Detailed Syllabus
Lecture-wise Breakup

Course Code	15B11CI412	**Semester:** Odd	**Semester:** V **Session:** 2021-22 **Month from** Sep to Dec
Course Name	Operating Systems and Systems Programming		
Credits	4	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Sec 62: Dr. Ashish Mishra, Sec 128: Dr. Shilpa Budhkar
	Teacher(s) (Alphabetically)	Sec 62:, Dr Chetna Dabas, ,Mr. Kashav Ajmera, Dr. Prakash Kumar, Dr. Prashant Kaushik , Ms Sarishty Gupta, Sec 128: Dr. Neeraj Jain, Rupesh Koshariya, Dr. Mukta Goyal

COURSE OUTCOMES		**COGNITIVE LEVELS**
C311.1	Describe and explain the fundamental components of operating systems and system programming.	Understand Level (C2)
C311.2	Apply and compare various policies of scheduling in processes and threads in OS.	Apply Level (C3)
C311.3	Describe and discuss various resource management techniques of operating systems and compare their performances.	Apply Level (C3)
C311.4	Understand the concept of IPC and describe various process synchronization techniques in OS.	Understand Level (C2)
C311.5	Discuss the working of IO management and apply various disk scheduling techniques.	Apply Level (C3)
C311.6	Analyze and report 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 issues,	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 and monitors.	10
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	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 (5), Quiz/Assignment/Mini Project/Case Study (15))
Total	**100**

Project Based Learning: The students in the group of 3-4 submitted a case study of the Real-World Operating System like Windows, Linux, Macintosh etc. which was best suited for their mini project developed in their 5th semester. In the case study, they explained all the major components and services provided by the Operating system used for their mini project. This gave the students an exposure of the various components and services of real-world operating systems and helps them to map these services with the concepts taught in the subject and which further motivates them in the futuristic designing of a new Operating System.

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.	CharlesCrowley “Operating System A Design Approach”TMH.
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

Course Code	15B17CI472	**Semester:** Even	**Semester:** V **Session:** 2021 - 2022 **Month from** Aug to Dec
Course Name	Operating System and System Programming Lab		
Credits	1	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	Dr Chetna Dabas & Dr Mukta Goyal (Sec 128)
	Teacher(s) (Alphabetically)	Ashish Mishra, Chetna Dabas, Dharmveer Singh Rajpoot, Kashav Ajmera, Prashant Kaushik

COURSE OUTCOMES		**COGNITIVE LEVELS**
C371.1	Understand Various Unix Commands.	Understand Level (Level 2)
C371.2	Develop programs to create different types of processes using pthread library under Linux environment.	Apply Level (Level 3)
C371.3	Develop programs to implement resource management task like CPU scheduling algorithms, deadlock handling.	Apply Level (Level 3)
C371.4	Develop programs to implement and test various synchronization techniques like semaphores, binary semaphore and monitors via different classical test suites.	Apply Level (Level 3)
C371.5	Design and analyze various disk-scheduling algorithms, memory management schemes, file management systems.	Analyze Level (Level 4)

Module No.	**Topic**	**No. of Labs**	**CO**
1.	Unix Commands	1	**C371-1.1**
2.	Process creation/ Inter process communication (IPC)	1	**C371-1.2**
3.	Processes creation using pthread library under Linux environment.	1	**C371-1.2**
4.	Synchronization techniques like semaphores, binary semaphore and monitors via different classical test suites.	2	**C371-1.4**
5.	Resource management task like CPU scheduling algorithms, deadlock handling.	1	**C371-1.3**
6.	Disk-scheduling algorithms, memory management schemes, file management systems.	1	**C371-1.5**

Evaluation Criteria

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

Project based learning: A group report submission by students based on the project following case study with following contents:

1. Problem statement
2. Introduction

3. Proposed work with tools and datasets used
4. Workflow diagram of the proposed work
5. Results
6. Snapshots of the results
7. Conclusions
8. References

Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc.)	
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)
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	**Semester:** V **Session:** 2021-2022 **Month from** Aug to Dec
Course Name	Open Source Software Lab		
Credits	1	**Contact Hours**	0-0-2

Faculty (Names)	**Coordinator(s)**	J62: Ms. Sarishty Gupta, Ms. Kirti Aggarwal J128: Dr. Chetna Gupta (J128)
	Teacher(s) (Alphabetically)	J62: Dr. Alka Singhal, Ms. Sonal J128: Dr. Charu, Dr. Himani

COURSE OUTCOMES		**COGNITIVE LEVELS**
C372.1	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)
C372.2	Develop python programs using lists, tuples, dictionaries, functions, Numpy, SciPy and Matplotlib.	Apply Level (Level 3)
C372.3	Develop python programs to scrap and process data using Beautiful Soup, pandas and MongoDB.	Apply Level (Level 3)
C372.4	Analyze baseline methods for pre-processing, clustering and classification algorithms using scikit-learn python libraries.	Analyze Level (Level 4)
C372.5	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.	C372.1	1
2.	Introduction To Python	● Making use of lists, tuples, and dictionaries, indexing and slicing to access data	C372.2	1
3.	Python	● Create user defined functions using built-in functions such as **filter (f, a)** from python libraries.	C372.2	1
4.	Numpy, SciPy, Matplotlib (Python)	● Write python programs using various functions of Numpy, SciPy and Matplotlib library.	C372.2	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.	C372.3	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.	C372.5	1
7.	Scikit-Learn (Python)	• Write python programs for data analysis, feature engineering, clustering and classification.	C372.4	1

Evaluation Criteria

Components	**Maximum Marks**
LabTest1	20
LabTest2	20
Evaluation	30
Attendance	15
Lab record submission	15
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 improves 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.	https://guides.github.com/
2.	https://sustainabledevelopment.un.org/
3.	Python Cookbook by David Beazley and Brian K. Jones
4.	Head First Servlets & Java Server Pages by Bryan Basham, Kathy Sierra, and Bert Bates
5.	Python for Data Analysis by Wes McKinney

Detailed Syllabus
Lab-wise Breakup

Course Code	15B28CI582	**Semester:** ODD	**Semester:** V **Session:** 2020 -2021 **Month from** Aug to Dec ODD Semester (Special Sem)	
Course Name	Multimedia Lab			
Credits	1		**Contact Hours**	0-0-2

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

COURSE OUTCOMES		**COGNITIVE LEVELS**
C373.1	Demonstrate in working with various image formats and tools in GIMP.	Understand Level (Level 2)
C373.2	Demonstrate application of various toolboxes in Inkscape.	Understand Level (Level 2)
C373.3	Illustrate aesthetics of visual composition such as logo designing, poster making, comic strips, etc., using GIMP & Inscape.	Apply Level (Level 3)

Module No.	**Title of the Module**	**List of Experiments**	**CO**
1	Introduction to Digital Graphics	• Exploring Gimp Manual • Exploring image formats • Understanding Tool Box and Canvas	C372.1
2	Raster Image Editing	• Transform tool, selection tool, Brush tool, Text tool, Gradients, transparency, etc. • Working with GIMP Layers • Operating in GIMP - selection, transformation, feathering, applying filters and effects, colour and tonal adjustments, automating tasks, image editing, image enhancement, layer masking, Smoke effect, Cartoon Effect, watermark, creative text, etc.	C372.1
3	Vector Image Editing	• Creating SVG files • Operating Inkscape tools – selection, node, tweek, Zoom, pencil, pen, text. • Creating 2D & 3D Drawing.	C372.2
4	Projects	• Logo Designing • Graphic Compositions • Short Animations	C372.3

Evaluation Criteria

Components	**Maximum Marks**
Lab Test 1	20

Lab Test 2	20
Day-to-Day (Evaluation/Mini-Project/Sincerity/Interaction)	60
Total	**100**

Project Based Learning: Students, working in pairs or in small groups will be encouraged to design 2D images in GIMP for forming real-life requirements such as book-cover/ comic strip, logos, and other such desirables. These may be used as stand-alone objects or in conjunction with other designs to form an aggregated requirement.

Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development

The students study various designs and drawing structures to help them with development of UI or logos or models for aggregation. The students are given constructive feedback for their designs. These give exposure to students for understanding industrial / professional requirements for designing interfaces.

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

Multimedia	1. "Multimedia – An Introduction" by John Villamil and Louis Molina. 2. "Multimedia Magic" by Gokul, S. 3. https://www.javatpoint.com/gimp
GIMP	1. https://www.gimp.org/books/ 2. https://www.gimp.org/ 3. https://howtogimp.com/help/help-with-gimp/gimp-tutorials/
Inkscape	1. https://inkscape.org/ 2. https://wiki.inkscape.org/wiki/images/f/f2/Introduction_to_Inkscape_by_Gavin_Corley.pdf 3. https://www.selfmadedesigner.com/inkscape-logo-tutorial/
Additional reading material may be given to the students as and when required.	

Detailed Syllabus
Lecture-wise Breakup

Course Code	15B29CI591	**Semester:** Odd	**Semester:** V **Session:** 2021 -2022 **Month from** sEP to Dec
Course Name	Minor Project-1		
Credits	2	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	K VIMAL KUMAR
	Teacher(s) (Alphabetically)	ALL FACULTY

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

Evaluation Criteria

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

Detailed syllabus
Lecture-wise Breakup

Course Code	16B1NHS432	**Semester:** ODD	**Semester:** V **Session:** 2021-2022 **Month from** Aug to Dec
Course Name	POSITIVE PSYCHOLOGY		
Credits	3	**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Dr. Badri Bajaj	
	Teacher(s) (Alphabetically)	Dr. Badri Bajaj Ms. Shikha Kumari	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-9.1	Demonstrate an understanding of the various perspectives of positive psychology and apply them in day to day life	Apply Level (C3)
C303-9.2	Examine various theories and models of happiness, well-being and mental health	Analyze Level (C4)
C303-9.3	Recommend possible solutions for enhancing happiness, well-being and mental health	Evaluate Level (C5)
C303-9.4	Evaluate interventions/strategies for overall positive functioning	Evaluate Level (C5)

Module No.	**Title 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 Lectures	**42**

Evaluation Criteria

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

Project based learning: Each student will think of some personal and professional goals. The student will apply the learnings from the course topics from the first four modules and make and execute plan for achievement of their goals. Each student can take help from any other student in the class. Each student will make a presentation in the class and will also submit a project 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)

Snyder, C.R., Lopez, S. J., & Pedrotti, J.T. (2011). Positive Psychology: The Scientific and Practical Explorations of Human Strengths. 2nd Ed., Sage Publications

Wesley J. Chun (2014). Positive Psychology, 1is Ed., Pearson

Dewe, P. & Cooper, C. (2012). Well-Being & Work: Towards a Balanced Agenda. Palgrave Macmillian:NY.

Vijay Parkash, Updesh Kumar, Archana. (2015). Positive Psychology: Applications in Work, Health and Well – Being. 1st Ed., Pearson

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS433	**Semester:** Odd	**Semester:** V	**Session:** 2021-2022	
			Month from Aug to Dec		
Course Name	Financial Management				
Credits	3	**Contact Hours**	3-0-0		
Faculty (Names)	**Coordinator(s)**	Dr.Sakshi Varshney, Dr.Shirin Alavi			
	Teacher(s) (Alphabetically)	Dr.Sakshi Varshney, Dr.Shirin Alavi			

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-3.1	Understand the fundamental concepts of Financial Management and Analyze the time value of money in taking investment decisions.	Analyze Level (Level 4)
C303-3.2	Contrast the various forms of business organizations, evaluate the sources of funds and measure their financial performance through ratio analysis.	Evaluate Level (Level5)
C303-3.3	Evaluate investment projects using capital budgeting techniques.	Evaluate Level (Level5)
C303-3.4	Apply the concept of cost of capital into evaluation of investment projects	Apply Level (Level 3)
C303-3.5	Evaluate the leverage capacity of a business and its application in selection of Longterm sources of finance.	Evaluate Level (Level5)
C303-3.6	Understand the practical considerations for managing working capital requirementin a firm.	Understand Level (Level 2)

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

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

Project based learning: Each student in a group of 4-5 will opt a company which is listed in at least one of the stock exchanges of India. To make subject application based, the students analyze latest financial data and other information of last two years of chosen company by the financial tool of Ratio analysis and use this financial data for decision making. Understanding Balance Sheet and financial statements of the business firm enhances the student's knowledge on organisational structure of the firm and financial analysis helps their employability into financial 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. Chandra, P., *Financial Management Theory and Practice*, 7th ed., Tata McGraw Hill, 2007.
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_fundfinman_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, 2019.
4. Kishore, R.M., *Financial Management*, 6th ed, Taxmann, 2007.
5. Mukherjee,M and Hanif.M., Financial accounting, 8th ed., Tata McGraw Hill,2008.
6. Pandey, I.M., Financial management, 11th ed, Vikas Publishing House Pvt Ltd, 2015

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Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NHS434	**Semester:** Odd	**Semester:** V **Session**: 2021-22 **Month from** Aug to Dec
Course Name	Introduction to Contemporary Form of Literature		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr Monali Bhattacharya (Sector 62) Dr Ekta Srivastava (Sector 128)
	Teacher(s) (Alphabetically)	Dr. Ekta Srivastava & Dr Monali Bhattacharya

COURSE OUTCOME		**COGNITIVE LEVELS**
C303-6.1	Interpret & relate with the genres, periods, and conventional as well as experimental forms of literature as current ethical, technological and cultural reflections of society.	Understand level (C2)
C303-6.2	Apply literary and linguistic theories on the texts to identify them as cultural constructs inculcating human values in the society.	Apply level (C3)
C303-6.3	Analyze select representative texts of different cultures thematically and stylistically.	Analyse level (C4)
C303-6.4	Determine the reciprocal relationship between the individual and culture individually and/or through a research-based paper/poster presentation.	Evaluate level (C5)
C303-6.5	Create literary, non-literary write-up with proper applied grammar usage, individually and in a team.	Create level (C6)

Module No.	**Title of the Module**	**Topics in the module**	**No. of Lectures 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 Lectures	**42**

Evaluation Criteria

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

Project Based Learning: Students are supposed to write Personal Narrative: Memoir or a Blog (of 2 pages) keeping transition markers, stylistic and linguistic devices in mind, thereafter, submit it to preassigned peer, who reviews it and writes a biographical note of the writer, based on stylistic choices made by him/her in blog and memoir. Students also are required to submit an entire project having components of Research Paper (analyzing mythical text of one's choice), Comparative Analysis of his/her work with Penelopiad or Hayavadana in Digital Poster Format & Report on Online Collaboration

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.
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

Detailed Syllabus
Lecture-wise Breakup

Subject Code	**16B1NHS435**	**Semester:** ODD	**Semester:** V **Session:** 2020-21 **Month from** Aug to Dec
Subject Name	Sociology of Media		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Priyanka Chhapariya
	Teacher(s) (Alphabetically)	Dr. Priyanka Chhapariya Shikha Kumari

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-2.1	Demonstrate a basic understanding of different concepts used in the systematic study of Sociology of Media	Understand level (C 2)
C303-2.2	Examine various sociological theoretical orientations towards media and society.	Analyze level (C4)
C303-2.3	Analyze the key issues related to the processes of Production of Media, Popular Culture and consumer culture.	Analyze level (C4)
C303-2.4	Critically evaluate the Cultural Consumption, Social Class & the process of construction of subjectivities and audience reception in new Media	Evaluate level (C5)
C303-2.5	Create positive and critical attitude towards the use of new media and understanding of threats of Digital Age	Create level (C6)

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**

Project Based Learning- 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).

Detailed syllabus
Lecture-wise Breakup

Course Code	16B1NHS532	**Semester:** ODD	**Semester:** V **Session:** 2021-2022 **Month from** Aug to Dec
Course Name	Planning and Economic Development		
Credits	03	**Contact Hours**	3-0-0

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

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-4.1	Understand the issues and approaches to economic development.	Understand Level (Level 2)
C303-4.2	Evaluate National income accounting, human development index and sustainable development.	Evaluate Level (Level 5)
C303-4.3	Apply an analytical framework to understand the structural characteristics of development.	Apply Level (Level 3)
C303-4.4	Analyze the role of Macroeconomic stability & policies and Inflation in the development process.	Analyze Level (Level 4)
C303-4.5	Evaluate the importance of federal development and decentralization.	Evaluate Level (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 Development	The Federal Set-up - The Financial Issues in a Federal Set-up, Principles for Efficient Division of Financial Resources between Governments. Financial Federalism under Constitution. Finance Commissions in India, Terms of References and	6

		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 formula 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).

Detailed syllabus
Lecture-wise Breakup

Course Code	16B1NMA533	**Semester:** Odd	**Semester:** V **Session:** 2021 -2022 **Month from** Aug to Dec
Course Name	Matrix Computations		
Credits	4	**Contact Hours**	3-1-0

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	Explain the basics of matrix algebra and inverse of a matrix by partitioning.	Understand Level (C2)
C301-3.2	Solve the system of linear equations using direct and iterative methods.	Apply Level (C3)
C301-3.3	Explain the vector spaces and their dimensions, inner product space, norm of a vector and matrix.	Understand Level (C2)
C301-3.4	Apply the Gram-Schmidt process to construct orthonormal basis and Q-R decomposition of a matrix.	Apply Level (C3)
C301-3.5	Construct Gershgorin's circles and solve eigenvalue problem using Jacobi, Givens, Housholder, power and inverse power methods.	Apply Level (C3)
C301-3.6	Analyze systems of differential and difference equations arising in dynamical systems using matrix calculus.	Analyze 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	Eigen values and Eigenvectors, spectral radius,	12

	Problems	Greshgorin's theorem, Jacobi method, Givens rotations method and Householder's method, Power and Inverse power methods, Q-R algorithm.	
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 4-5 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.

Detailed Syllabus

Lecture-wise Breakup

Course Code	16B1NPH531	**Semester:** Odd	**Semester:** V **Session:** 2021 -2022 **Month from** Sep to Dec
Course Name	Quantum Mechanics for Engineers		
Credits	3	**Contact Hours**	3

Faculty (Names)	**Coordinator(s)**	Anuraj Panwar
	Teacher(s) (Alphabetically)	Anuraj Panwar

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-10.1	Remember basics of Quantum Mechanics and its applications.	Remember Level (C1)
C301-10.2	Explain postulates of quantum mechanics, Dirac notation, Schrödinger Equation, Perturbation theory and Qubits.	Understand Level (C2)
C301-10.3	Solve various problems related to different quantum systems and construct quantum circuits using quantum gates.	Apply Level (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.	Analyze Level (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 Uncertainity 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 (07 M), Class Test, Quizzes, *etc* (07 M), Assignments in PBL mode (06 M), and Internal assessment (05 M)]
Total	**100**

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**.**

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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH532	**Semester**: ODD	**Semester:** V **Session:** 2021 -2022 **Month from** Aug to Dec
Course Name	Materials Science		
Credits	3	**Contact Hours**	3

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

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-11.1	Recall variety of engineering materials for their applications in contemporary devices	Remember Level (C1)
C301-11.2	Explain dielectric, optical, magnetic, superconducting, polymer and thermoelectric properties	Understand Level (C2)
C301-11.3	Apply properties of dielectric, optical, magnetic, superconducting, polymer and thermoelectric materials to solve related problems	Apply Level (C3)
C301-11.5	Prove and estimate solution of numerical problems using physical and mathematical concepts involved with various materials	Evaluate Level (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 Materials	Thermoelectric (TE) effects and coefficients (Seebeck, Peltier, Thompson); TE materials and devices, Heat conduction, Cooling, Figure of Merit; TE power generation (efficiency), refrigeration (COP), Examples and applications.	**3**

		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [Quiz/class test (7), attendance (7), PBL assignment (6) and teacher assessment (5)]
Total	**100**

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.

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

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

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH533	**Semester:** Odd	**Semester:** V **Session:** 2021-2022 **Month from** Aug to Dec		
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	Define the coherent properties, high brightness of laser, population inversion and optical feedback to laser technology	Remember Level (C1)
C301-12.2	Extend the knowledge of lasers in some applications like LIDAR, laser tracking, bar code scanner, lasers in medicine and lasers in industry	Understand Level (C2)
C301-12.3	Apply the optical ray transfer matrix to determine the stability of a laser resonator	Apply Level (C3)
C301-12.4	Distinguish the operational principles of CW, Q-switched, mode locked lasers; laser rate equations for three & four level lasers; different types of laser systems	Analyze Level (C4)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Fundamentals of Lasers	Laser idea and properties; Monochromaticity, directionality, brightness, Temporal and spatial Coherence. Interaction of radiation with matter; Absorption, spontaneous and stimulated emission of radiation, Rates equations, Einstein's A and B coefficients. Laser rate equations: Four level and three level systems. Conditions for producing laser action, population inversion, saturation intensity, threshold condition and gain optimization. Experimental techniques to characterize laser beam.	12
2.	Types of Lasers	Pumping processes; optical and electrical pumping. Optical Resonators; The quality factor, transverse and longitudinal mode selection; Q switching and Mode locking in lasers. Confocal, planar and spherical resonator systems. Types of Lasers; Solid state Lasers; Ruby Laser, Nd:YAG laser. Gas lasers; He-Ne laser, Argon laser, CO_2, N_2 and Excimer Laser. Dye (liquid) Laser, Chemical laser (HF), Semiconductor Lasers; Heterostructure Lasers, Quantum well Lasers. Free electron laser, X-ray laser and Ultrafast Laser.	16
3.	Applications of Lasers	Image processing; Spatial frequency filtering and Holography, Laser induced fusion; Fusion reactor, creation of Plasma. Lightwave communications. Use in optical reader (CD player) and writer. Nonlinear optics; harmonic generation, self focusing. Lasers in industry; Material processing, Cutting, welding and whole drilling.	12

		Precision length measurement, velocity measurement, Laser Tracking, Metrology and LIDAR. Lasers in medicines and surgery. Lasers in defense, Lasers in space sciences, Lasers in sensors.	
		Total number of Lectures	**40**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 [Attendance (07 M), Class Test, Quizzes, *etc* (07 M), Assignments in PBL mode (06 M), and Internal assessment (05 M)]
Total	**100**

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.

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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	16B1NPH535	**Semester:** ODD	**Semester:** V **Session:** 2021-22 **Month from** Aug to Dec
Course Name	Nuclear Science and Engineering		
Credits	3	**Contact Hours**	3

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

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

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Nuclear Constituents and their properties, Nuclear Forces	Rutherford scattering and estimation of nuclear size, Constituents of the nucleus and their properties, Nuclear Spin, Moments and statistics, Magnetic dipole moment, Electric quadruple moment. Nuclear forces, Two body problem - Ground state of deuteron, Central and non-central forces, Exchange forces: Meson theory, Yukawa potential, Nucleon-nucleon scattering, Low energy n-p scattering, Effective range theory, Spin dependence, charge independence and charge symmetry of nuclear forces, Isospin formalism.	07
2.	Nuclear Models	Binding energies of nuclei, Liquid drop model: Semi-empirical mass formula, Mass parabolas, Prediction of Nuclear stability, Bohr-Wheeler theory of fission, Shell model, Spin-orbit coupling. Magic numbers, Angular momenta and parities of nuclear ground state, Magnetic moments and Schmidt lines, Collective model of a nucleus.	05

3.	Nuclear decay and Nuclear reactions	Alpha decay, Beta decay, Pauli's Neutrino hypothesis-Helicity of neutrino, Theory of electron capture, Non-conservation of parity, Fermi's theory, Gamma decay: Internal conversion, Multipole transitions in nuclei, Nuclear isomerism, Artificial radioactivity, Nuclear reactions and conservation laws, Q-value equation, Centre of mass frame in nuclear Physics, Scattering and reaction cross sections, compound nucleus, Breit-Wigner one level formula	08
4.	Interaction of nuclear radiation with matter	Interaction of charge particles with matters: Bohr's ionization loss formula and estimation of charge, mass and energy. Interaction of electromagnetic radiation with matter, Linear absorption coefficient. Nuclear particle detectors and neutron counters.	07
5.	Accelerator and reactor Physics	Different types of reactors, tracer techniques, activation analysis. Radiation induced effects and their applications: Accelerators: Linear accelerators, Van de Graff generator, LINAC, Cyclotrons, 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 (07 M), Class Test, Quizzes, *etc* (07 M), Assignments in PBL mode (06 M), and Internal assessment (05 M)]
Total	**100**

Project Based 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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	17B1NHS531	**Semester:** Odd	**Semester:** V **Session:** 2021 -2022 **Month from** Aug to Dec
Course Name	Technology and Culture		
Credits	3	**Contact Hours**	3-0-0

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

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-5.1	Understand socio-cultural factors and their effect on individuals, organizations and the business environment	Apply Level (C2)
C303-5.2	Appraise technological convergence and cultural divergence, relate the differences to the literature and suggest solutions	Evaluate Level (C5)
C303-5.3	Interpret and communicate effectively in physical and virtual teams by evaluating appropriate concepts, logic and selecting the apt IT tools.	Evaluate Level (C5)
C303-5.4	Evaluation of the theoretical knowledge to adapt to cultural differences in global work environment.	Evaluate Level (C 5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	▪ The Information Technology Revolution ▪ The concept of Network societies ▪ Technology and Culture-how cultural beliefs influence technology	5
2.	Dimensions of Culture	▪ Evolution of Culture ▪ Principal theories of Culture: Kluckholn and Strodtbeck, Hofstede, Trompenaars and Schwartz ▪ Cultural Diversity and cross-cultural literacy	6
3	Levels of Culture	▪ Levels of Culture ▪ Measurement of Culture	5
4.	Cross cultural communication in physical and virtual teams	▪ The Communication Process ▪ Language and Culture ▪ Non-Verbal Communication ▪ Barriers to Cross Cultural Understanding	6
5.	Negotiation and Decision Making	▪ Theories of Negotiation ▪ Negotiation and Intercultural Communication ▪ Decision making in cross cultural environment ▪ Expatriate Management	6
6.	Culture and Marketing	Culture and research Culture and Consumer behaviour ▪ Culture and Marketing	7

7.	Cross Culture and Leadership	▪ Leadership and Culture ▪ Theories of Culture centric leadership and their Global Relevance ▪ Developing Competencies for Global citizens ▪ Women as International Leaders ▪ Cross Cultural Training ▪ Ethical Guidelines for Global Citizens	7
		Total number of Lectures	**42**

Evaluation Criteria

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

Project based learning: Students in group of 4-5 members are required to present a term paper exploring the influence of culture on diverse aspects of business, design and technology.

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.	Cateora, P. R., Meyer, R. B. M. F., Gilly, M. C., & Graham, J. L. (2020). *International marketing*. McGraw-Hill Education.
2.	Coyle,D., The Culture Code: The Secrets of Highly Successful Groups, Bantam, 2018
3.	Fletcher, R., & Crawford, H. (2013). *International marketing: an Asia-Pacific perspective*. Pearson Higher Education AU.
4.	Gerard Bannon, J. (red.). Mattock, Cross-cultural Communication: The Essential Guide to International Business.2003
5.	Maidenhead.Riding the Waves of Culture: Understanding Cultural Diversity in Business (2012).3rd edition. McGraw Hill.
6.	Madhavan,S., Cross Cultural Management: Concepts and Cases(2nd Ed),Oxfor University Press 2016.
7.	Robertson, Ronald. Globalization: Social theory and global culture, London: Sage, 1992.

Detailed syllabus
Lecture-wise Breakup

Course Code	17B1NMA531	**Semester:** Odd	**Semester:** V **Session:** 2021-22 **Month from** Aug to Dec
Course Name	Basic Numerical Methods		
Credits	3	**Contact Hours**	3-0-0
Faculty (Names)	**Coordinator(s)**	Prof. Lokendra Kumar & Dr. P. K. Srivastava	
	Teacher(s) (Alphabetically)	Dr. D .C. S. Bisht , Prof. Lokendra Kumar, Dr. P. K. Srivastava & Prof. R. C. Mittal,	

COURSE OUTCOMES		**COGNITIVE LEVELS**
C301-5.1	Explain the concepts of approximation and errors in computation.	Understand level (C2)
C301-5.2	Construct numerical methods for algebraic and transcendental equations and their convergence.	Apply Level (C3)
C301-5.3	Outline the methods of interpolation using finite differences and divided difference formulas.	Understand level (C2)
C301-5.4	Make use of numerical differentiation and integration.	Apply Level (C3)
C301-5.5	Solve the system of linear equations using direct and iterative methods.	Apply Level (C3)
C301-5.6	Solve ordinary differential equations using different numerical methods.	Apply Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Approximation and Errors in Computation	Errors, relative error, absolute error, 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, Bessel's and Sterling's central difference operators, Laplace-Everett's formula, Newton's divided difference formula, Lagrange's interpolation formula.	08
4.	Numerical Differentiation and Integration	Derivatives using Newton's Forward and Backward Interpolation, Bessel's and Sterling's central difference operators, Maxima and minima of a tabulated function. 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	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,	09

	Equations	Finite-Difference Method	
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 problemsbased on system 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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	18B11CS212	**Semester:** Odd	**Semester:** V	**Session:** 2021-22	
			Month from Aug to Dec		
Course Name	Computer Networks & Security				
Credits	3	**Contact Hours**	3		
Faculty (Names)	**Coordinator(s)**	Kavita Pandey			
	Teacher(s) (Alphabetically)	Kavita Pandey			

COURSE OUTCOMES		**COGNITIVE LEVELS**
C310.1	Solve problems by using various key protocols in the protocol suite using networking and security concepts.	Apply level (Level 3)
C310.2	Examine various transport protocols along with its performance enhancing mechanisms and security solutions.	Analyze level (Level 4)
C310.3	Appraise the shortest path for the network using various routing protocols andevaluate it.	Evaluate level (Level 5)
C310.4	Utilize data link layer protocols for multiple access communication, error detection and correction problems.	Apply level (Level 3)
C310.5	Apply the knowledge of number theory in public key cryptographic techniques by understanding the principles & theories of cryptography.	Apply level (Level 3)

Module No.	**Title of the Module**	**Topics in the module**	**No. of Lectures for the module**
1.	Introduction	Network terminologies, Network Architectures, Network Models, Protocol layers and their services, , Switching techniques, Network Vulnerabilities and security	4
2.	The Application Layer	Principles of Application-Layer Protocols, The World Wide Web: HTTP, The Internet's Directory Service: DNS, Introduction to Sockets, Security Aspects in Application layer, HTTPS, DNSSEC,	7
3.	The Transport Layer	Transport-Layer Services and Principles, Multiplexing and Demultiplexing Applications, Connection Oriented and Connectionless services, UDP and TCP, Connection Establishment & Termination, Transport Layer Protocols (go back N, stop and wait, selective repeat), Flow Control and Error Control, TCP Congestion Control, Attack and vulnerability issues in Transport layer: Transport	8
4.	The Network	Introduction and Network Service Model, Internet Protocol (IP), Fragmentation & addressing, Routing	9

	Layer	Principles, Routing in the Internet, IPSec Architecture: Authentication Header (AH) and Encapsulating Security Payload (ESP)	
5.	The Link Layer and Local Area Networks	The Data Link Layer: Introduction, Services, Error Detection and Correction, Multiple Access Protocols and LANs, LAN Addresses and ARP, IEEE MAC Security Standard, MACSec (802.1AE)	6
6.	Cryptography	Introduction to principles and theories of Cryptography, Cryptography basics: Plain Text, Cipher Text, Encryption Algorithm, Decryption Algorithm, Cryptanalysis and attacks, Symmetric Ciphers: Conventional Symmetric Encryption Algorithms Symmetric vs Asymmetric Block and Stream ciphers, DES: DES Structure & DES Security, Asymmetric Ciphers: Public Key Cryptography Principles & Applications, RSA, Diffie-Hellman Key Exchange, RC4 and RC5, Hash Functions Message Digest MD5,SHA1	8
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (PBL=10 + Assignments =10, Attendance=5)
Total	**100**

Project Based Learning: Each student in a group of 3-4 will select a real world application where networking and security concepts are involved. Study the literature around the chosen application. The application will be developed with the use of any open source platform and simulators in its sister lab course. This enhances the student's knowledge on secured communication applications and helps in enhancing their employability into related sector.

Recommended Reading material:

Text Books

1. James Kurose, Keith Ross, "Computer Networking: A Top-Down Approach Featuring the Internet",Pearson Education, Inc, Seventh edition, 2017
2. Andrew S. Tanenbaum , "Computer Networks", Prentice-Hall Publishers; 5e (5th Edition), 2013
3. William Stallings, "Data and Computer Communications", Pearson, Tenth edition, 2014
4. Behrouz A Forouzan, DebdeepMukhopadhyay, "Cryptography & Network Security", Chennai McGraw Hill Education (India) Private Limited, Third edition, 2015
5. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson, Seventh Edition, 2017

Reference Books

6. Larry Peterson , Bruce Davie , "Computer Networks a Systems Approach", Morgan Kaufmann
7. Douglas E. Comer, "Computer Networks and Internets", Pearson Education; Sixth edition (15 April 2018)
8. ChristofPaar, Jen Pelzl, "Understanding Cryptography", Springer

Journals

9. USENIX Security Symposium
10. ACM Transactions on Information and system security
11. IEEE Press Computer Security and Privacy

Detailed Syllabus
Lab-wise Breakup

Course Code	18B15CS212	**Semester:** Odd	**Semester:** V	**Session:** 2021-2022
			Month from Aug to Dec	
Course Name	Computer Networks and Security Lab			
Credits	1	**Contact Hours**	0-0-2	
Faculty (Names)	**Coordinator(s)**	Kavita Pandey		
	Teacher(s)	Kavita Pandey		

COURSE OUTCOMES		**COGNITIVE LEVEL**
C370.1	Classify wired network technologies and basic building blocks in computer networks.	Understand level (Level 2)
C370.2	Visualize and analyze the packets of different TCP/IP Layers and security protocols of TCP/IP Protocol Suite in Wireshark.	Analyze level (Level 4)
C370.3	Build UDP and TCP client server applications using socket programming and secured key exchange algorithms.	Apply level (Level 3)
C370.4	Estimate the performance of the Protocols using Network Simulator.	Evaluate level (Level 5)
C370.5	Examine various security techniques to solve real world problems.	Analyze level (Level 4)

Module No.	**Title of the Module**	**Topics in the module**	**CO**
1.	Introduction	Introduction to Computer Network devices / UNIX Commands for TCP/IP Protocol Suite	C370.1
2.	Wireshark Simulator	Capturing, study and analysis of Application Layer, Transport Layer and Network Layer packet communication (*.pcap) files and Security Protocols in Wireshark	C370.2
3.	Socket Programming	UDP and TCP client server socket programming. Client server communication for symmetric key, asymmetric key cryptographic techniques and key exchange algorithms	C370.3
4.	Network Simulator (NS2)	Modeling of wired communication network, Performance estimation of the protocols at Network and Transport layer.	C370.4

5.	Application Development	Development of secured applications to solve real world problems	C370.5

Evaluation Criteria

Components	**Maximum Marks**
Lab Test -1	20
Lab Test -2	20
Lab Evaluations	25
Project	20
Attendance	15
Total	**100**

Project Based Learning: Each student in a group of 3-4 will select a real world application and analyze the different layers of the network model. Understand the various challenges related to sending the data in a secured manner. By getting the knowledge in the chosen domain from the PBL component of sister theory course, implement the application using open source platforms, simulator,etc. This enhances the student's knowledge on secured communication applications and helps in enhancing their employability into related sector.

Text Books

1. UNIX Network Programming, Volume 1, Second Edition: Networking APIs: Sockets and XTI, Prentice Hall, 1998, ISBN 0-13-490012-X.
2. Anish Nath, "Packet Analysis with Wireshark Paperback," Packt Publishing
3. Abhishek Ratan, et.al., Python Network Programming: Conquer all your networking challenges with the powerful Python language 1st Edition, 2019
4. Teerawat Issariyakul, Ekram Hossain, "Introduction to Network Simulator NS2", Springer.

Reference Books

5. John Goerzen, Foundations of Python Network Programming: The comprehensive guide to building network applications with Python, 2nd ed. Edition, 2010
6. W. Richard Stevens , TCP/IP Illustrated, Vol. 1: The Protocols (Addison-Wesley Professional Computing Series) 1st Edition, 1994
7. Yoram Orzach, "Network Analysis Using Wireshark Cookbook," Packt Publishing
8. NS3 Documentation, available at https://www.nsnam.org/documentation/
9. Behrouz A Forouzan, Debdeep Mukhopadhyay, "Cryptography & Network Security", Chennai Mc Graw Hill Education (India) Private Limited, Third edition, 2015
10. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson, Seventh Edition, 2017

Detailed Syllabus
Lecture-wise Breakup

Course Code	19B12HS311	**Semester:** ODD	**Semester:** V **Session:** 2021-22 **Month from** Aug to Dec
Course Name	Entrepreneurship Development		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr Badri Bajaj
	Teacher(s) (Alphabetically)	Dr Badri Bajaj

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

Module No.	**Title 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

Detailed Syllabus
Lecture-wise Breakup

Course Code	20B12CS331	**Semester**: Odd	**Semester:** V	**Session:** 2021-2022
			Month from: Aug to Dec	
Course Name	Fundamentals of Machine Learning			
Credits	3	**Contact Hours**	3-0-0	
Faculty (Names)	**Coordinator(s)**	Dr. Parul Agarwal, Dr. Mukesh Saraswat (J128)		
	Teacher(s) (Alphabetically)	Dr. Mukesh Saraswat, Dr. Parul Agarwal		

COURSE OUTCOMES		**COGNITIVE LEVELS**
C330-1.1	Understand the mathematical concepts of machine learning approaches.	Understand Level (C2)
C330-1.2	Apply the fundamentals of linear algebra and probability theory to the machine learning problems.	Apply Level (C3)
C330-1.3	Apply the concepts of regression analysis and vector calculus to the machine learning models.	Apply Level (C3)
C330-1.4	Analyze the role of dimensionality reduction and density estimation for machine learning problems	Analyze Level (C4)
C330-1.5	Evaluate and test the significance of machine learning results statistically.	Evaluate Level (C5)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Introduction	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 Semester Examination	35
TA	25 (Attendance (10), Quiz/ Assignments in PBL mode/etc (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 Books:

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

Reference Books:

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

Detailed syllabus
Lecture-wise Breakup

Course Code	20B12CS332	**Semester:** Odd	**Semester** V **Session:** 2021 -2022 **Month from:** Sep **to** Dec
Course Name	Fundamentals of Computer Security		
Credits	3	**Contact Hours**	3-1-0

Faculty (Names)	**Coordinator(s)**	Dr.Charu Gandhi(128), Dr. Sangeeta Mittal(62)
	Teacher(s) (Alphabetically)	Dr.Charu Gandhi(128), Dr. Sangeeta Mittal (62)

COURSE OUTCOMES		**COGNITIVE LEVELS**
C330-2.1	Explain the fundamental concepts of computer security and malware types	Remember Level (C1)
C330-2.2	Identify types of cryptographic techniques and working of classical cryptosystems	Understand Level (C2)
C330-2.3	Describe authentication and access control paradigms	Understand Level (C2)
C330-2.4	Apply proactive solutions to security like Firewalls and IDS	Apply Level (C3)
C330-2.5	Describe legal and ethical issues with respect to information security	Understand Level (C2)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Security Basics	General overview, terminology and definitions, Security models and 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
4.	Access Control	Access Policies, Implementing Access Control, Procedure-Oriented Access Control, Role-Based Access Control, Captchas	5
5.	Intrusion Detection and Response	Goals for Intrusion Detection Systems, Types of IDSs – Anomaly Based and Signature Based ,Intrusion Prevention Systems, Intrusion Response	5
6.	Firewalls	What Is a Firewall?, Design of Firewalls, Types of Firewalls, Personal Firewalls, Comparison of Firewall Types, Example Firewall Configurations Network Address Translation (NAT), Data Loss Prevention	3

7.	Legal and Ethical Issues	Protecting Programs and Data - Copyrights, Patents, Trade Secrets, Information and the Law - Information as an Object, Legal Issues Relating to Information, Protection for Computer Artifacts, Ethical Issues in Computer Security	4
		Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance-07, Class Test/ Quiz-07, Internal assessment-05, Assignment-06)
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. Applying these concepts will 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:** V **Session:** 2021 -2022 **Month from** Sep to Dec
Course Name	Introduction to Big Data & Data Analytics		
Credits	3	**Contact Hours**	4

Faculty (Names)	**Coordinator(s)**	Dr. Bharat Gupta (62), Dr. Neeraj Jain (128)
	Teacher(s) (Alphabetically)	Dr. Bharat Gupta, Dr. Neeraj Jain

COURSE OUTCOMES		**COGNITIVE LEVELS**
C330-3.1	To understand the fundamental concepts of growing field of big data analytics	Understand Level [Level 2]
C330-3.2	To demonstrate the tools required to manage and analyze big data like Hadoop, NoSql MapReduce	Apply Level [Level 3]
C330-3.3	To apply predictive models and advanced computing paradigms for big data analytics	Apply Level [Level 3]
C330-3.4	To analyze the big data using intelligent & visualization techniques	Analyze Level [Level 5]
C330-3.5	To design and create predictive and mathematical model to solve complex real-world problems for decision making.	Apply Level [Level 3]

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 Map Reduce, Testing and Debugging Map Reduce Applications	7

Total number of Lectures	**42**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance-07, Class Test/ Quizze-07, Internal assessment-05, Assignments-06)
Total	**100**

Project based learning: The number of students in mini-project will be between 2-3. The project members will design, develop and implement the big data application by using Python language.

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 real time 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.

Detailed Syllabus
Lecture-wise Breakup

Course Code	20B12CS334	**Semester:** Odd	**Semester:** V **Session:** 2021 - 2022 **Month from** Sep to Dec
Course Name	Object Oriented Analysis and Design Using JAVA		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Raju Pal (J128) and Dr. Sulabh Tyagi (J62)
	Teacher(s) (Alphabetically)	Dr. Raju Pal (J128) and Dr. Sulabh Tyagi (J62)

COURSE OUTCOMES		**COGNITIVE LEVELS**
C330-4.1	Illustrate Object-Oriented Design and convert it to its code using JAVA Programming language.	Understand Level (C2)
C330-4.2	Dissect the requirements to identify the potential use cases, classes and objects in the system.	Analyze Level (C4)
C330-4.3	Build UML diagrams such as class diagram, object diagram for structural modelling and state chart diagram, sequence diagrams for behavioural modelling.	Apply Level (C3)
C330-4.4	Create solutions to solve real world problems. using object-oriented analysis and design principles.	Apply Level (C3)
C330-4.5	Estimate the complexity of object-oriented designs using several 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: Benefits and Understanding the challenges OOAD can address, Overview of Software Development Life Cycle (SDLC) & Rational Unified Process (RUP), Object-Oriented Requirements Elicitation & Analysis and Systems Behavior, Quality Attributes, Software Architect and Design Roles in Industry, Conceptual and Technical Designs, Competing Qualities and Trade-offs, Record, Organize, and Refine Components	12
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	3

3.	Object Oriented analysis with UML	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, 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 Behaviour, Activity, Do-activity, Entry Activity, Exit Activity, Nested State Diagram, Nested States, Signal Generalization, Concurrency, Activity and Swim lane diagram, Elements of Component and deployment Diagram Object Constraint	8
4.	Converting Design to Code in JAVA	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	10
5.	Design Principles	SOLID principles, Cohesion, Coupling, techniques for good Object-Oriented design, separation of concerns, information hiding, and conceptual integrity	5
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 student in a group of 3-4 have to work on a mini-project, in which they will identify a real-life problem and develop the solution by applying their knowledge of object-oriented approach. The project implementation should be in JAVA preferably along with well documentation on different aspects of the software. This enhances the understanding of students towards different concepts of object-oriented approach and also helps them during their employability.

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

Detailed Syllabus Lecture-wise Breakup

Course Code	20B12CS335	**Semester:** Odd	**Semester**: V **Session**: 2021 -2022 **Month from** Sep to Dec
Course Name	Image Processing and Computer Vision		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr.Pawan Kumar Upadhyay
	Teacher(s) (Alphabetically)	Dr.Pawan Kumar Upadhyay

COURSE OUTCOMES		**COGNITIVE LEVELS**
C330-5.1	Understand the basic concepts of computer vision and image processing	Understand Level(C2)
C330-5.2	Apply different methods for intensity transformation, binary imageprocessing and Fourier transformation	Apply Level (C3)
C330-5.3	Apply different spatial and spectral domain filters for image enhancements	Apply Level (C3)
C330-5.4	Apply thresholding, edge-based and region-based techniques for image segmentation	Apply Level (C3)
C330-5.5	Apply image processing techniques for various computer vision tasks	Apply Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of lectures for the module**
1.	Fundamentals Of DigitalImage Processing and Computer Vision	Introduction to Computer Vision and Image Processing, Image geometry, Fundamental steps in Digital Image Processing, Applications with examples of Imaging Modalities, Elements of Visual Perception, Image Sensing and Acquisition, Sampling and Quantization, Basic Relationships Between Pixels	5
2.	Basic Mathematical Tools for Intensity Transformations	Element-wise versus Matrix Operations, Linear versus Nonlinear Operations, Arithmetic Operations, Set and Logical Operations, Spatial Operations, Vector and Matrix Operations, Image Transforms, Probability and Random Variables, Image Negatives, Log Transformations, Power-Law (Gamma) Transformations, Piecewise Linear Transformation Functions, Histogram Processing	5
3.	Binary Image Processing	Formation of Binary Image, Thresholding, Geometric properties, Projections, Run length encoding, Binary algorithms, Morphological operators	4
4.	Spatial Filtering	Mechanics of Linear Spatial Filtering, Spatial Correlation and Convolution, Separable Filter Kernels, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters, Highpass, Bandreject, and Bandpass Filters from Lowpass Filters, Combining Spatial Enhancement Methods	5

5	Sampling and Fourier Transformation	Complex Numbers, Fourier Series, Impulses and their Sifting Properties, The Fourier Transform of Functions of One Continuous Variable, Convolution, The Fourier Transform of Sampled Functions, The Sampling Theorem, Aliasing, Function Reconstruction (Recovery) from Sampled Data, Discrete Fourier Transform of One Variable and two variables, Properties of the 2-D DFT and IDFT, The Fast Fourier Transform	4
6.	Frequency Domain Filtering	Basics of Filtering in the Frequency Domain, Image Smoothing Using Lowpass Frequency Domain Filters, Image Sharpening Using Highpass Filters, Selective Filtering	3
7.	Image Segmentation	Point, Line, and Edge Detection, Image Gradient and Its Properties, The Canny Edge Detector, Local Processing and Global Processing Using Hough Transform, Basic Global Thresholding, Optimum Global Thresholding Using Otsu's Method, Segmentation by Region Growing and by Region Splitting and Merging.	6
8.	Computer Vision Applications	Case Studies like OCR, Scene understanding, Gesture recognition etc. using basic image processing techniques.	10
		Total number of Lectures	42

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (Attendance-07, Class Test/ Quizze-07, Internal assessment-05, Assignments-06)
Total	**100**

Project Based Learning: To be mapped from PBL components which will improve their fundamental concept of image processing and computer vision with automation skills by making them available for various applications of Healthcare, entertainment and education learning jobs in IT industry.

Text Books:

1،	Digital Image Processing 4th Edition by Rafael C Gonzalez, PEARSON INDIA, May 2018.
2.	Computer Vision and Image Processing: Fundamentals and Applications by Manas KamalBhuyan, CRC Press; 1 edition, Oct 2019.

Reference Books:

1.	Computer Vision: Algorithms and Applications by Richard Szeliski, Springer, 2010.
2.	Machine Vision by Ramesh Jain, Rangachar Kasturi, Brian G. Schunck, McGraw-Hill, Inc., ISBN 0-07-032018-7, 1995

Detailed Syllabus
Lecture-wise Breakup

Course Code	20B13HS311	**Semester:** Odd	**Semester:** V **Session:** 2021-22 **Month from** Sep to Dec
Course Name	**Indian Constitution and Traditional Knowledge**		
Credits	3	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Chandrima Chaudhuri
	Teacher(s) (Alphabetically)	• Dr. Chandrima Chaudhuri • Dr. Niti Mittal • Dr. Praveen Sharma • Dr. Swati Sharma

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 Level (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 Level (C2)
C305.3	Analyze the working of Indian federalism with reference to centre-state relations	Analyze Level (C4)
C305.4	Analyze the impact of the contemporary challenges such as caste and gender to the working of Indian democracy	Analyze Level (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) • Amendments to the constitution	8
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

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

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 provisions	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 Based Learning: 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.

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

Detailed Syllabus
Lecture-wise Breakup

Course Code	21B12HS312	**Semester**: Odd	**Semester**: V **Session**: 2021 -2022 **Month from** Sep to Dec
Course Name	Management Accounting		
Credits	03	**Contact Hours**	3-0-0

Faculty (Names)	**Coordinator(s)**	Dr. Mukta Mani
	Teacher(s) (Alphabetically)	Dr. Mukta Mani

COURSE OUTCOMES		**COGNITIVE LEVELS**
C303-10.1	To understand and analyse the financial statements of a business organization	Analyse Level (C4)
C303-10.2	To apply cost concepts and cost-volume-profit analysis in decision making	Apply Level (C3)
C303-10.3	To understand the concepts of cost management and apply activity-based costing	Apply Level (C3)
C303-10.4	To analyse relevant information for decision making	Analyse Level (C4)
C303-10.5	To apply the concepts of accounting for planning and control	Apply Level (C3)

Module No.	**Title of the Module**	**Topics in the Module**	**No. of Lectures for the module**
1.	Basic Accounting	Concepts, Techniques and Conventions	4
2.	Understanding and analysing financial statements	Balance sheet, Income statement, statement of changes in stockholders' equity, statement of cash flows, Use of ratios for analysis	6
3.	Introduction to Management accounting	Management Accounting in service organizations, Management Process and accounting, Ethical conduct for accountants	4
4.	Introduction to cost behaviour	Identifying resources, Activities, Costs and Cost drivers; Variable and Fixed cost behaviour; Cost-Volume-Profit Analysis	4
5.	Measurement of	Cost drivers, Management influence on cost behaviour,	3

	Cost behaviour	Cost functions	
5.	Cost Management Systems and Activity-Based costing	Direct, Indirect cost; Cost allocation; Traditional and Activity Based costing systems	4
6.	Relevant information for decision making	Relevant information for Pricing decisions and operational decisions	7
6.	Budgetary Control	Introduction to budgets; Functional budgets, Master budget, Fixed and flexible budgets, Budgets as financial planning models	4
7.	Standard Costing and Variance analysis	Standard costing system, Variance analysis	3
8.	Management control systems and responsibility accounting	Management control system, Organizational goals, controllability and measurement of financial performance, measures of profitability, ROI or Economic profit	3
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 product, two services or one product & one service. They will estimate the fixed and variable costs related to the business and carry-out 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 projected master budget for next three years which include 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.

Detailed Syllabus
Lab-wise Breakup

Course Code	21B19CS212	**Semester:** Odd	**Semester:** V **Session:** 2021-2022 **Month from** Sep to Dec
Course Name	Programming Fundamentals Lab		
Credits	1	**Contact Hours**	2

Faculty (Names)	**Coordinator(s)**	Purtee Kohli
	Teacher(s) (Alphabetically)	Purtee Kohli

COURSE OUTCOMES		**COGNITIVE LEVELS**
C380.1	Write programs using conditional and loop statements in C.	Apply Level [Level 3]
C380.2	Write programs using concepts of array, structure, pointers and function in C.	Apply Level [Level 3]
C380.3	Write programs in C++ to implement OOPs concepts related to objects, classes, constructor, destructor, and friend function.	Apply Level [Level 3]
C380.4	Write programs in C++ using OOPs concept like encapsulation, inheritance, polymorphism and abstraction.	Apply Level [Level 3]
C380.5	Implement different operations on basic stack, queue and tree data structures with sorting techniques	Apply Level [Level 3]
C380.6	Apply all in the project doing	Apply Level [Level 3]

Module No.	**Title of the Module**	**Topics in the module**	**No. of Lab**	**CO**
1	C Programming Fundamentals	To explore various data types, Conditional Statements: IF, IF-ELSE, ESLEIF, Switch-Case, Looping: FOR, WHILE, DO-WHILE.	1	C380.1
2	Structures, Pointers & Arrays	To explore questions Structure Definition, Structure Handling, Introduction to Pointers, Arrays.	2	C380.2
3	C Programming Functions	To explore Function Definition, Function Declaration, Call by Value, Call by Reference, Recursions.	1	C380.2
4	Object Oriented Fundamentals using C++	To explore Objects, Classes, Methods, implementing functions in the class, use of scope resolution operator, Access Modifiers, static functions and static data members, constructor and destructors,	2	C380.3
5	OOP Advanced Concepts	Do lab assignments to explore Inheritance: single, multiple, multi-level and hybrid, Polymorphism: function and	1	C380.4

		operator overloading, virtual member functions, abstract base classes and pure virtual functions, Introduction to SDLC.		
6	Basic Data Structures using C	To explore Stacks, Stack, Queue (array-based implementation). Circular Queue and Deque using array, 1D-Linked list, 2D-Link list application, Binary trees, Binary tree Implementation: array and pointer based	2	C380.5
7	Searching & Sorting	To explore Searching Techniques: Linear Search, Binary Search; Sorting: Bubble Sort, Insertion Sort, Selection Sort.	1	C380.5
8	UmL modeling	Introduce and explore concept and Use case in detail	1	C380.3
9	Class diagram	Introduce and explore class diagram and how to make it	1	C380.3
		Total number of Labs	**12**	

Evaluation Criteria

Components	**Maximum Marks**
Lab test 1	15
Lab test 2	15
Internal component	40 (Eval1,Eval2,viva work)
TA	20 (Assignment+ Attendance)
Total	**100**

Project based learning: Each student in a group of 3-4 will have to develop a mini project based on object-oriented programming concepts and Data Structure. The students have to design the class diagram for any real-world application and organize its related data using appropriate data structure. The students have to implement the mini project using C++ language. Project development and its presentation will enhance the 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)

1	Herbert Schildt. “The Complete Reference C++ ”, 4th Edition, TMH, 2017
2	Yashavant P Kanetkar,”Let Us C” (2016). BPB Publications, 15th Edition.
3	Herbert Schildt. “The Complete Reference C ”, 4th Edition, TMH, 2017
4	E Balaguruswamy , Object Oriented Programming With C++ , 7th Edition , TMH, 2017
5	UML 2.0 in a Nutshell [Book] - O'Reilly Media
6	https://www.youtube.com/watch?v=Umm1ZQ5ltZw in hindi

Detailed Syllabus
Lecture-wise Breakup

Subject Code	21BI9CS211	**Semester:** Odd	**Semester:** V **Session:** 2021-2022 **Month from** Sep to Dec
Subject Name	Programming Fundamentals		
Credits	1	**Contact Hours**	1-0-0

Faculty (Names)	**Coordinator(s)**	Purtee Kohli
	Teacher(s) (Alphabetically)	Purtee Kohli

COURSE OUTCOMES		**COGNITIVE LEVELS**
C360.1	Introduce basic object oriented briefly different from normal procedural	Analyze Level [Level 4]
C360.2	Principles of object oriented	Analyze Level [Level 4]
C360.3	Represent knowledge and with the object oriented concepts	Apply Level [Level 3]
C360.4	Apply model object orient concepts of in complete and in a case study	Apply Level [Level 3]
C360.5	Introduce them to for various important types use case, object, class diagram UML types.	Apply Level [Level 3]

Module No.	**Title of the Module**	**Topics covered in the module**	**No. of Lectures for the module**
1	C Programming Fundamentals	Datatypes, Conditional Statements: IF, IF-ELSE, ESLEIF, Switch-Case, Looping: FOR, WHILE, DO-WHILE.	2
2	Structures, Pointers & Arrays	Structure Definition, Structure Handling, Introduction to Pointers, Arrays.	2
3	C Programming Functions	Function Definition, Function Declaration, Call by Value, Call by Reference, Recursions.	1
4	Object Oriented Fundamentals using C++	Objects, Classes, Methods, implementing functions in the class, use of scope resolution operator, Access Modifiers, static functions and static data members, constructor and destructors,	2
5	OOP Advanced Concepts	Inheritance: single, multiple, multi-level and hybrid, Polymorphism: function and operator overloading, virtual member functions, abstract base classes and pure virtual functions, Introduction to SDLC.	2.5
6	Basic Data Structures using C	Stacks, Stack, Queue (array-based implementation). Circular Queue and Deque using array, 1D-Linked list, 2D-Link list application, Binary trees, Binary tree	2.5

		Implementation: array and pointer based	
7	Searching & Sorting	Searching Techniques: Linear Search, Binary Search; Sorting: Bubble Sort, Insertion Sort, Selection Sort.	2
		Total number of Lectures	**14**

Evaluation Criteria

Components	**Maximum Marks**
T1	20
T2	20
End Semester Examination	35
TA	25 (5 Tutorial/Assignment+ 10 Attendance+10 Project)
Total	**100**

Project based learning: Each student in a group of 3-4 will have to develop a mini project based on object-oriented programming concepts and Data Structure. The students have to design the class diagram for any real-world application and organize its related data using appropriate data structure. The students have to implement the mini project using C++ language. Project development and its presentation will enhance the 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)

1	Herbert Schildt. “The Complete Reference C++ ”, 4th Edition, TMH, 2017
2	Yashavant P Kanetkar,”Let Us C” (2016). BPB Publications, 15th Edition.
3	Herbert Schildt. “The Complete Reference C ”, 4th Edition, TMH, 2017
4	E Balaguruswamy , Object Oriented Programming With C++ , 7th Edition , TMH, 2017
5	UML 2.0 in a Nutshell [Book] - O'Reilly Media
Youtube link	https://www.youtube.com/watch?v=Umm1ZQ5ltZw in hindi