circuits, Ripple	C273.1

		adder logic circuit, 4 x1 multiplexor circuit and realize the various input output logic based on control, 4X1 multiplexor with NAND gates logic circuits	
2.	Combinational circuits	Design the subtractor circuits with defined bit logic, Adder-subtractor logic circuits, The odd frequency divider circuits, Carry lookup adder, Carry select and carry save, Adder circuits by modifying the ripple carry adder logic given in module-1.,Timing diagram of all four adder circuits and compare their performance, Decoder circuits with defined logic, 4-bit ALU circuits with defined operation logic.	**C273.1**
3.	8085 Simulator Introduction	Understanding Hardware Specification of the **8085 Simulator** in detail, Add two 8-bit numbers from load sample program from file menu, assemble and execute it step by step and view the contents of registers and memory., Basic Data transfer instructions, Arithmetic instructions, Logical instruction of 8085 using sample programs withnote changes in flags.	**C273.2**
4.	8085 Programming (Simple)	8085 Assembly Programming: Basic Arithmetic (like addition, subtraction, multiplication, division etc), Array (sum , reverse, average copy etc) etc and explore more about Arithmetic , Logical and Flow control Instructions	**C273.2**
5.	8085 Programming (Complex)	8085 Assembly Programming: Logical and Data transfer (like Min, Max, Even/odd, Sorting etc), more complex program(like Factorial, Link list etc) , String etc and explore more about Arithmetic, Logical and Flow control Instructions	**C273.2**
6.	MIPS(MARS) Simulator (Simple)	MIPS Assembly Programming: Arithmetic (like addition, subtraction, multiplication, division etc), Logical and Data transfer (like Min, Max, Even/odd, Sorting etc), Array (sum , reverse, average copy etc)	**C273.3**
7.	MIPS(MARS) Simulator (Complex)	Complex program (Factorial, Fibonacci etc), String Operations, Translation of C control statement into MIPS(IF THEN ELSE,WHILE, FOR LOOP, SWITCH control,)and explore more about Arithmetic, Logical, Flow control Instructions using MARS Simulator.	**C273.4**
8.	Projects	Students are expected to create an hardware and software co-designed application based on 8085/ 8086/ MIPS/ Other controller (like Arduino) / Small Size computer (like Raspberry Pi)programming either in assembly or high level language.	**C273.5**

Project based learning: Project in COA lab is an integral part of the lab. Student form group size 3-4, and discuss the project idea with their lab faculty before finalizing. All projects are based on hardware and hardware components like microprocessor microcontrollers (like Arduino), microcomputer (like Raspberry pi), various sensors (like temperature sensor, humidity sensor etc), cams (like webcam), etc. are used. Programming language is used as per processor/controller. Students develop projects/prototypes to interact with physical environment, control physical object with software which is base of IoT and embedded system. Students learn various processor architecture as well as their programming languages. This helps students to understand how to develop IoT based products and embedded systems.

Evaluation Criteria

Components	Maximum Marks
Evaluation 1	10
Lab Test 1	20
Evaluation 2	10
Lab Test 2	20
Project	25
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)

Text Book

1. William Stallings, Computer Organization and Architecture–Designing for Performance, 9th Edition, Pearson Education, 2013.

2. Nicholas Carter, Schaum's outline of Computer Architecture, Tata McGraw Hill, 2017

3. John L. Hennessy and David A Patterson, Computer Architecture A quantitative Approach, Morgan Kaufmann / Elsevier, Sixth Edition, 2017

Reference Book

1. Microprocessor Architecture Programming and Applications with the 8085 [HB]-6/e. 25 September 2014. by Ramesh Gaonkar .

2. The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro-Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions : Architecture, Programming, and Interfacing. Barry B. Brey, Pearson Education India, 2009.

3. http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/comp_org_arc/web/

4. http://cs.nyu.edu/~gottlieb/courses/2010s/2011-12-fall/arch/class-notes.html

5. http://www.cse.iitm.ac.in/~vplab/courses/comp_org/LEC_INTRO.pdf

6. http://www.cs.iastate.edu/~prabhu/Tutorial/title.html

7. http://www.cag.csail.mit.edu/

8. http://www.research.ibm.com/compsci/arch

9. M. Morris Mano, Computer System Architecture, Prentice Hall of India Pvt Ltd, Fourth edition, 2002. ISBN: 81-203-0855-7.

Detailed Syllabus
Lecture-wise Breakup

Course Code	17M17CS121	Semester Odd (specify Odd/Even)	Semester 10th Session2023 - 2024Month from July to Dec
Course Name	Project Based Learning-II		
Credits	4	**Contact Hours**	0-0-8
Faculty (Names)	**Coordinator(s)**	Dr. Amit Mishra	
	Teacher(s) (Alphabetically)	Dr. Archana Purwar, Dr. Indu Chawla, Dr Amit Mishra	

COURSE OUTCOMES At the completion of the course, Students will be able to		COGNITIVE LEVELS
C210.1	Identify live problems that would be solved through automated software development process.	Apply Level (C3)
C210.2	Confront the issues related to development of project which includes team work, test driven design, data collections, implementations etc.	Apply Level (C3)
C210.3	Develop oral communication skill and prepare a technical report	Apply Level (C3)
C210.4	Critically review the projects and can skilfully map each stage in software development cycle.	Apply Level (C3)

Course Code	15B11CI313	Semester ODD (specify Odd/Even)	Semester Fifth Session 2023-2024 Month from July –Dec 2023
Course Name	Computer Organization and Architecture		
Credits	4 (L=3, T=1)	**Contact Hours**	3-1-0

Faculty (Names)	Coordinator(s)	Dr. Hema N. (Sec. 62), Dr. Bansidhar Joshi (Sec.128)
	Teacher(s) (Alphabetically)	Amarjeet Kaur, Bansidhar Joshi, Dipty Tripathi,Hema N., Jagriti, Rashmi Kushwah, Shailesh Kumar, Varun Srivastava

COURSE OUTCOMES		COGNITIVE LEVELS
C213.1	Summarize and Classify the different computer systems based on RISC and CISC Architecture.	(Understand)Level 2
C213.2	Apply the knowledge of performance metrics to find the performance of systems.	(Apply) Level 3
C213.3	Examining various types of computers based on Instruction Set Architectures.	(Apply)Level 3
C213.4	Analyze RISC and CISC based systemdesigns for Hardwired and Microprogrammed Controller.	(Analyze) Level 4
C213.5	Apply the knowledge of pipeline, IO and cache to understand these systems. Further, analyze the performance of such systems.	(Analyze) Level 4
C213.6	Create and analyze an assembly language program of RISC and CISC-based systems.	(Evaluate) Level 5

Module No.	Title of the Module	Topics in the Module	No. of Lectures for module
1.	Introduction	Levels in architecture, Virtual machine, Evolution of multi-level machines.	2
2.	Performance of Computer	Introduction,Performance Measures For Computer System using MIPS, Clock Rate, No. of Instruction andAmdahl's Law. Numerical Related to performance measures for different specification.	4
3.	CPU Organization	Basic Computer Organization, Instruction Representation basics,Data-path and control, Instruction execution, Microinstruction.	4

4.	Data Path and Control	Introduction,Architecture of JC62, Instruction Set,Hardwired designing for JC62. Micro-programmed control designing for JC62.	4
5.	Generalized Study of Instruction Set Architecture	Stack/accumulator/register-register/register-memory type of architecture. Memory addressing techniques.	2
6.	Types of Instruction	Data movement, Arithmetic/logic, Control flow, Addressing modes. Instruction format.	2
7.	Instruction Set Architecture (ISA) of 8085	8085 Architecture, 8085 Instruction Set, 8085 Instruction Format, 8085 Addressing Modes, 8085 instruction execution and datapath. 8085 Assembly programming for simple applications.	5
8.	ISA of MIPS	MIPS Architecture, MIPS Instruction Set, MIPS Instruction Format, MIPS Addressing Modes, MIPS instruction execution and datapath. MIPS Assembly programming for simple applications.	5
9.	Memory Organization	Hierarchal memory structure, Cache memory and organization, Cache Mapping,Cache Replacement algorithms,Memory interfacing for 8085.	5
10.	I/O Organization	IO instruction format, IO Mapping, Programmed/Interrupt driven I/O, DMA controllers	3
11.	Pipelining	Introduction To Pipelining System, Pipelining in RISC based Systems (MIPS), Pipeline Hazards and its solutions.	5
12.	Multicore Architecture	Generalized study of Multicore Machines.	1
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance =10, Sincerity=05, Internal assessment/ Class Test or/and Quizzes/Mini-Project = 10).
Total	**100**

Project-based learning: In this subject, students will learn the Organization and Architecture of the different computer systems. After completing the subject, students can measure the performance of different computer systems. They can create low bit assembler applications. Along with this, they will be able to interface memory with different architectures like 8085and MIPS.

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

Text Books

1.	M. Morris Mano, Computer System Architecture, Prentice Hall of India Pvt Ltd, 3rd Edition (updated), 30 June 2017.
2.	William Stallings, Computer Organization and Architecture–Designing for Performance, Ninth Edition, Pearson Education, 2013.
3.	John L. Hennessy and David A Patterson, Computer Architecture A Quantitative Approach, Morgan Kaufmann / Elsevier, Sixth Edition, 23rd November 2017
4.	Ramesh Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, Prentice Hall, Eight Edition, 2013.
Reference Books	
1.	Nicholas Carter, Schaum's outline of Computer Architecture, Tata McGraw Hill, Second Edition, 2014.

Detailed Syllabus

Course Code	15B11CI373	Semester ODD	Semester Second	Session 2023-2024
		(specify Odd/Even)	Odd(July to December 2023)	

Course Name	Computer Organization and Architecture Lab		
Credits	1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Dr. Jagriti(J128), Amarjeet Kaur(J62)
	Teacher(s) (Alphabetically)	Amarjeet Kaur, Dr.Bansidhar Joshi,Dr. Jagriti, Dr.Shailesh Kumar,

COURSE OUTCOMES		COGNITIVE LEVELS
C377.1	Implementation basic ALU of 2-bit and 4-bit computer using hardwired simulation tool	Apply (Level 3)
C377.2	Initialization and fetching of data from specific memory using various addressing mode of 8085	Understand (Level 2)
C377.3	Develop 8085 assembly language programs using software interrupts and various assembler directives.	Apply (Level 3)
C377.4	Develop MIPS assembly language programs using software interrupts and various assembler directives.	Apply (Level 3)
C377.5	Create of application and its software using 8085/MIPS microprocessor or microcontrollers	Create (Level 6)

Module No.	Title of the Module	List of Experiments	CO
1.	COA Hardwired simulation tool	Realize the truth table of various gates like as AND, OR, NOT, XOR, NAND and NOR., Conversion of universal gates,Designthehalfadderandfulladdercircuits,Ripple	C377.1

		adder logic circuit, 4 x1 multiplexor circuit and realize the various input output logic based on control, 4X1 multiplexor with NAND gates logic circuits	
2.	Combinational circuits	Design the subtractor circuits with defined bit logic, Adder-subtractor logic circuits, The odd frequency divider circuits, Carry lookup adder, Carry select and carry save, Adder circuits by modifying the ripple carry adder logic given in module-1.,Timing diagram of all four adder circuits and compare their performance, Decoder circuits with defined logic, 4-bit ALU circuits with defined operation logic.	**C377.1**
3.	8085 Simulator Introduction	Understanding Hardware Specification of the **8085 Simulator** in detail, Add two 8-bit numbers from load sample program from file menu, assemble and execute it step by step and view the contents of registers and memory., Basic Data transfer instructions, Arithmetic instructions, Logical instruction of 8085 using sample programs withnote changes in flags.	**C377.2**
4.	8085 Programming (Simple)	8085 Assembly Programming: Basic Arithmetic (like addition, subtraction, multiplication, division etc), Array (sum , reverse, average copy etc) etc and explore more about Arithmetic , Logical and Flow control Instructions	**C377.2**
5.	8085 Programming (Complex)	8085 Assembly Programming: Logical and Data transfer (like Min, Max, Even/odd, Sorting etc), more complex program(like Factorial, Link list etc) , String etc and explore more about Arithmetic, Logical and Flow control Instructions	**C237.2**
6.	MIPS(MARS) Simulator (Simple)	MIPS Assembly Programming: Arithmetic (like addition, subtraction, multiplication, division etc), Logical and Data transfer (like Min, Max, Even/odd, Sorting etc), Array (sum , reverse, average copy etc)	**C377.3**
7.	MIPS(MARS) Simulator (Complex)	Complex program (Factorial, Fibonacci etc), String Operations, Translation of C control statement into MIPS(IF THEN ELSE,WHILE, FOR LOOP, SWITCH control,)and explore more about Arithmetic, Logical, Flow control Instructions using MARS Simulator.	**C377.4**
8.	Projects	Students are expected to create an hardware and software co-designed application based on 8085/ MIPS/ Other controller (like Arduino) / Small Size computer (like Raspberry Pi)programming either in assembly or high level language.	**C377.5**

Project based learning: Project in COA lab is an integral part of the lab. Student form group size 3-4, and discuss the project idea with their lab faculty before finalizing. All projects are based on hardware and hardware components like microprocessor microcontrollers (like Arduino), microcomputer (like Raspberry pi), various sensors (like temperature sensor, humidity sensor etc), cams (like webcam), etc. are used. Programming language is used as per processor/controller. Students develop projects/prototypes to interact with physical environment, control physical object with software which is base of IoT and embedded system. Students learn various processor architecture as well as their programming languages. This helps students to understand how to develop IoT based products and embedded systems.

Evaluation Criteria

Components	Maximum Marks
Evaluation 1	10
Lab Test 1	20
Evaluation 2	10
Lab Test 2	20
Project	25
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)

Text Book

1. William Stallings, Computer Organization and Architecture–Designing for Performance, 9th Edition, Pearson Education, 2013.

2. Nicholas Carter, Schaum's outline of Computer Architecture, Tata McGraw Hill, 2017

3. John L. Hennessy and David A Patterson, Computer Architecture A quantitative Approach, Morgan Kaufmann / Elsevier, Sixth Edition, 2017

Reference Book

1. Microprocessor Architecture Programming and Applications with the 8085 [HB]-6/e. 25 September 2014. by Ramesh Gaonkar .

2. The Intel Microprocessors: 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, Pentium Pro-Processor, Pentium II, Pentium III, Pentium 4, and Core2 with 64-bit Extensions : Architecture, Programming, and Interfacing. Barry B. Brey, Pearson Education India, 2009.

3. http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/comp_org_arc/web/

4. http://cs.nyu.edu/~gottlieb/courses/2010s/2011-12-fall/arch/class-notes.html

5. http://www.cse.iitm.ac.in/~vplab/courses/comp_org/LEC_INTRO.pdf

6. http://www.cs.iastate.edu/~prabhu/Tutorial/title.html

7. http://www.cag.csail.mit.edu/

8. http://www.research.ibm.com/compsci/arch

9. M. Morris Mano, Computer System Architecture, Prentice Hall of India Pvt Ltd, Fourth edition, 2002. ISBN: 81-203-0855-7.

Department of Computer Science and Engineering& Information Technology
AY: 2023-24, Odd Semester

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11CI412	Semester Odd (specify Odd/Even)	Semester V Session 2022-23 Month from July to Dec 2023		
Course Name	Operating Systems and Systems Programming				
Credits	4		Contact Hours		3-1-0

Faculty (Names)	Coordinator(s)	Sec 62: Dr. Vikash, Sec 128: Ashish Kumar
	Teacher(s) (Alphabetically)	Sec 62:, Dr Vivek Kumar Singh, Mr. Kashav Ajmera, Dr. Prakash Kumar, Mr. Prashant Kaushik , Dr. Taj Alam,Dr. Ankita Jaiswal Sec 128: Dr. Anubhuti, Ambalika, Ashish Sharma

COURSE OUTCOMES		COGNITIVE LEVELS
C311.1	Explain the fundamental concepts along with the various components of operating systems and system programming.	Remember Level (C1)
C311.2	Apply various OS scheduling techniques and algorithms for processes and threads.	Apply Level (C3)
C311.3	Elaborate the various resource management techniques of operating systems and their performance.	Evaluate Level (C5)
C311.4	Omit the concept of IPC and describe various process synchronization techniques in OS.	Understand Level (C2)
C311.5	Compare various disk scheduling algorithms and utilize IO management techniques.	Apply Level (C3)
C311.6	Analyze the appropriate OS design choices when building real-world systems.	Analyze Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction and Historical context of Operating Systems	What are Operating Systems? All components Description, The Evolution of OS: Batch Systems, multi programming systems, Time sharing systems, Parallel systems, Real Time systems, Distributed systems.	2
2.	Operating Structure and Architecture	Operating system structure: Micro kernel, Monolithic systems, Layered systems, Virtualization, Client-server model, Mobile Operating System. X86 architecture overview, Booting sequences, Boot loaders and their stages, BIOS and its routines, Interrupts.	2
3.	Process Concepts, Threads & Concurrency, Scheduling Concurrency & Synchronization	Process concepts, Threads: Overview, Benefits, User and Kernel threads, Multithreading models. Scheduling, Operations on processes, Cooperative processes, IPC, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Process synchronization: Critical section problems, Semaphores, Synchronization hardware	10

	issues,	and monitors.	
4.	Deadlock	System model, Characterization, Methods for handling deadlocks. Deadlock prevention, Avoidance and detection, Recovery from deadlock	5
5.	Memory Management.	Background, Swapping, Contiguous memory allocation, Paging, Segmentation, Segmentation with Paging, Virtual Memory	8
6.	File System management and Input output management	File concept, Access models, Directory structure, Protection, File-system Structure, Allocation methods, Free space management. Overview, I/O hardware, Application I/O interface.	2
7.	Secondary Storage Management	Disk structure, Disk scheduling, Disk management., Swap-space management	2
8.	Fault and Security Issues	Overview of system security, Security methods and devices, Protection, access, and authentication, Models of protection, Memory protection.	2
9.	Distributed O.S	Int. to distributed operating systems, synchronization and deadlock in distributed systems	1
10.	Case studies of OS	Windows, Linux ,IBM, Tizen Operating System	2
11.	System Programming	Introduction, Components of a Programming System: Assemblers, Loaders, Macros, Compliers, Formal System.	2
12.	Interrupts and Exceptions	Synchronous and asynchronous interrupts, Calling a System Call from User Space, INT, Trap Handling, System call dispatch, arguments and return value, Device Interrupts.	2
13.	Kernel Synchronization, System Calls and System Signals	Disabling Interrupts, Lock Implementation, Linux Synchronization Primitives	2
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance, Quiz/Assignment/Mini Project/Case Study)
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.	William Stallings, "OPERATING SYSTEMS INTERNALS AND DESIGN PRINCIPLES".
2.	Andrew S. Tanenbaum, "Operating Systems Design and Implementation", Third Edition,Prentice Hall Publications2006
3.	A.S. Tanenbaum, "Modern Operating Systems", 2nd edition, Prentice Hall India.
4.	A.Silberschatz, P.Galvin, G. Gagne, "Operating systems concepts" Willey international company (sixth edition)

5.	Gary Nutt, "Operating Systems – A modern perspective", Pearson Education
6.	David Solomon and Mark Russinovich ," Inside Microsoft Windows 2000", Third Edition, Micorosoft Press
7.	D. M. Dhamdhere, " Systems Programming and Operating systems" TMH, 2nd revised edition.2006
8.	ACM/IEEE transactions on operating systems concepts.
9.	www.vmware.com
10.	www.luitinfotech.com/kc/what-is-cloud-computing.pdf
11.	https://cs162.eecs.berkeley.edu/static/sections/section8.pdf
12.	CharlesCrowley "Operating System A Design Approach"TMH.

Detailed Syllabus
Lab-wise Breakup

Subject Code	15B17CI472	Semester Even (specify Odd/Even)	Semester V Session 2023-2024 Month: July-Dec 2023
Subject Name	\multicolumn{2}{l	}{Operating System and System Programming Lab}	NBA Code: C275-1
Credits	0-0-1	Contact Hours	2

Faculty (Names)	Coordinator(s)	Dr. Vivek Kumar Singh (Sec-62) & Dr. Anubhuti (Sec 128)
	Teacher(s) (Alphabetically)	Dr. Ashish Parihar, Kashav Ajmera, Dr. Parmeet Kaur, Prashant Kaushik, Dr. Vivek Kumar Singh

COURSE OUTCOMES		COGNITIVE LEVELS
C275-1.1	Understand Various Unix Commands.	Understand Level (Level 2)
C275-1.2	Develop programs to create different types of processes using pthread library under Linux environment.	Apply Level (Level 3)
C275-1.3	Develop programs to implement resource management task like CPU scheduling algorithms, deadlock handling.	Apply Level (Level 3)
C275-1.4	Develop programs to implement and test various synchronization techniques like semaphores, binary semaphore and monitors via different classical test suites.	Apply Level (Level 3)
C275-1.5	Design and analyze various disk-scheduling algorithms, memory management schemes, file management systems.	Analyze Level (Level 4)

Module No.	Topic	No. of Labs	COs
1.	Unix Commands	1	C275.1
2.	Process creation/ Inter process communication (IPC)	1	C275.2
3.	Processes creation using pthread library under Linux environment.	2	C275.2
4.	Synchronization techniques like semaphores, binary semaphore and monitors via different classical test suites.	2	C275.4
5.	Resource management task like CPU scheduling algorithms, deadlock handling.	1	C275.3
6.	Disk-scheduling algorithms, memory management schemes, file management systems.	1	C275.5

Evaluation Criteria

Components	Maximum Marks
Lab Test-1	**20**
Lab Test-2	**20**
Day-to-Day	**60**(Mini Project-20, Lab Assessment-30, Attendance-10)
Total	**100**

Project Based Learning: Project based learning: Each student works on different case studies in Lab Assignments. They utilize the concepts taught in the lab and develop projects in a group of 3-4.The course emphasized on the skill development for employability in software industry by engaging students on soft development methodologies of operating systems. Various activities are carried out to enhance the student's software development skills. Some of them are study of various scheduling methods, memory management techniques and file management techniques.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc.)	
Text book(s)	
1.	Charles Crowley "Operating System A Design Approach" TMH.
2.	Andrew S. Tanenbaum "Operating Systems Design and Implementation", Third Edition, Prentice Hall Publications 2006
3.	A.S. Tanenbaum, "Modern Operating Systems", 2nd edition, Prentice Hall India.
4.	A.Silberschatz, P.Galvin, G. Gagne, "Operating systems concepts" Willey international company (Ninth edition)
Reference Book(s)	
5.	Gary Nutt, "Operating Systems – A modern perspective", Pearson Education
6.	David Solomon and Mark Russinovich , "Inside Microsoft Windows 2000", Third Edition, Micorosoft Press
7.	Milan Milenkovic, "Operating Systems: Concepts and Design", McGraw-Hill computer science series
8.	ACM/IEEE transactions on operating systems concepts.
9.	www.vmware.com

Detailed Syllabus
Lab-wise Breakup

Course Code	15B17CI575	Semester ODD (specify Odd/Even)	Semester 5th Session 2023-2024 Month from July 23 to December 23
Course Name	Open Source Software Lab		
Credits	1	Contact Hours	2 hours

Faculty (Names)	Coordinator(s)	J62: Ms. Deepti J128: Prof. Chetna Gupta
	Teacher(s) (Alphabetically)	J62: Dr. Alka Singhal, Ms. Purtee Kohli, Dr. Sonal, Dr. Vikash J128: Prof. Charu, Dr Mukta Goyal

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	Implement python programs using lists, tuples, dictionaries, functions, Numpy, SciPy and Matplotlib.	Apply Level (Level 3)
C375.3	Develop python programs to scrap and process data using Beautiful Soup, pandas and 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)	• 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.	C375.1	1
2.	Introduction To Python	• Making use of lists, tuples, and dictionaries, indexing and slicing to access data	C375.2	1
3.	Python	• Create user defined functions using built-in functions such as **filter (f, a)** from python libraries.	C375.2	2
4.	Numpy, SciPy, Matplotlib (Python)	• Write python programs using various functions of Numpy, SciPy and Matplotlib library.	C375.2	2
5.	Beautiful Soup (Python), Pandas, MongoDB	• 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.	C375.3	2

6.	Java Script, Java Servlet and Java Server Pages.	• Write programs for building web-pages using java script. • Buildweb-based applications using server-side programming – Java Server Pages (JSP) and Java Servlet.	C375.5	1
7.	Scikit-Learn (Python)	• Write python programs for data analysis, feature engineering, clustering and classification.	C375.4	2

Evaluation Criteria		
Components	**Maximum Marks**	
LabTest1	20	
LabTest2	20	
Evaluation /Quiz	30 Quiz 1 (15)+ Quiz 2 (15)	
Attendance	15	
PBL	15	
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Total	**100**	

Project Based Learning: The course emphasizes on skills required to develop open-source projects. The use of Python, its libraries and frameworks allow students to create scripts to automate tasks. The skills acquired in open-source software lab helps students in employability and improve the possibility of career opportunities in the field of Data Science, Web Development, Application Development and Machine Learning.

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.	McKinney, W. (2022). *Python for data analysis*. " O'Reilly Media, Inc.".
2.	Beazley, D., & Jones, B. K. (2013). *Python cookbook: Recipes for mastering Python 3*. " O'Reilly Media, Inc.".
3.	https://guides.github.com/
4.	https://sustainabledevelopment.un.org/
5.	Karthik, P. (2019). *Web Applications using JSP (Java Server Page): Develop a fully functional web application*. BPB Publications.
6.	https://www.w3schools.com/python/
Recommended Reference Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Matthes, E. (2023). *Python crash course: A hands-on, project-based introduction to programming*. no starch press.
2.	Lott, S. F., & Phillips, D. (2021). *Python Object-Oriented Programming: Build robust and maintainable object-oriented Python applications and libraries*. Packt Publishing Ltd.
3.	https://www.learnpython.org/

Detailed Syllabus

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Course Code	15B17CI576	Semester Odd (specify Odd/Even)	Semester 5th Session 2023 -2024 Months from July 2023 to December 2023
Course Name	Information Security Lab		
Credits	1	**Contact Hours**	2

Faculty (Names)	Coordinator(s)	J62:Mradula Sharma J128: Shariq Murtuza
	Teacher(s) (Alphabetically)	J-62: Dr. Amanpreet Kaur,Mradula Sharma, Dr. SharddhaPorwal, Dr. Somya Jain, Dr. Raghu Vamsi J-128: Shariq Murtuza, Dr. Kedar Singh

Course Outcomes (CO)	Description	Cognitive Level (Bloom's Taxonomy)
C374.1	Understand and demonstrate the foundational principles of information security by explaining the concepts of symmetric key cryptography, Data Encryption Standard, and public key cryptography.	Level-2 (Understanding Level)
C374.2	Apply the knowledge of symmetric key cryptography and key exchange algorithms to design and implement secure communication protocols in client-server programming.	Level-3 (Applying Level)
C374.3	Assess and categorize the vulnerabilities in system by inspecting network traffic using Wireshark	Level-4 (Analyzing Level)
C374.4	Compare different steganography, antivirus and anti-worm solutions, assessing their effectiveness in protecting against malware threats.	Level-5 (Evaluating Level)
C374.5	Students will be able to design and implement information security measures for real-world applications.	Level-6 (Creating Level)

Module No.	Title of the Module	List of Experiments
1.	Cryptography	Introduction to Cryptography
2.	Ciphers	Implementation of Cipher using Transposition techniques and Caesar Cipher
3.	Ciphers	Implementation of Substitution Ciphers: Hill Cipher and

		Polyalphabetic Cipher
4.	Symmetric key cryptography	Introduction to Symmetric key cryptography
5.	Data Encryption Standard	Implementation of Data Encryption Standard (DES)
6.	Public key cryptography	Introduction to Public key cryptography and Digital signature
7.	Key Exchange Algorithm	Implementation of Diffie Hellman Key Exchange Algorithm
8.	Client server programming	Client server programming using TCP
9.	Client server programming	Implementation of DES and RSA using Client server programming
10.	Steganography	Introduction to Steganography
11.	Antivirus and Anti-Worms	Introduction to Antivirus and Anti-Worms, and Wireshark tool
12.	Applications of Information Security	Applications of Information Security to real world problems
13.	Wireshark	Understanding of Secure-socket layer, Application Layer (HTTP, FTP, DNS) using Wireshark tool

Project based learning: The students are grouped into groups of size 5-6 and will be implementing a secure client server program with required encryption techniques. The student will analyze the requirements and select the required solutions. This will help in the employability of students in the information security sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Information Security, Principles and Practice, , 2nd Edition, Mark Stamp, Wiley, 2011
2.	Security in Computing 5th Edition , Charles P Fleeger et. al. - Prentice Hall, 2015
3.	The InfoSec Handbook: An Introduction to Information Security- Apress Open, Nayak, Umesha, and UmeshHodeghatta Rao, 2014
4.	Information Security: The Complete Reference, 2nd Edition- Mark Rhodes Ousley, 2013
5.	Cracking Codes with Python: An Introduction to Building and Breaking Ciphers-Al Sweigart, 2018

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Course Code	15B17CI576	Semester Odd (specify Odd/Even)	Semester 5th Session 2023 -2024 **Months from** July 2023 **to** December 2023
Course Name	Information Security Lab		
Credits	1	**Contact Hours**	2

Faculty (Names)	Coordinator(s)	J62:Mradula Sharma J128: Shariq Murtuza
	Teacher(s) (Alphabetically)	J-62: Dr. Amanpreet Kaur,Mradula Sharma, Dr. SharddhaPorwal, Dr. Somya Jain, Dr. Raghu Vamsi J-128: Shariq Murtuza, Dr. Kedar Singh

COURSE OUTCOMES		COGNITIVE LEVELS
C374.1	Understand and demonstrate the foundational principles of information security by explaining the concepts of symmetric key cryptography, Data Encryption Standard, and public key cryptography.	Level-2 (Understanding Level)
C374.2	Apply the knowledge of symmetric key cryptography and key exchange algorithms to design and implement secure communication protocols in client-server programming.	Level-3 (Applying Level)
C374.3	Assess and categorize the vulnerabilities in system by inspecting network traffic using Wireshark	Level-4 (Analyzing Level)
C374.4	Compare different steganography, antivirus and anti-worm solutions, assessing their effectiveness in protecting against malware threats.	Level-5 (Evaluating Level)
C374.5	Students will be able to design and implement information security measures for real-world applications.	Level-6 (Creating Level)

Module No.	Title of the Module	List of Experiments
1.	Cryptography	Introduction to Cryptography
2.	Ciphers	Implementation of Cipher using Transposition techniques and Caesar Cipher
3.	Ciphers	Implementation of Substitution Ciphers: Hill Cipher and Polyalphabetic Cipher
4.	Symmetric key cryptography	Introduction to Symmetric key cryptography
5.	Data Encryption Standard	Implementation of Data Encryption Standard (DES)

6.	Public key cryptography	Introduction to Public key cryptography and Digital signature
7.	Key Exchange Algorithm	Implementation of Diffie Hellman Key Exchange Algorithm
8.	Client server programming	Client server programming using TCP
9.	Client server programming	Implementation of DES and RSA using Client server programming
10.	Steganography	Introduction to Steganography
11.	Antivirus and Anti-Worms	Introduction to Antivirus and Anti-Worms, and Wireshark tool
12.	Applications of Information Security	Applications of Information Security to real world problems
13.	Wireshark	Understanding of Secure-socket layer, Application Layer (HTTP, FTP, DNS) using Wireshark tool

Evaluation Criteria:

Components	Maximum Marks
LabTest1	20
LabTest2	20
Evaluation /Quiz	30 Eval 1 (15)+ Eval 2 (15)
Attendance	15
PBL	15

Total	**100**

Project based learning: The students are grouped into groups of size 5-6 and will be implementing a secure client server program with required encryption techniques. The student will analyze the requirements and select the required solutions. This will help in the employability of students in the information security sector.

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)
Text Book(s):
1. Information Security, Principles and Practice, , 2nd Edition, Mark Stamp, Wiley, 2011
2. Security in Computing 5thEdition , Charles P Fleeger et. al. - Prentice Hall, 2015
Reference Book(s):
1. The InfoSec Handbook: An Introduction to Information Security- Apress Open, Nayak, Umesha, and UmeshHodeghatta Rao, 2014
2. Information Security: The Complete Reference, 2ndEdition- Mark Rhodes Ousley, 2013
3. Cracking Codes with Python: An Introduction to Building and Breaking Ciphers-Al Sweigart, 2018

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B19CI591	Semester Odd (specify Odd)	Semester V Session 2023- 2024 Month from July to December
Course Name	Minor Project-1		
Credits	2	Contact Hours	4

Faculty (Names)	Coordinator(s)	ANKIT VIDYARTHI, ANUBHUTI MOHINDRA
	Teacher(s) (Alphabetically)	ALL FACULTY

COURSE OUTCOMES		COGNITIVE LEVELS
C350.1	Gather the requirement of the tools, techniques, and programming language constructs to design the solution of the problem	Understanding (Level 2)
C350.2	Choose the best appropriate programming platform, language, tools, and data structure to implement the solution of the problem	Apply (Level 3)
C350.3	Illustrate the linking of the various modules and sub modules of the designed solution with proper demonstration	Analyzing (Level 4)
C350.4	Evaluate results to test the effectiveness of the proposed solution	Evaluating (Level 5)
C350.5	Managing to deploy the project with source code and Database (If prepared) on open source platform like Github and others.	Creating (Level 6)

Evaluation Criteria

Components	Maximum Marks
Viva-1	20
Viva-2	20
D2D	60
Total	**100**

Project-based learning: Each student in a group of 3-4 will have to develop a Minor Project based on different engineering concepts. The students can opt for any real-world application to implement Minor Project. The students have to implement the real-world problem using an open-source programming language. Project development will enhance the knowledge and employability of the students in the IT sector.

Subject Code	16B1NHS432	Semester: ODD	Semester V Session 2023-2024 Months: from July to December
Subject Name	**POSITIVE PSYCHOLOGY**		
Credits	**3**	Contact Hours	(3-0-0)
Faculty (Names)	Coordinator(s)	Dr. Badri Bajaj (JIIT-62) & Dr. Shweta Verma (JIIT-128)	
	Teacher(s) (Alphabetically)	Dr. Badri Bajaj, Dr. Shweta Verma	

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Demonstrate an understanding of the various perspectives of positive psychology and apply them in day to day life	Apply Level (C3)
CO2	Examine various theories and models of happiness, well-being and mental health	Analyze Level (C4)
CO3	Recommend possible solutions for enhancing happiness, well-being and mental health	Evaluating Level (C5)
CO4	Evaluate interventions/strategies for overall positive functioning	Evaluating Level (C5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Introduction to Positive Psychology	Overview, Perspectives, Classification and Measures: Human Strengths and Positive Outcomes.	**6**
2.	Prosocial Behavior	Empathy and Egotism; Altruism, Gratitude, and Forgiveness.	**6**
3.	Positive Emotions and Wellbeing	Emotional and Cognitive States; Focus on Application: Finding the positive in the Negative; Positive Emotions & Well-Being; Positive Emotions & Flourishing; Flow Experiences	**6**
4.	Happiness	Happiness and its Traditions; Determinants- Subjective Well-Being Hedonic Basis of Happiness; Life Satisfaction; Self –Realization: The Eudaimonic Basis of Happiness Happiness and Emotional Experiences; Other Facts of Life-Work & Unemployment; Intelligence; Education; and Religion.	**6**

5.	Mental Health	Mental Health and Behavior; Prevent the Bad and Enhance the Good.	6
6.	Positive Environments	Positive Schooling, Good at Work, Balance Between ME and WE.	6
7.	Living Well	Mindfulness; Contours of a Positive Life: Meaning & Means; Cultural Context, Every Stage of Life, Resilience, Positive Youth Development, Life Tasks of Adulthood, Successful Aging.	6

Total number of Hours		**42**

Evaluation Criteria

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

Project based learning: Students will identify possible solutions for enhancing happiness and well-being. They will work in groups and identify easy to implement solutions having minimal financial bearing on them using these strategies. Existing resources at the home, institution, work organization, and community can be used. While identifying the strategies it is essential to refer to various research papers, books, and online resources, etc. to support the logic behind the identified strategies. Each student will implement the identified strategies for minimum three weeks and share their experiences before and after implementation. Each group will submit a project report after completion of the project. It will be important to add appropriate references (in-text citations and bibliography) for identifies strategies in the report.

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.	Snyder, C.R., Lopez, S. J., & Pedrotti, J.T. *Positive Psychology: The Scientific and Practical Explorations of Human Strengths*, 4th Ed., Sage Publications, 2018.
2	Steve, B., & Marie, C. *Positive psychology*, 1st Ed., Pearson Education India, 2014.
3.	Boniwell, I., & Tunariu, A. D., *Positive Psychology: Theory, Research and Applications*, 2nd Ed., McGraw-Hill Education, 2019.
4.	Zelenski, J., *Positive Psychology: The Science of Well-being*, 1st Ed., Sage Publications, 2019.
5.	Snyder, C. R., Lopez, S. J., Edwards, L. M., & Marques, S. C. (Eds.), *The Oxford handbook of positive psychology*. 1st Ed., Oxford university press, 2020.

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Course Code	16B1NHS433	Semester: Odd	Semester: Session 2023-2024
			Month from: July to Dec

Course Name	Financial Management

Credits	3	**Contact Hours**	3 (3-0-0)

Faculty (Names)	Coordinator(s)	Dr Mukta Mani, Dr. Sakshi Varshney
	Teacher(s) (Alphabetically)	Dr Mukta Mani, Dr. Sakshi Varshney

COURSE OUTCOMES		COGNITIVE LEVELS
C303-3.1	Understand the fundamental concepts of Financial Management and its various dimensions	Understand (Level 2)
C303-3.2	Apply the knowledge of the time value of money, capital budgeting techniques, cost of capital and in taking long-term investment decisions	Apply (Level 3)
C303-3.3	Analyze the leverage capacity of a business and apply it in the selection of Long-term sources of finance.	Analyze (Level 4)
C303-3.4	Evaluate the financial performance of a business through financial statements	Evaluate (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Basic financial concepts-Meaning of Accounting, Accounting Concepts and Conventions, Introduction to Double Entry system and Accounting equation, Definition and Objectives of Financial management,	4
2.	Time value of Money	Compounding, Discounting, Annuity, Perpetuity, Loan Amortization	5
3.	Analysis of Financial Statements	Understanding of Balance Sheet and Income Statements, Ratio Analysis, Interpretation, Importance and limitations	5
4.	Capital Budgeting: Principle Techniques	Nature of Capital Budgeting, Evaluation Techniques: Discounting (NPV, IRR etc.) and Non-discounting Techniques (payback, ARR etc)	6
5.	Long Term Sources of Finance	Definition, types, advantages and disadvantages	4
6.	Concept and measurement of cost of capital	Definition, measurement of specific costs, computation of Overall Cost of Capital,	5
7.	Cash Flows for Capital Budgeting	Identification and determination of relevant cash flows	5
8.	Leverages and Capital Structure Decision and Working Capital Management	Break Even Analysis, Operating, Financial and combined leverage, Capital structure EBIT- EPS analysis, Concept of working capital management, practical considerations in Working capital management, Evils of Excess or Inadequate Working Capital, Cash Management – Receivables Management – Inventory Management	8
		Total number of Lectures	**42**

Evaluation Criteria	Maximum Marks

Components	20
T1	20
T2	35
End Semester Examination	25 (Project+ Quiz+ Class participation)
TA	**100**
Total	

Project-based learning: Each student in a group of 4-5 will opt for a company which is listed in at least one of the stock exchanges of India. To make the subject application based, the students analyze the latest financial data and other information of the last two years of the chosen company by the financial tool of Ratio analysis and use this financial data for decision-making. Understanding the Balance Sheet and financial statements of the business firm enhances the student's knowledge of the organisational structure of the firm and financial analysis helps their employability in the financial sector.

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

1. Chandra, P., *Financial Management Theory and Practice*,11th ed., Tata McGraw Hill, 2022.

2. Horne, J.C.V. and Wachowicz, J.M. Fundamentals of Financial Management, 13th ed., Pearson Publication, 2009. Accessed online: https://wps.pearsoned.co.uk/ema_uk_he_wachowicz_fundfinm an_13/106/27149/6950308.cw/-/6950310/index.html

3. Khan, M.Y. and Jain, P.K. Financial Management: Text, Problems and Cases, 8th ed., McGraw Hill Education, 2020.

4. Kishore, R.M., *Financial Management*, 8th ed, Taxmann, 2020

5. Mukherjee,M and Hanif.M., Financial Accounting, 8th ed., Tata McGraw Hill,2008.

6. Pandey, I.M., Financial management, 12th ed, Vikas Publishing House Pvt Ltd, 2021

Subject Code	16B1NHS434	Semester: ODD	Semester VSession 2023-24 July - December
Subject Name	Introduction to Contemporary Form of Literature		
Credits	3	Contact Hours	3 (3-0-0)

Faculty (Names)	Coordinator(s)	Dr Monali Bhattacharya (Sector 62)
	Teacher(s) (Alphabetically)	Dr Monali Bhattacharya

Course Outcomes:

	Course Outcome	COGNITIVE LEVELS
C303-6.1	Interpret & relate with the genres, periods, and conventional as well as experimental forms of literature.	CL-2 Understand
C303-6.2	Apply literary and linguistic theories on the texts to identify them as cultural constructs.	CL-3 Apply
C303-6.3	Analyze select representative texts of different cultures thematically and stylistically.	CL-4 Analyse
C303-6.4	Evaluate literature as reflection of society through a research-based paper/poster presentation individually and / or in a team.	CL-5 Evaluate
C303-6.5	Create literary, non-literary write-up with proper applied grammar usage.	CL-6 Create

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Module No.	Subtitle of the Module	Topics in the module	No. of Hours for the module
1.	**Introducing Literary Theories**	• From Formalism to Reader Response Theory: Major Terms & Concepts • Narrative Art & Narratology • Language & Style: An Introduction	12
2.	**Introducing New Forms & Sub Genres Today: Features & Portions**	• New Fiction: Graphic Novels, Cyberpunk • Non-Fiction: Memoirs & Autobiographies, Biographies	4

3.	**Modern Retellings/ Childeren's Literature**	*Cinderella* (Poem) - Roald Dahl	3
4.	**European Lit./Travel/ Memoir/ Spiritual Literature**	*Eat, Pray & Love (Travelogue& cinematic adaptation)*	4
5.	**Written Communication Through Non-Fiction**	*Personal Narratives (Diary, Blog, Memoirs, Travelogue)*	4
6.	**Commonwealth / Indian Literature**	*Hayavadana(Short Play)*- Girish Karnad	4
7.	**Afro-American Lit/ Post Colonial Literature**	*Sweetness (Short Story)* – Toni Morrison	3
8	**Sci-fi (Cyberpunk)**	*Neuromancer (Science Fiction) – William Gibson*	4
9	**Canadian Literature/ Speculative Fiction**	*The Penelopiad- Margaret Atwood*	4
		Total number of Hours	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Quiz, Project, Class Interaction)
Total	**100**

PBL Component: Project: The project is to be submitted in two parts, a Digital Poster and a report.
It is to be done in a group of 5-6 students.
Project :Comparative Analysis of any text with Penelopiad or Hayavadana in Digital Poster Format through application of theories& Report on the analysis and team effort.
 Poster is to be made in comparative mode in narrative format (as per sample shared) using archetypal symbols & by applying formalism and reader-response theory to analyze its contemporary significance.
Report is to be made in 2-3 pages.
Students would take a text (Novel /play/adaption) of their choice which is based on some of the myths of East or West, but it should not be any of the texts taught in V Semester syllabus of this course to compare it with Penelopiad or Hayavadana.

Recommended Reading material:

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.H. Abrams, 'A Glossary of Literary Terms'.7th Edition, Hienle&Hienle: Thomson Learning, USA, 1999. For online version:

	https://mthoyibi.files.wordpress.com/2011/05/a-glossary-of-literary-terms-7th-ed_m-h-abrams-1999.pdf
2.	Mark William Roche, 'Why Literature matters in the 21st Century', 1st Edition, Yale University Press, 2004.
3	https://allpoetry.com/poem/8503199-Cinderella-by-Roald-Dahl Online video version: https://www.youtube.com/watch?v=dLmNG5EbHvc. An interview with Dahl: https://www.youtube.com/watch?v=pA7kUPStmPE
4	Elizabeth Gilbert, 'Eat, Pray & Love. 1st Edition, Penguin,US, 2006. For online version: http://mrs-sullivan.com/wp-content/uploads/Eat-Pray-Love-Book-on-pdf.pdf An interview with Elizabeth :https://www.youtube.com/watch?v=m9B9zFo4RFw
5	William Zinsser, 'On Writing Well: The Classic Guide to Writing Nonfiction', Harper Perennial; 30th Anniversary ed. Edition, 2016 For Online version: http://richardcolby.net/writ2000/wp-content/uploads/2017/09/On-Writing-Well-30th-Anniversa-Zinsser-William.pdf
6	Girish Karnad, 'Hayavadana', 1st Edition, Oxford University Press, Delhi, 1975 (30th Impression, 2012). For online version: https://pdfcoffee.com/hayavadana-girish-karnadpdf-pdf-free.html An interview with Karnad: https://www.youtube.com/watch?v=laL7oWWuLGI
7	https://www.newyorker.com/magazine/2015/02/09/sweetness-2 Audio version: https://www.youtube.com/watch?v=ltKXTZTBmPs. An interview with Morrison: https://www.youtube.com/watch?v=DQ0mMjII22I&list=RDDQ0mMjII22I&start_radio=1&rv=DQ0mMjII22I&t=107
8	William Gibson, 'Neuromancer', 1st Edition, The Berkley Publishing Group, New York, 1984. For online version http://index-of.es/Varios-2/Neuromancer.pdf
9	Margaret Atwood, 'The Penelopiad', 1st Edition, Canongate Series, Knopf, Canada, 2005. For online version: https://www.langhamtheatre.ca/wp- content/uploads/2010/09/The-Penelopiad.pdf An interview with Atwood: https://www.youtube.com/watch?v=D5Wj_JQ6NhY

Subject Code	16B1NHS435	Semester : ODD	Semester: V Session: 2023-24 Month: July 2023 to Dec 2023
Subject Name	SOCIOLOGY OF MEDIA		
Credits	3	Contact Hours	(3-0-0)

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

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C303-2.1	Demonstrate a basic understanding of different concepts used in the systematic study of Sociology of Media	Understanding(C 2)
C303-2.2	Examine various sociological theoretical orientations towards media and society.	Analyzing(C 4)
C303-2.3	Analyze the key issues related to the processes of Production of Media, Popular Culture and consumer culture.	Analyzing(C 4)
C303-2.4	Critically evaluate the Cultural Consumption, Social Class & the process of construction of subjectivities and audience reception in new Media	Evaluating(C 5)
C303-2.5	Create positive and critical attitude towards the use of new media and understanding of threats of Digital Age	Creating(C 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction	Introduction to the Course	1
2.	Theoretical Orientation	• Functionalist Approach to the Sociology of Media and Popular Culture • Critical Approach to the Sociology of Media and Popular Culture • Symbolic Interactionist Approach to the Sociology of Media and Popular Culture • Different theories of Media	8
3.	Concept of Popular Culture and its critical analysis	• What is popular culture? • Difference between 'pop' culture and 'high' culture • What distinguishes popular culture from other kinds of culture (art, folk culture)? Is there a distinction at all anymore? • Visualizing Society through 'pop' culture/ media • Risks and rituals that come with Popular Culture	8
4.	New media	• Difference between tradition media and new media • New media as technology • New Information Technology (brief history in case of India)	5

5.	Media & State	• Mediatization of Society • Free-speech Media	5
6.	Consumption of Media and Media reception	• Social Actors as Audience/ Audience as market– Theory • Media effects: Media and representations (gender, ethnic)- the under-representation and misrepresentation of subordinate groups. • Media and the construction of reality: media logic and cultivation analysis theory • Information Society vs Informed Society • Cultural Consumption and Social Class	9
7.	Media in Global Age	• Rise of Network Society- Manuel Castells • Global Media: impact of market & state • Global Perspectives: The world on our doorstep • Marketing and aesthetics in everyday life	7
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Presentation and attendance)
Total	**100**

PBL: Each student will review research papers applying assumptions of different media theories studies in the course and submit a project.

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.	JosephTurow, *Media Today: An Introduction to Mass Communication*,3rd Ed., Taylor & Francis. UK. (2008).
2.	JA Fisher 'High Art v/s Low Art, in Berys Nigel Gaut& Dominic Lopes (eds.), *The Routledge Companion to Aesthetics*. Routledge2001
3.	G.Ritzer, 'McDonaldization of Society,. *The Journal of American Culture*. Volume 6, Issue 1. (2001 [1983])Pp. 100-107.
4.	Manuel. Castells,'Introduction', in *Rise of Network Society: The Information Age: Economy, Society and Culture*, 2nd Ed (1996).

Syllabus and Evaluation Scheme of Planning and Economic Development

CourseCode	16B1NHS532	Semester: ODD (specify Odd/Even)	Semester: 5th Month: from July to Dec. 2023
CourseName	Planning and Economic Development		
Credits	03	ContactHours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Amba Agarwal Dr. Amandeep Kaur
	Teacher(s) (Alphabetically)	Dr. Amba Agarwal Dr. Amandeep Kaur

COURSE OUTCOMES		COGNITIVE LEVELS
CO1	Understand the issues and approaches to economic development.	Understand (Level 2)
CO2	Apply an analytical framework to understand the structural characteristics of development.	Apply (Level 3)
CO3	Analyze the role of Macroeconomic stability & policies and Inflation in the development process.	Analyze (Level 4)
CO4	Examine the importance of federal development and decentralization.	Analyze (Level 4))
CO5	Evaluate National income accounting, human development index and sustainable development.	Evaluate (Level 5)

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. Approaches to economic development. Rostows Stages of Growth.	5
2.	National Income Accounting	National Income Accounting, Green GNP and Sustainable development	5
3.	Indicators of development	PQLI, Human Development Index (HDI) and gender development indices.	4
4.	Demographic Features, Poverty and Inequality	Demographic features of Indian population; Rural-urban migration; Growth of Primary, Secondary and Tertiary Sector.	5
5.	Inflation and Business Cycles	Inflation. Business cycle. Multiplier and Accelerator Interaction.	6
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.	6
7.	Federal	The Federal Set-up - The Financial Issues in a	6

		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	
8.	Planning and Development	Need for planning, Decentralisation, Rural and Urban local bodies.	5
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment + Quiz)
Total	**100**

Project-based Learning: Each student in a group of 4-5 will opt a topic and submit a report related to India's Development Indicators based on following parameters; National Income, State Income, Human Development Index (HDI), Gender Development Indices (GDI), Demographic Profile, Migration, Sectoral contributions of income and employment, Poverty, Income Inequality & literacy, Federal Structure, Budgetary estimates, Tax and Monetary Policy, Distribution of financial resources from central to state to local bodies. Understanding fundamental development indicators will upgrade student's knowledge on various Economic Development front and improve mechanism to formulate suitable policy design, which further strengthen their employability into public and private decision-making body.

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.	**Todaro, M.P.**, **Stephen C. Smith,** Economic Development, Pearson Education, 2017
2.	**Thirwal, A.P.**, Economics of Development, Palgrave, 2011
3.	**Ahuja, H. L.**, Development Economics, S Chand publishing, 2016
4.	**Ray, Debraj,** Development Economics, Oxford University Press, 2016
5.	**Meier, G.M.,** Leading Issues in Economic Development, Oxford University Press, New Delhi, 2008
6.	**Ahuja, H. L.,** Development Economics, S Chand publishing, 2016
7.	**Benavot, Aaron.** "Education, gender, and economic development: A cross-national study." Sociology of education (1989): 14-32.
8.	**Falk, Armin, and Johannes Hermle.** "Relationship of gender differences in preferences to economic development and gender equality." Science 362, no. 6412 (2018).

Theory of Numbers (16B1NMA731)

Divisibility, The greatest common divisor, coprime integers, The least common multiple, Linear Diophantine Equations, The Fundamental Theorem of Arithmetic, Prime Number Theorem, Goldbach and Twin Primes conjectures, Residue classes, Euclid's algorithm, Chinese Remainder, Wilson's and Fermat's Theorem, pseudoprimes. Greatest integer function, The Euler phi function, RSA Cyptosystem, arithmetic function, The Mobius function, Carmichael conjecture, The number-of-divisors and sum-of-divisors functions, Perfect numbers, characterization of even perfect numbers. Quadratic residues and non-residues, The Legendre symbol, Euler's Criterion, The law of quadratic reciprocity. Primitive roots.

Course Description

Course Code	16B1NMA731	Semester Odd	B.Tech. V SemesterSession Month from July 2023 to Dec. 2023
Course Name	Theory of Numbers		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Himanshu Agarwal	
	Teacher(s) (Alphabetically)	Dr. Himanshu Agarwal	

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
C301-4.1	explain concepts related to divisibility, congruences, numbers of special form, number theoretic functions, primitive roots and indices.	Understanding (C2)
C301-4.2	solve the system of linear congruences using properties of congruences, Euclid algorithm and Chinese remainder theorem.	Applying (C3)
C301-4.3	apply the concepts of primitive roots, indices, Legendre symbol and quadratic residue to solve the nonlinear congruences.	Applying (C3)
C301-4.4	analyze the concepts of number theory in hashing, cryptography, calendar and ISBN check digits problems.	Analyzing (C4)

Module No.	Subtitle 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 factorization, Least common multiple, Prime number theorem(statement only), Goldbach and twin primes conjectures.	5
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	4
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	8
4.	**Primitive Roots and Indices**	The order of an integer, Primitive roots, Theory of indicies, Solution of non-linear congruences.	9
5.	**Quadratic Residues**	Quadratic residues and non-residues, Euler's Criterion, The Legendre symbol, Gauss Lemma, Quadratic reciprocity, Solution of quadratic congruences.	8
6.	**Applications**	Hashing functions, Cyptosystem, Calendar problem, ISBN check digits	8
		Total Number of Lectures	**42**

Evaluation Criteria

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

Project based learning: Each student in a group of 4-5 will analyseapplicationsof Chinese remainder theorem in congruency problems.Also the students will explore the applications of secure communication techniques, Cyptosystem, Calendar problem, ISBN check digits.

	Recommended Reading (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)
1.	**James Strayer**, Elementary Number Theory, Waveland Press, 1994/2002, ISBN 1-57766-224-5.
2.	**Kenneth Rosen**, Elementary Number Theory and its Applications, 5th Edition, McGraw Hill, ISBN 0-201-87073-8.
3.	**I. Niven, H. Zuckerman, H. Montgomery**, An Introduction to the Theory of Numbers, 5th Edition, Wiley, ISBN 0471625469.
4.	**David M. Burton**, Elementary Number Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

Course Code	16B1NPH531	**Semester: ODD**	**Semester V Session** 2023 -2024
			Month from July to December
Course Name	**Quantum Mechanics for Engineers**		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Sandeep Mishra
	Teacher(s) (Alphabetically)	Sandeep Mishra

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 [Attendance (05 M), Class Test, Quizzes, *etc* (06 M), Assignments in PBL mode (10 M), and Internal assessment (04 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 (Berkeley 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.

Project Based Learning: Students may do projects on various applications of quantum mechanics like quantum computing and quantum information. This will help them apply theory learnt to more advanced problems in quantum mechanics. This should help students develop research-based learning which is very important in emerging technologies like quantum computing and information**.**

Course Code	16B1NPH532	Semester: ODD	Semester: 5th Session: 2022 -2023 Month from July 22 to December 22		
Course Name	Materials Science				
Credits	3		Contact Hours	3	

Faculty (Names)	Coordinator(s)	Dr. Vikas Malik and Dr Ashish Bhatanagar
	Teacher(s) (Alphabetically)	Dr. Vikas Malik and Dr Ashish Bhatanagar

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.	Optical Materials	Basic Concepts, Light interactions with solids, Optical properties of nonmetals: refraction, reflection, absorption, Beer-Lambert law, transmission, Photoconductivity. Drude Model, relation between refractive index and relative dielectric constant, Optical absorption in metals, insulators and semiconductors. Introduction to Photonic band gap (PBG) materials and its applications	6
3.	Magnetic Materials	Concept of magnetism, Classification – dia-, para-, ferro-, antiferro- and ferri-magnetic materials, Their properties and Applications; Hysteresis; Magnetic Storage and Surfaces.	10
4.	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
5.	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
6.	Thermoelectric	Thermoelectric (TE) effects and coefficients (Seebeck, Peltier, Thompson); TE materials and devices, Heat conduction,	3

	Materials	Cooling, Figure of Merit; TE power generation (efficiency), refrigeration (COP), Examples and applications.	
		Total number of Lectures	**40**

Evaluation Criteria

Components	Maximum Marks	
T1	20	
T2	20	
End Semester Examination	35	
TA	25	[Quiz/class test (7), attendance (7), PBL assignment (6) and teacher assessment (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.

Project Based Learning: Students will make application oriented individual projects on selected material (dielectric, magnetic, superconducting,optical and Thermoelectric etc.) depending on its suitability for advanced application such as medical diagnostic, sensing (pertaining to current pandemic situation) and similar. Each project will envisage the material properties, the working principles, advantages and disadvantages of that specific material as well as the possible advancement from the literature. This will be a group project and students will work in a group of 3-4 students. This project will make them prepared for industry jobs in the material industry or for higher studies in similar fields.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH533	Semester Odd (specify Odd/Even)	Semester 5th Session 2023-2024
			Month from July to December

Course Name	Laser Technology and Applications

Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Navneet Kumar Sharma, Anshu D. Varshney
	Teacher(s) (Alphabetically)	Anshu D. Varshney, Navneet Kumar Sharma

COURSE OUTCOMES		COGNITIVE LEVELS
C301-12.1	Defining the properties and principle of lasers	Remember Level (C1)
C301-12.2	Understanding of various applications of lasers	Understand Level (C2)
C301-12.3	Ability to apply the concepts of standard techniques for the pulsed operation of laser and stability of laser resonator	Apply Level (C3)
C301-12.4	Analysis of types of lasers	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 length measurement, velocity measurement, Laser Tracking, Metrology and LIDAR. Lasers in medicines and surgery. Lasers in defense, Lasers in space sciences, Lasers	12

			in sensors.	
			Total number of Lectures	**40**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [Attendance (05 M), Class Test, Quizzes, *etc* (06 M), Assignments in PBL mode (10 M), and Internal assessment (04 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, *Lasers Theory and Applications*, Macmilan India.
2.	W. T. Silfvast, *Laser Fundmentals*, Cambridge Univ-Press.
3.	O. Svelto, *Principles of Lasers*, Springer.
4.	Saleh and Teich, *Fundamentals of Photonics*, John Wiley & Sons.

Project based learning: Each student in a group of 4-5 students will opt a topic and will do the theoretical study in detail. The students will submit their report. To make the subject application based, the students analyze the optical fiber applications, holography applications and use of photons in memory devices. This shall improve the skills and employability of the students in laser and photonic industries.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH535	Semester: ODD	Semester: V Session: 2023-24 **Month from**: July to December
Course Name	Nuclear Science and Engineering		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Dr. Manoj Tripathi/ Dr. Anuj Kumar
	Teacher(s) (Alphabetically)	Dr. Manoj Tripathi/ Dr. Anuj Kumar

COURSE OUTCOMES		COGNITIVE LEVELS
C301-14.1	Relate terminology and concepts of nuclear science with various natural phenomenon and engineering applications.	Remembering (C1)
C301-14.2	Explain various nuclear phenomenon, nuclear models, mass spectrometers, nuclear detectors, particle accelerators. and classify elementary particles.	Understanding (C2)
C301-14.3	Solve mathematical problems for various nuclear phenomenon and nuclear devices.	Applying (C3)
C301-14.4	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	05

		moments and Schmidt lines, Collective model of a nucleus.	
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, Synchrotons, 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 [Attendance (05 M), Class Test, Quizzes (06 M), Assignments in PBL mode (10 M), and Internal assessment (04 M)]
Total	**100**

Project Base Learning	Different groups of students with 5-6 students in each group may be formed and these groups may be given to complete a task like identifying common applications to nuclear science, recent developments in nuclear science, etc. The students may be asked to make presentations on topics like radioactive dating or nuclear models and their applications. Devices like linear accelerators, cyclotrons etc. may also be included. The students may also be asked to study the recent developments in nuclear science/ engineering and present them.

	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.

Statistical Information Theory with Applications (17B1NMA533)

Review of probability and information measures, fuzzy sets, properties and their generalizations, data compression techniques and related coding techniques, basic concepts of cryptography and secure data, types of ciphers, spurious keys and unicity distance, classical and product cryptosystems, semantic security and stream ciphers, characteristics for perfect security, limitations of perfectly secure encryption, cryptanalysis of classical cryptosystems.

Course Description

Course Code	17B1NMA533	Semester Odd	Semester V Session 2023-24 Month from July 2023- Dec 2023
Course Name	Statistical Information Theory with Applications		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Amit Srivastava	
	Teacher(s) (Alphabetically)	Dr. Amit Srivastava	

COURSE OUTCOMES: After pursuing the above mentioned course, the students will be able to:		COGNITIVE LEVELS
C301-8.1	interpret the notions of entropy, relative entropy and mutual information in probabilistic and fuzzy frameworks.	Understanding Level(C2)
C301-8.2	apply the various measures of uncertainty and discrepancy in information distortion related problems.	Applying Level (C3)
C301-8.3	examine the importance of information theory in data compression problems.	Analyzing Level (C4)
C301-8.4	analyze problems related to encryption and decryption using information theoretic concepts.	Analyzing Level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Information Theoretic Measures	Review of Probability theory, Average information, Shannon and Renyi Entropy, Mutual information. Introduction to concepts of directed divergence, inaccuracy and information improvement	10
2.	Fuzzy Sets and Measures of Fuzzy Uncertainty.	Fuzzy Sets. Fuzzy Uncertainty and Fuzzy Information Measure, Similarity Measures, Fuzzy Measures of Directed Divergence, Total Ambiguity and Information Improvement, R-Norm Fuzzy Information Measure and its Generalizations.	10

3.	Source Coding	Data compression, Kraft-Mcmillan Equality and Compact Codes, Encoding of the source output, Shannon-Fano coding, Huffman coding, Lempel-Ziv (LZ) coding, Shannon-Fano-Elias Coding and Introduction to Arithmetic Coding. rate distortion theory, Lossy Source coding.	10
4.	Applications of information theory in Cryptography	Basic concepts of cryptography and secure data, Mathematical Overview and Shannon theory of Cryptography, perfect secrecy and the one time pad, Spurious Keys & Unicity Distance, Classical and Product Cryptosystems. semantic security and Stream ciphers, Characteristics for perfect security, Limitations of perfectly secure encryption, Block and Stream ciphers, Cipher Modes, Substitution Ciphers, Mono-alphabetic Substitution and Poly-alphabetic Substitution, Polygram, Transposition Ciphers, Rail Fence, Scytale, Book cipher, Vernam cipher, VigenereTabluae, 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, PBL)
Total	**100**

Project Based Learning: Each student in a group of 4-5 will apply the concepts of information theory in cryptography along with a detailed analysis of the proposed topic.

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, 3rd Ed, Tata McGraw-Hill, 2016.
2.	**Jain, K. C., and Srivastava, A.,** Information Theory & Coding, 3nd 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

Subject Code	19B12HS311	Semester: ODD	Semester V Session 2023-24
			Month from July to December 2023

Subject Name	**ENTREPRENEURSHIP DEVELOPMENT**

Credits	3	Contact Hours	3(3-0-0)

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

COURSE OUTCOMES- Proposed		COGNITIVE LEVELS
C303-8.1	Understand entrepreneurial fundamentals and considerations for developing a business idea	Understand Level (C2)
C303-8.2	Apply the entrepreneurial fundamentals to establish and develop business ventures and develop an entrepreneurial mindset	Apply Level (C3)
C303-8.3	Examine the importance of various critical business aspects such as marketing, finance and strategic planning in developing business	Analyze Level (C4)
C303-8.4	Assess strategies for resource hiring, Team management and leading a business venture	Evaluate Level (C5)

Module No.	Subtitle of the Module	Topics in the module	No. of Lectures for the module
1.	Entrepreneurial perspective	Foundation, Nature and development of entrepreneurship, importance of entrepreneurs, Entrepreneurial Mind, Individual entrepreneur Types of entrepreneurs, Entrepreneurship in India	8
2.	Beginning Considerations	Creativity and developing business ideas; Creating and starting the venture; Building a competitive advantage; Opportunity recognition, Opportunity assessment; Legal issues	14
3.	Developing Marketing Plans	Developing a powerful Marketing Plan, E-commerce, Integrated Marketing Communications	6
4.	Developing Financial Plans	Sources of Funds, Managing Cash Flow, Creating a successful Financial Plan Developing a business plan	11
5.	Leading Considerations	Developing Team, inviting candidates to join team, Leadership model	3
Total number of Lectures			**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignment, Project, Class Participation, Attendance)
Total	**100**

Project based learning: Each student in a group of 4-5 will work on developing business plan around a new idea. They will include the major business consideration in the plan. The students will present the business plans. Discussions on these practical issues will enhance students' understanding of entrepreneurship. The students will learn from other groups as well through other groups' presentations.

	Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)	
1.	Robert D Hisrich, Michael P Peters & Dean A Shepherd, "Entrepreneurship" 10th Edition, McGraw Hill Education, 2018	
2.	Norman M. Scarborough and Jeffery R. cornwell, "Essentials of entrepreneurship and small business management" 8th Edition, Pearson, 2016	
3.	Rajiv Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, 2011	
4.	Sangeeta Sharma, "Entrepreneurship Development", 1st Edition, Prentice-Hall India, 2016	
5.	John Mullins, "The New Business Road Test: What entrepreneurs and investors should do before launching a lean start-up" 5th Edition, Pearson Education, 2017	

Logical Reasoning and Inequalities (18B12MA312)

Weighted AGM inequality and Young's inequality, Karamata's inequality, Popoviciu's inequality, Hermite Hadamard inequality, Basic inequalities for concave and convex functions, 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, Catalan numbers, partition numbers, difference sequences, Sterling numbers, perfect numbers, 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.

Course Description

Course Code	18B12MA312		Semester Odd	Semester V Session 2023-24 Month from Aug 2023- Dec 2024
Course Name	Logical Reasoning and Inequalities			
Credits	3		Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)		Dr. Lakhveer Kaur	
	Teacher(s) (Alphabetically)		Dr. Lakhveer Kaur	

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above-mentioned course, the students will be able to:		
C301-9.1	Explain the concepts of mathematical inequalities, combinatorics, special numbers and logical reasoning.	Understanding (Level 2)
C301-9.2	apply the concepts of combinatorics and special numbers for solving various related problems.	Applying (Level 3)
C301-9.3	examine inequalities in the field of information theory and cryptography.	Analysing (Level 4)
C301-9.4	Analyse different problems using logical reasoning.	Analysing (Level 4)

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 with applications in information theory, Bounds on Shannon entropy function and their generalizations, Perfect secrecy in cryptography.	12
2.	Basics of	Pigeon Hole Principle, Binomial Theorem, Properties	12

	Counting	of binomial coefficients, combinatorial identities, Permutation of Multisets, Multinomial Theorem, Combinations of Multisets, Sterling's Formula, Generalization of Binomial coefficients, Inclusion exclusion principle.	
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, PBL)
Total	**100**

Project based learning: Each student in a group of 3-4 will apply the concepts of logical reasoning to solve related practical problems.

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.

Open Electives

Generalized Fuzzy Set Theory with Applications (19B12MA412)

Intuitionistic fuzzy sets (*IFS*s), measures of entropy, similarity and discrimination between intuitionistic fuzzy sets, applications of *IFS*s in medical diagnosis and pattern recognition , hesitant fuzzy sets, extensions of hesitant fuzzy sets, dual hesitant fuzzy sets, interval valued hesitant fuzzy sets, triangular fuzzy hesitant fuzzy sets, hesitant fuzzy linguistic term sets, aggregation operators, weighted aggregation operators, ordered weighted averaging operator,induced ordered weighted averaging operator, Pythagorean fuzzy sets,hesitant Pythagorean fuzzy sets and their aggregation operators in multiple attribute decision making, Dempster-shafer theory as an alternative to bayesian networks, frame of discernment, belief function, plausibility and basic probability assignments.

Course Description

Course Code	19B12MA412	Semester Odd	Semester VII Session 2023-24 Month from Aug 2023-Jan 2024
Course Name	Generalized Fuzzy Set Theory with Applications		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Amit Srivastava	
	Teacher(s) (Alphabetically)	Dr. Amit Srivastava	

COURSE OUTCOMES		COGNITIVE LEVELS
C401-21.1	Explain the concepts of fuzzy sets, its various generalizations and possibility theory.	Understanding level (C2)
C401-21.2	Apply the theory of generalized fuzzy sets in pattern recognition and medical diagnosis problems.	Applying level (C3)
C401-21.3	Analyze generalized fuzzy information measures in multiple attribute decision making (MADM) problems.	Analyzing level (C4)
C401-21.4	Examine the problems related to Dempster-Shafer theory and possibility measures.	Analyzing level (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Intuitionistic fuzzy sets	Intuitionistic fuzzy sets (*IFS*s) – Basic definitions and operations. Measures of entropy, similarity and discrimination between Intuitionistic fuzzy sets (*IFS*s). Applications of *IFS*s in medical diagnosis and pattern recognition.	10
2.	Hesitant fuzzy sets	Hesitant fuzzy sets – concepts, basic operations and basic properties. Extensions of hesitant fuzzy sets – Dual Hesitant fuzzy sets, Interval valued Hesitant fuzzy sets, Triangular Fuzzy Hesitant Fuzzy Sets, Hesitant Fuzzy Linguistic Term Sets.	10

3.	Aggregation Operators	Aggregation Operators – concepts, basic operations and basic properties, weighted aggregation operators, Ordered weighted averaging operator,Induced ordered weighted averaging operator.	8
4.	Pythagorean fuzzy sets	Pythagorean fuzzy sets - concepts, basic operations and basic properties, Hesitant Pythagorean fuzzy sets and their aggregation operators in multiple attribute decision making.	8
5.	Dempster-Shafer Theory	Dempster-Shafer Theory as an alternative to Bayesian networks. Frame of discernment, Belief function, Plausibility and basic probability assignments.	6
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25(Quiz, Assignments, PBL)
Total	**100**

Project based learning: Students are divided in a group of 4-5 to do a survey on the application based study of highlighted topics. The student can recognize the real life problems and try to understand by themselves that the structure of the problem similar to the application of the topics coloured above in the course.

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.	**Atanassov, Krassimir T.,** Intuitionistic Fuzzy Sets -Theory & Applications, Springer, 1999.
2.	**Xu, Zeshui,** Hesitant Fuzzy Sets Theory, Springer Verlag, 2014.
3.	**Bhargava, A. K.,** Fuzzy Set Theory, Fuzzy Logic and Their Applications, S. Chand & Company Pvt. Ltd., 2013.
4.	**CengizKahraman, UzayKaymak, Adnan Yazici,** (Editors), Fuzzy Logic in Its 50th Yea New Developments, Directions and Challenges, Studies in Fuzziness and Soft Computing, Springer Verlag, Vol. 341, 2016.
5.	**Huchang Liao, ZeshuiXu,** Hesitant Fuzzy Decision Making Methodologies and Applications, Uncertainty and Operations Research, Springer Verlag, 2017.

Course Code	20B12CS331	Semester : Odd	Semester 5th Session 2023-2024
			Month: July 2023 to Dec 2023

Course Name	Fundamentals of Machine Learning		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	Coordinator(s)	Dharamveer Rajpoot (62), Hmani Bansal (128)
	Teacher(s) (Alphabetically)	Anil Kumar Mehto, Dharamveer Rajpoot, Hmani Bansal

COURSE OUTCOMES		COGNITIVE LEVELS
C330-1.1	Understand the mathematical concepts of machine learning approaches.	Understand (Level 2)
C330-1.2	Apply the fundamentals of linear algebra and probability theory to the machine learning problems.	Apply (Level 3)
C330-1.3	Apply the concepts of regression analysis and vector calculus to the machine learning models.	Apply (Level 3)
C330-1.4	Analyze the role of dimensionality reduction and density estimation for machine learning problems	Analyze (Level 4)
C330-1.5	Evaluate and test the significance of machine learning results statistically.	Evaluate (Level 5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Machine learning	Why machine learning, learning problems, types of learning: supervised, unsupervised, semi-supervised learning, fundamentals of machine learning	02
2.	Linear Algebra	Linear equations, solving linear equations, matrices, Cholesky Decomposition, singular value decomposition, matrix approximation, vector space, Norms, inner product, length and distances, angles and orthogonality, orthogonal complement, inner product, orthogonal projections and rotations, linear independence, linear mapping, Affine spaces	09
3.	Probability Theory	Discrete and continuous probability, sum rule, product rule, Baye's Theorem, Gaussian Estimation, conjugacy and exponential family, inverse transform, Hidden Markov model	05
4.	Regression Analysis	Problem formulation, parameter estimation, linear regression vs non-linear regression models, univariate vs multivariate regression, regression using least squares, logistic regression in machine learning	05

5.	Vector Calculus	Gradients of vector valued function, gradient descent learning, lagrange's function in supervised learning, automatic differentiation, linearization and multivariate taylor series in machine learning	07
6.	Dimensionality Reduction and Density Estimation	Maximum variance, Low rank approximation, PCA, ICA, LDA, latent Variable, GMM, Maximum Likelihood estimation, expected maximization machine learning	08
7.	Statistical Validations	T test, paired T test, Z test, hypothesis testing, ANOVA, Pearson coefficient, significance testing	06
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks	
T1	**20**	
T2	**20**	
End Term	**35**	
TA	**25**	Attendance (10), Assignment/Quiz/Mini-Project (15)
Total	**100**	

Project based learning: Each student in a group of 3-4 will have to develop a mini project based on fundamentals of machine learning algorithms. The students can opt any real-world application where these algorithms can be applied. The students have to implement the mini project using any open source programming language. Project development will enhance knowledge and employability of the students in IT sector.

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

Text Book(s):

1.	Goodfellow, Ian, YoshuaBengio, and Aaron Courville. (2016). Deep learning. MIT press.
2.	Deisenroth, Marc Peter, A. Aldo Faisal, and Cheng Soon Ong. (2020). Mathematics for machine learning. Cambridge University Press.

Reference Book(s):

1.	Mitchell, Tom M. (1997). Machine learning.
2.	Bishop, Christopher M. (2006). Pattern recognition and machine learning. Springer.
3.	Hastie, Trevor, Robert Tibshirani, and Jerome Friedman. (2009). The elements of statistical learning: data mining, inference, and prediction. Springer Science & Business Media.

Course Description

Subject Code	20B12CS332	Semester: Odd	Semester 5th Session 2023 -2024
			Month from: July to Dec 2023
Subject Name	Fundamentals of Computer Security		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr.Charu Gandhi(128), Dr.Asmita Yadav(62)
	Teacher(s) (Alphabetically)	Dr.Charu Gandhi(128), Dr. Asmita Yadav(62), Dr.Amanpreet Kaur(62)

COURSE OUTCOMES		COGNITIVE LEVELS
C330-2.1	Explain the fundamental concepts of computer security, malicious code and its effects	Understand Level (C2)
C330-2.2	Describe various authentication and access control paradigms	Understand Level (C2)
C330-2.3	Apply various preventive measures and techniques used to obtain secure system	Apply Level (C3)
C330-2.4	Examine various security parameters from the perspective of legal and ethical issues	Analyse Level (C4)

Module No.	Subtitle of the Module	Topics in the Module	No. of Lectures for the module
1.	Security Basics	General overview, terminology and definitions, Security policy issues	6
2.	Introduction to Malware	Introduction to Malicious code, Spyware, Ransomware, Logic Bombs, Virus, Bacteria and Worms, Introduction to Anti-malware technology	6
3.	Threats to Network Communications and Basic Cryptography	Threats to Network Communications, Interception: Eavesdropping and Wiretapping, Modification, Fabrication: Data Corruption, Interruption: Loss of Service, Port Scanning, Introduction to cryptography and classical cryptosystem, Steganography vs Cryptography	8
4.	Authentication	Identification Versus Authentication, Authentication Based on Something You Know, Something You Are, Something You Have, Federated Identity Management, Multifactor Authentication, Secure Authentication, Password policies	5
5.	Access Control	Access Policies, Implementing Access Control, Procedure-Oriented Access Control, Role-Based Access Control, Captchas	5

6.	Intrusion Detection and Response	Goals for Intrusion Detection Systems, Types of IDSs – Anomaly Based and Signature Based	5
7.	Firewalls	What Is a Firewall?, Design of Firewalls, Types of Firewalls, Personal Firewalls, Comparison of Firewall Types, Example Firewall Configurations	3
8.	Legal and Ethical Issues	Introduction to Cyber Crimes and Cyber Laws and IT Act 2000	4
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (**Attendance- 10, Class Test/ Quiz-10, Mini Project (for PBL) -5)**
Total	**100**

Project Based Learning: Each student in a group of 2-4 will choose one of the computer security aspects such as malware defence, cryptographic applications, reverse engineering code, authentication implementation, intrusion detection system development, firewalls configuration etc. for development and analysis. Applyingtheseconceptswill enable the students in enhancing their understanding and skills towards computer system hardening.

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

	Text Books:
1.	Security in Computing (5th edition), Pfleeger, Pfleeger and Margulies, Pearson.
2.	Computer Security: Art and Science by Matt Bishop, Addison-Wesley Educational Publishers Inc
	Reference Books:
1.	Computer Security Fundamentals, (4th Edition), Chuck Easttum, Pearson Ed.
2.	Foundations of Computer Security, David Salomon, Springer
3.	Introduction to Modern Cryptography (2nd edition), Katz and Lindell, Chapman & Hall/CRC
4.	Elements of Computer Security, David Salomon, Springer
5.	Cryptography Theory and Practice (3rd edition), Stinson, Chapman & Hall/CRC

Detailed Syllabus
Lecture-wise Breakup

Course Code	20B12CS333	Semester: ODD	Semester: 5th Session:2023 -2024
			Month from July 2023 - December 2023

Course Name	Introduction to Big Data and Data Analytics

Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Pawan Kumar Upadhyay (62), Dr.Neeraj Jain (128)
	Teacher(s) (Alphabetically)	Dr. Pawan Kumar Upadhyay, Dr.Neeraj Jain

COURSE OUTCOMES		COGNITIVE LEVELS
C330-3.1	To demonstrate the fundamental concepts of growing field of big data analytics.	Understand (Level 2)
C330-3.2	To make use of tools required to manage and analyze big data like Hadoop, NoSql MapReduce.	Apply (Level 3)
C330-3.3	To apply predictive models and advanced computing paradigms for big data analytics.	Apply (Level 3)
C330-3.4	To analyze the big data using intelligent & visualization techniques.	Analyze (Level 4)
C330-3.5	To design and create predictive and mathematical model to solve complex real-world problems for decision making.	Create (Level 6)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Big Data	Introduction to Big Data landscape, Big Data: Why and where, Characteristics of Big Data- V's of Big Data (volume, velocity, variety, veracity, valence, and value)and Dimensions of Scalability, Data Models for Big Data Products(NOSQL, NEWSQL,HADOOP), Data Science and Analytics.	7
2.	Data Visualization Techniques	Introduction to Python or R, Understanding and Visualizing Data, Data Visualization R/Python.	5
3.	Data Modeling and Optimization	Modeling Uncertainty and Risk, Optimization and Modeling Simultaneous Decisions, Case Study.	5
4.	Decision Making and Predictive Analytics-1	Data exploration, Evaluation methods, Regression Techniques (Linear, Logistics, Multivariate), Classification Techniques (Decision Tree, ID3, Naïve Bayes), Case Study.	9
5.	Decision Making and Predictive Analytics-2	Clustering Techniques, Anomaly Detection, Dimensionality Reduction, Neural networks for deep learning, Hands-on using Python/R, Case Study.	9
6.	Big Data Technologies	Using Hadoop to store data (HDFS, HBASE), Process Data using MapReduce, Testing and Debugging MapReduce Applications.	7
		Total number of Lectures	42

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Internal assessment-05, Class Test/Quiz/Assignment-10, Mini-Project in PBL mode-10)
Total	**100**

Project based learning: The number of students in mini-project will be between 2-3. Students will use Python to design, develop, and implement big data applications or predictive models.

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

Reference Books:

1.	Dey, N., Hassanien, A. E., Bhatt, C., Ashour, A., & Satapathy, S. C. (Eds.). (2018). Internet of things and big data analytics toward next-generation intelligence (pp. 3-549). Berlin: Springer.
2.	Marz, N., & Warren, J. (2015). Big Data: Principles and best practices of scalable realtime data systems. Manning Publications Co.
3.	Grover, M., Malaska, T., Seidman, J., & Shapira, G. (2015). Hadoop Application Architectures: Designing Real-World Big Data Applications. " O'Reilly Media, Inc.".
4.	Covington, D. (2016). Analytics: Data Science, Data Analysis, and Predictive Analytics for Business. CreateSpace Independent Publishing Platform.

Text Books:

1.	EMC Education Services. (2015). Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data. Wiley.
2.	Nelli, F. (2018). Python data analytics: with pandas, numpy, and matplotlib. Apress.
3.	Sedkaoui, S. (2018). Data analytics and big data. John Wiley & Sons.
4.	Erl, T., Khattak, W., & Buhler, P. (2016). Big data fundamentals: concepts, drivers & techniques. Prentice Hall Press.
5.	Dasgupta, N. (2018). Practical big data analytics: Hands-on techniques to implement enterprise analytics and machine learning using Hadoop, Spark, NoSQL and R. Packt Publishing Ltd.
6.	Kumar, V. N., & Shindgikar, P. (2018). Modern Big Data processing with Hadoop: Expert techniques for architecting end-to-end Big Data solutions to get valuable insights. Packt Publishing Ltd.

Course Code	20B12CS334	Semester ODD	Semester: 5th Session: 2023 - 2024
			Month from: July **to** Dec 2023
Course Name	Object Oriented Analysis and Design Using JAVA		
Credits	3-0-0	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Raju Pal (J128) and Shivendra Singh (J62)
	Teacher(s) (Alphabetically)	Dr. Raju Pal (J128) and Shivendra Singh (J62)

COURSE OUTCOMES		COGNITIVE LEVELS
C333-1.1	Explain Object-Oriented Analysis and Design principles	Understand Level (C2)
C333-1.2	Analyze requirements to identify use cases, classes, and objects	Analyze Level (C4)
C333-1.3	Create UML diagrams for structural and behavioral modeling	Apply Level (C3)
C333-1.4	Design and implement software solutions using object-oriented analysis and design	Apply Level (C3)
C333-1.5	Evaluate software design complexity using metrics	Evaluate Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Principles of Object-Oriented Analysis and Design	Programming Paradigms, Introduction to Object Oriented Paradigm, Principles of Object Orientation, Software Complexity: development process, flexibility, behaviour of discrete system, The canonical Form of the complex system, Benefits and Understanding the challenges OOAD can address, Overview of Software Development Life Cycle (SDLC), Object-Oriented Requirements Elicitation & Analysis and Systems Behavior, Quality Attributes	5
2.	Object Oriented Analysis	Identifying Classes and Objects, Responsibilities, Relationships in problem domain, Object Model, Methods of Class Identification, Listing nouns and Verbs, Synonyms, Attributes and Methods Quality Check: Coupling, chohesion, sufficiency, completeness, premitiveness,	8

3.	Structural modeling and its implementation in JAVA	UML structure: Overview of static and dynamic UML diagrams, Modeling System Behavior with use case diagram and notations, From Use Cases to Functional Requirements, Elements of object and class diagram with notations: object, class, link, association, multiplicity, link attributes, association end names, association classes, qualified association, association ends, N-ray association, aggregation and composition, generalization, abstract class. Objects and Classes in JAVA, implementing various relationships in JAVA- Association, Inheritance, generalization, Abstraction in Java, Method Overriding and Overloading, Object Roles, Class Types, Implementing Polymorphism, Extensibility and UML, Generalization with Interfaces and Packages in Java	15
4.	Behavioral modeling	Sequence & Collaboration diagram with notations, Object Collaborations, Interaction Diagrams, State Diagram - Event ,Change Event, Signal Event, Call Event, Time Event , States, Transition & Conditions, Transition, Guard Condition, Action, State Diagrams, One shot State Diagram, Creating State Diagram, State Diagram Behavior, Activity, Do-activity, Entry Activity, Exit Activity, Nested State Diagram, Nested States, Signal Generalization, Concurrency, Activity and Swim lane diagram	4
5.	Design Principles	SOLID principles, Cohesion, Coupling, techniques for good Object-Oriented design, separation of concerns, information hiding, and conceptual integrity	6
6.	OO Design Metrics	Understanding and Analyzing Software Design Metrics for Object Oriented Software.	4
		Total number of Lectures	**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 [Attendance (10) + Assignment/Quiz/Mini-project (15)]
Total	**100**

Project based learning: Each group of 3-4 students will work on a mini-project. They will identify a real-life problem and develop a solution using their knowledge of the object-oriented approach. The project implementation should preferably be in JAVA and should be accompanied by comprehensive documentation covering various aspects of the software. This approach enhances students' understanding of different object-oriented concepts and prepares them for practical applications in the workforce.

	Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)
Text Books:	
1.	Object Oriented Modeling And Design With UML 2nd Edition by MICHAEL BLAHA and JAMES RUMBAUGH, PEARSON INDIA 2013
2.	UML 2 AND THE UNIFIED PROCESS: Practical Object-oriented Analysis and Design 2nd Editon by Jim Arlow, Pearson 2015
3.	The Object-Oriented Thought Process: ObjectOr Thought Process by Matt Weisfeld 2013
4.	Java: The Complete Reference, Eleventh Edition by Herbert Schildt , 2019
5.	Core Java Volume I--Fundamentals (Core Series) 11th Edition, by Cay S. Horstmann, 2018
Reference Books:	
1.	Head First Object-Oriented Analysis and Design A Brain Friendly Guide to OOA&D By Brett McLaughlin, Gary Pollice, David West 2011
2.	An Introduction to Programming and Object-Oriented Design with Java by Frederick A. Hosch Jaime Nino 2009
3.	OBJECT-ORIENTED ANALYSIS AND DESIGN With applications Third EDITION Grady Booch Rational Santa Clara, California 2009
4.	Object Oriented Analysis and Design Andrew Haigh 2001
5.	UML and C++ A practical approach to OO Development, 1997

Course Code	20B13HS311	Semester: Odd	Semester: V Session: 2023-24 Month: July-December 2023
Course Name	Indian Constitution and Traditional Knowledge		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Ila Joshi (62) & Dr Gaurika Chugh (128)
	Teacher(s) (Alphabetically)	• Dr. Aviral Mishra • Dr Gaurika Chugh • Dr. Ila Joshi • Dr. Namreeta Kumari • Ms. Shikha Kumari • Dr Shweta Verma

CO Code	COURSE OUTCOMES	COGNITIVE LEVELS
C305.1	Demonstrate an understanding about the early Indian traditional political thought and the constitutional design by knowing about the structure of government in place	Understand(C2)
C305.2	Demonstrate an understanding of the role of Indian President, Prime Minister, Governor, other members of the legislature in their mutual interaction and local governments as representatives of the common masses	Understand (C2)
C305.3	Analyze the working of Indian federalism with reference to centre-state relations	Analyze(C4)
C305.4	Analyze the impact of the contemporary challenges such as caste and gender to the working of Indian democracy	Analyze(C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	The Indian Constitution	• Historical Background to the Indian Constitution • Salient features of the Indian Constitution • Fundamental Rights (Part III of the Indian Constitution) • Fundamental Duties (Part IVA of the Indian Constitution) • Directive Principles of the State Policy (Part IV of the Indian Constitution)	8

		• Amendments to the constitution	
2.	Organs of the Government	• The Executive: President, Prime Minister and Governor- appointment, powers and functions • The Legislature: Parliament and its components- Lok Sabha and Rajya Sabha (composition and functions) • The Judiciary: Supreme Court-composition, functions, appointment and jurisdiction	8
3.	Nature of Federalism in India	• Centre-State Legislative Relations • Centre-State Administrative Relations • Centre-State Financial Relations • Special Provisions of some state and the 5th and 6th schedule • Emergency provision	8
4.	Local Governance in India	• Urban local governance: Municipality-Structure & Functions • Rural Local governance: Panchayat-Organization and Powers • Civil Society: the participation of the people in local governance	8
5.	Traditional knowledge	• Kautilya- Theory of state • Mandala theory • Saptanga theory	6
6.	Challenges to Indian Democracy	• Caste as a critical factor in the Indian Constitution • Gender as critical to the process of Constutionalization	4
		Total number of Lectures	**42**

Evaluation Criteria

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

Project: Projects based on important Supreme Court judgments have to be submitted by the students as a part of the project-based learning method. This would help the students to know about the interpretation of

the various rights done by Supreme Court which would help them in their workplace as well as in general life.

	Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)
1.	A.A. George, *Important Judgements that transformed India*, New Delhi: McGraw Hill, 2020
2.	B. Chakraborty, *Indian Constitution: Text, Context and Interpretation,* New Delhi: Sage Publications, 2017
3.	B.K.Sharma, *Introduction to the Constitution of India*, New Delhi: Prentice Hall of India, 2002
4.	M.Laxmikanth, *Indian Polity*, 6th edition, Noida: McGraw Hill, 2019
5.	M.P.Singh and R. Saxena, R, *Indian Politics: Contemporary Issues and Concerns*, New Delhi: PHI Learning, 2008
6.	R. Kangle, *Arthashashtra of Kautilya*, New Delhi: Motilal Publishers, 1997
7.	Videos- Samvidhan series produced by Rajya Sabha Television .https://www.youtube.com/watch?v=0U9KDQnIsNk

Course Code	21B12HS312	Semester: Odd (specify Odd/Even)	Semester: 5th Session: 2023 -2024 Month from: July-December
Course Name	**Management Accounting**		
Credits	03	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Purwa Srivastava
	Teacher(s) (Alphabetically)	Dr Purwa Srivastava

COURSE OUTCOMES		COGNITIVE LEVELS
C303-10.1	Understand various aspects of the management accounting system including ethical conduct for accountants	Understand (C2)
C303-10.2	Understand cost behaviour and apply cost-volume-profit analysis in decision making	Apply (C3)
C303-10.3	Understand basic accounting concepts and analyze financial statements of a business organization	Analyze (C4)
C303-10.4	Analyze various costing systems for cost allocation and pricing decisions	Analyze (C4)
C303-10.5	Evaluate the master budget and carry out variance analysis for planning and management control decisions	Evaluate (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Basic Accounting concepts and financial statements	Accounting Concepts, principles, accounting equation, analysis of Balance sheet, Income statement, statement of changes in stockholders' equity, statement of cash flows. Common size statement, trend analysis and ratio analysis	7
2.	Management	Meaning of Management Accounting, Influences on	7

	accounting system	accounting systems, Ethical conduct for accountants	
3.	Cost Concepts and cost behaviour	Identifying resources, Activities, Costs and Cost drivers; Variable and Fixed cost behaviour; Cost-Volume-Profit Analysis	7
4.	Cost Management Systems	Direct, Indirect cost; Cost allocation; Traditional and Activity Based costing systems, special orders, pricing decision, cost-plus pricing, target costing, make or buy decision	7
5.	Budgetary Control	Introduction to budgets; Functional budgets, Master budgets, Fixed and flexible budgets, Budgets as financial planning models, Variance analysis	8
6.	Management control system	Organizational goal and performance measures, designing a management control system	6
Total number of Lectures			**42**

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (assignments, class test, project)
Total	**100**

Project-based learning- The students will be given a group project to identify a simple business, one with at least two products, two services or one product & one service. They will estimate the fixed and variable costs related to the business and carry outa Cost-Volume-Profit analysis to determine the Break-even sales of the business. Also, they will determine the cost of products/services using Activity-based Costing. Lastly, the students will prepare a projected master budget for the next three years which includes the sales budget, operating expenses budget, cash budget, purchase budget, projected balance sheet, profit and loss account and so on.

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.	Charles T. Horngren, Gary L. Sundem, Jeff O. Schatzberg, Dave Burgstahler, Introduction to Management Accounting, 16th Edition, Pearson Publication, 2014.
2.	Anthony A. Atkinson, Robert S. Kaplan, Ella Mae Matsumura, S. Mark Young, G. Arun Kumar, Management Accounting, 5th Edition, Pearson Publication, 2009.
3.	Arora, M.N. Cost and Management Accounting, Himalaya Publishing, 4th Edition, 2018.

4.	Hingorani, Ramanathan and Grewal, Management Accounting, S. Chand Publications, 2003.
5.	Ghosh, T. P., Financial Accounting for Managers, 4th Edition, Taxmann Publications, 2009.
6.	Maheshwari, S.N., Maheshwari, S.K., Financial Accounting, 10th ed, Vikas Publishing House.
7.	Pandey, I.M., Financial management, 11th ed, Vikas Publishing House Pvt Ltd, 2015
8.	Chandra, P., Financial Management Theory and Practice, 7th ed., Tata McGraw Hill, 2007.
9.	Chawla, M, Chawla, C and Gupta, A. "India: Anti-corruption Compliance in India" Mondaq, January, 2021. Accessed on: 30th October 2021. Link: https://www.mondaq.com/india/white-collar-crime-anti-corruption-fraud/1022326/anti-corruption-compliance-in-india
10.	Tangdall, S. "The CEO of Starbucks and the Practice of Ethical Leadership", Santa Clara University, 29th August 2018. Accessed on: 30th October 2021. Link: https://www.scu.edu/leadership-ethics/resources/the-ceo-of-starbucks-and-the-practice-of-ethical-leadership/

Detailed Syllabus

Course Code	22B12PH311	Semester: Odd	Semester: 5th Session: 2023-2024 From: July to December
Course Name	Engineering Materials and Technology		
Credits	3	Contact Hours	3

Faculty (Names)	Coordinator(s)	Dr. Alok P. S. Chauhan
	Teacher(s) (Alphabetically)	Dr. Alok Pratap Singh Chauhan

COURSE OUTCOMES After completion of the course, students will be able to:		COGNITIVE LEVELS
C3O1-2.1	Recall the importance of engineering materials existing in the environment around us.	Remembering (C1)
C3O2-2.2	Explain and compare the different properties of the materials along with their broad classifications.	Understanding (C2)
C3O3-2.3	Apply the knowledge to analyze and use the different processes of the materials manufacturing.	Applying (C3)
C3O4-2.4	Apply the knowledge to develop/ choose materials for advanced engineering applications including robotic, drone and aerospace.	Analyzing (C4)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
1.	Introduction to Materials	Broad categorization of materials, Structure, property and performance relationship in materials. Engineering Materials Development in India.	4
2.	Material Properties	Review of material properties. Fracture, fatigue, diffusion and creep. Failure of materials. Material Deformations. Durability, oxidation, corrosion and degradation. Basics of Phase Diagrams and Diffusion.	8
3.	Ceramics and Metals	Metals and Alloys. Strengthening and degradation, corrosion prevention. Material Strengthening. Sub-classification, processing and properties of traditional and advanced ceramics. Phase diagrams using CALPHAD approach for ceramics and metals.	8
4.	Polymers and Wood	Introduction and classification, polymeric structure, effects of glass transition temperature, polymer mechanical properties. Classification and facets of wood.	3
5	Material Composites	Composites: polymer matrix, metal matrix, ceramic matrix, carbon-carbon. Longitudinal and transverse modulus. Composite making methods.	6
6.	Processing and Selection of Material	Manufacturing Processes and Design, Instruments and Furnaces. Materials, Environment and Sustainability. Automation in Materials Processing, Laser ablation of materials in additive manufacturing.	7
7	Development	Exploring materials development using computer software tools. Python packages and machine learning algorithm. Material Analysis using PyMKS	4
		Total number of Lectures	**40**
Evaluation Criteria			

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

Recommended Reading material:	
1.	Callister, W. D., Material Science and Engineering: An Introduction, Wiley publication, 2014
2.	Ashby, Michael F. & Jones, David, Engineering materials, Elsevier publication, 2018
3.	Ashby, Michael F., Materials selection in mechanical design, Elsevier publication, 2019
4.	Jones, Robert M., Mechanics of composite materials, Taylor & Francis publication, 2015
5.	Chopra, Inderjit & Sirohi, Jayant, Smart structures theory, Cambridge press, 2013
6.	Raghavan, V., Materials Science and Engineering, Prentice Hall of India, 2004
7.	Bolton, W., Engineering Materials Technology, Elsevier, 2013, 1993

Project Based learning: Different groups of students with 3-4 students in each group may be formed and these groups may be given to complete a task like collecting and classifying the materials for different applications. Students may be given a task of preparing data on current and futuristic materials and processes. Students can explore and interact with different industry and come out with their understanding and interpretation. They can use different commercially available software tools to do designing and prediction. Within each of these problem domains, the students will learn to work in a team. It will improve their analytical skills and the students will learn to achieve their common goal through mutual discussion and sharing of knowledge, information & understanding.

Economics of Agriculture: Issues & Development

Course Code	**23B12HS312**	**Semester:** ODD	**Semester** V **Session** 2023 -2024
			Month from: July 2023-Dec2023
Course Name	**Economics of Agriculture: Issues & Development**		
Credits	03	**Contact Hours**	2-1-0

Faculty (Names)	**Coordinator(s)**	Dr. Vandana Sehgal
	Teacher(s) (Alphabetically)	Dr. Vandana Sehgal

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above mentioned course, the students will be able to:		
CO1	Understand the significance of agricultural sector in economic development	Understanding Level (C2)
CO2	Examine the working of marketing institutions and the players in marketing of agricultural commodities and the major sources of agricultural finance	Applying Level (C3)
CO3	Link the agricultural policies and its effect on sustainable agricultural development	Analyzing Level (C4)
CO4	Assess the impact of globalization on agricultural development.	Evaluating Level (C5)

Module No.	Title of the Module	Topics in the Module	No. of Lectures for the module
Module-I	**ROLE OF AGRICULTURE IN ECONOMIC DEVELOPMENT**	Nature and scope of Agricultural Economics; Role of agriculture in economic/rural development - Inter-sector Linkages of Agriculture- Barriers to Agricultural Growth-Schultz Theory of Transformation of Traditional Agriculture; Mellor's theory of Agricultural development - Boserup's Theory of Agricultural Development - The Chayanov Farm Household model - Barnum–Squire Farm Household Model - Hayami-Ruttan Induced Innovation Hypothesis	8
Module-II	**AGRICULTURAL**	Market intermediaries and their role-Problems in	8

	MARKETING AND PRICE ANALYSIS	Agricultural Marketing from Demand and Supply and Institutions sides - Need for regulation in the present context, Role of Information Technology and telecommunication in marketing of agricultural commodities - Market research-Market information service - electronic auctions (e-bay), e-Chaupals	
Module-III	AGRICULTURAL PRODUCTION ECONOMICS	Various Types of Factor-Product, Factor-Factor, and Product Product Relations; Role of Farm Size and Structure in Equilibrium, Determination of optimal levels of production and factor application - Optimal factor combination and least cost combination of production - Theory of product choice; selection of optimal product combination.	9
Module-IV	AGRICULTURAL FINANCE	Agricultural lending – Direct and Indirect Financing - Financing through Co-operatives, NABARD and Commercial Banks and RRBs. Role and Importance of Agricultural Finance. Financial Institutions and credit flow to rural/priority sector	8
Module-V	AGRICULTURAL DEVELOPMENT AND POLICIES	Development issues, poverty, inequality, unemployment and environmental degradation – Models of Agricultural Development - policy options for sustainable agricultural development, Globalization and the relevance of development policy analysis	9

Total number of Lectures -42

Evaluation Criteria

Components	Maximum Marks
T1	20
T2	20
End Semester Examination	35
TA	25 (Project, Assignment & Quiz)
Total	**100**

Project-based Learning: Each student in a group of 4-5 will choose a topic and submit a report focused on India's Agricultural Issues and Development, based on the following parameters: Agricultural Productivity, Crop Diversification, Technology Adoption, Agricultural Finance, Agricultural Marketing and Supply Chains, Government Policies and Initiatives, Rural-Urban Linkages, and Sustainable Agriculture. Exploring these fundamental agricultural indicators will enhance students' understanding of the diverse challenges and opportunities in the agricultural sector, equipping them with knowledge to contribute effectively to public and private decision-making bodies in the pursuit of agricultural development and sustainability.

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.	Agricultural Economics: Principles and Policy" by David L. Debertin,2012
2.	Principles of agricultural economics markets and prices in less developed countriesby David Colman And Trevor Young, Cambridge University Press
3.	Agricultural Development: An International Perspective" by Alain de Janvry and Elisabeth Sadoulet
4.	Agricultural Economics" by H. Evan Drummond and John W. Goodwin,2013
5.	Lekhi R.K. & Singh Joginder, Agricultural Economics, Kalyani Publishers, New Delhi.
6.	Priniples of Agricultural Economics by Andrew Barkley and Paul W. Barkley, Routledge Taylor and Francis Publications, 2013

Matrix Computations (16B1NMA533)

Detailed Syllabus

Course Code	16B1NMA533	Semester - Odd (specify Odd/Even)	Semester 5th Session 2023 -2024 Month from July 2023 - Dec 2023
Course Name	Matrix Computations		
Credits	3	Contact Hours	3-0-0

Faculty (Names)	Coordinator(s)	Dr. Amita Bhagat and Dr. Neha Singhal
	Teacher (s) (Alphabetically)	Dr. Amita Bhagat, Dr. Neha Singhal, Dr. Pato Kumari

COURSE OUTCOMES		COGNITIVE LEVELS
C301-3.1	recall the basics of matrix theory and system of linear equations.	Remembering Level(C1)
C301-3.2	explain matrix inversion by partitioning/elementary matrices, vector spaces, inner product spaces and matrix norms.	Understanding Level (C2)
C301-3.3	solve the system of linear equations and eigen value problems using direct and iterative methods.	Applying Level (C3)
C301-3.4	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	Review of matrices, partitioning, block diagonal matrix, elementary matrices, Inverse of a matrix by partitioning.	6
2.	Linear System of equations	Existence and uniqueness of solution for system of linear equations. LU decomposition, Crout's and Doolittle's method, Cholesky factorization. Gauss Siedel, Gauss Jacobi and partial pivoting.	6
3.	Vector and Inner Product Spaces	Vector spaces, Subspaces, dimension and basis, p-norms of vector, Inner product, Norm using inner product and norms of a matrix.	6
5.	Orthogonality	Orthogonal and orthonormal sets, Gram-Schmidt process, QR factorization.	4
4.	Eigen value Problems	Eigen values and Eigenvectors, spectral radius, Greshgorin's theorem, Jacobi method, Givens rotations method and Householder's method, Power and Inverse power methods, Q-R algorithm.	12
6.	Matrix Calculus	Powers and functions of matrices, application to solve discrete dynamical systems $x(t+1) = Ax(t)$, $x(0) = \alpha$ and a system of differential equations of the form $dx/dt = Ax$, $x(0) = \alpha$.	8
		Total number of Lectures	**42**

Evaluation Criteria	
Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Assignments, Quizzes and Tutorial)
Total	**100**

Project Based Learning: Each student in a group of 3-5 students will apply the concepts of matrix calculus to solve discrete dynamical systems and a system of differential equations arising in various disciplines.

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.
2.	**Golub, G. H., Loan, C. F. V.,** Matrix Computations, 4th Edition, Johns Hopkins University Press, 2013.
3.	**Datta, K. B.**, Matrix and Linear Algebra, 3rdEdition, Prentice Hall of India, 2016.
4.	**David, W. Lewis**., Matrix Theory, World Scientific, 1991.

Basic Numerical Methods (17B1NMA531)

Approximation and errors in computation, Bisection Method, Regula- Falsi Method, Secant Method, Iterative method, Newton-Raphson Method, finite differences, Newton's Forward and Backward interpolation, Bessel's and Sterling's central difference operators, Laplace-Everett's formula, Newton's divided difference formula, Lagrange's interpolation formula,derivatives using difference operators, Numerical integration formulas, Gauss elimination method, LU decomposition method, , Gauss-Seidel method, Picard's method, Euler's methods, Runge-Kutta method, Milne's method, Finite-Difference method.

Course Description

Course Code	17B1NMA531	Semester - Odd	Semester V Session 2022-23 Month from Jul 2023- Dec 2023
Course Name	Basic Numerical Methods		
Credits	3	Contact Hours	3-0-0
Faculty (Names)	Coordinator(s)	Dr. Dinesh C. S. Bisht	
	Teacher(s) (Alphabetically)	Dr. Dinesh C. S. Bisht	

COURSE OUTCOMES		COGNITIVE LEVELS
After pursuing the above-mentioned course, the students will be able to:		
C301-5.1	relate the concepts of approximation, numerical solution, and errors in computation.	Remembering (C1)
C301-5.2	demonstrate the understanding of approximation and basic numerical methods	Understanding (C2)
C301-5.3	apply numerical methods for interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations	Applying (C3)
C301-5.4	analyse the physical problem to establish mathematical model and use appropriatemethod to solve	Analyzing(C4)

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, error in series approximation.	02
2.	Algebraic and Transcendental Equations	Bisection Method, Regula- Falsi Method, Secant Method, Iterative method, Newton-Raphson Method, convergence.	07
3.	Interpolation	Finite Differences, Relation between difference operators, Newton's Forward and Backward Interpolation, Gauss Backward Interpolation,	08

		Bessel's and Sterling's central difference operators, Laplace-Everett's formula, Newton's divided difference formula, Lagrange's interpolation formula.	
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. Trapezoidal, Simpson's, Boole's and Weddle's rules, Euler-Maclaurin formula.	11
5.	System of Linear Equations	Gauss Elimination method, LU decomposition method, Gauss-Seidel 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 first 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, Tutorials, PBL)
Total	**100**

Project Based Learning: Students will be divided in a group of 4-5 to collect literature and submit a report on application of different numerical methods to solve practical problems based on systems of linear equations and ordinary differential equations.

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, 7th Ed., Pearson Education, 2004.
2.	**M. K. Jain, S. R. K. Iyengar and R. K. Jain,** Numerical Methods for Scientific and Engineering Computation, 6th Ed., New Age International, New Delhi, 2014.
3.	**R. S. Gupta,** Elements of Numerical Analysis, 2nd Ed., Cambridge University Press, 2015.
4.	**S.D. Conte and C. deBoor,** Elementary Numerical Analysis, An Algorithmic Approach, 3rd Ed., McGraw-Hill, New York, 1980.