

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

|                    |   |   |   |
|--------------------|---|---|---|
| <b>Course Code</b> | 15B11CI412                                | <b>Semester Odd</b><br>(specify Odd/Even) | <b>Semester V Session</b> 2023-24<br><b>Month from</b> July to Dec 2023 |
| <b>Course Name</b> | Operating Systems and Systems Programming |   |   |
| <b>Credits</b>     | 4   | <b>Contact Hours</b>                      | 3-1-0   |

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

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

| <b>Module No.</b> | <b>Title of the Module</b>  | <b>Topics in the Module</b>   | <b>No. of Lectures for the module</b> |
|-------------------|---|---|---------------------------------------|
| 1.                | 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.<br>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, Tizen Operating System  | 2 |
| 11. | System Programming                                      | Introduction, Components of a Programming System: Assemblers, Loaders, Macros, Compilers, Formal System.   | 2 |
| 12. | Interrupts and Exceptions                               | Synchronous and asynchronous interrupts, Calling a System Call from User Space, INT, Trap Handling, System call dispatch, arguments and return value, Device Interrupts.           | 2 |
| 13. | Kernel Synchronization, System Calls and System Signals | Disabling Interrupts, Lock Implementation, Linux Synchronization Primitives  | 2 |

**Total number of Lectures**      **42**

**Evaluation Criteria**

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

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

|    |  |
|----|--|
| 1. | William Stallings, “OPERATING SYSTEMS INTERNALS AND DESIGN PRINCIPLES”.  |
| 2. | Andrew S. Tanenbaum, “Operating Systems Design and Implementation”, Third Edition, Prentice Hall Publications 2006 |
| 3. | A.S. Tanenbaum, “Modern Operating Systems”, 2 <sup>nd</sup> 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              |

|            |   |
|------------|---|
| <b>7.</b>  | D. M. Dhamdhere, “ Systems Programming and Operating systems” TMH, 2 <sup>nd</sup> revised edition.2006                                 |
| <b>8.</b>  | ACM/IEEE transactions on operating systems concepts.  |
| <b>9.</b>  | <a href="http://www.vmware.com">www.vmware.com</a>  |
| <b>10.</b> | <a href="http://www.luitinfotech.com/kc/what-is-cloud-computing.pdf">www.luitinfotech.com/kc/what-is-cloud-computing.pdf</a>            |
| <b>11.</b> | <a href="https://cs162.eecs.berkeley.edu/static/sections/section8.pdf">https://cs162.eecs.berkeley.edu/static/sections/section8.pdf</a> |
| <b>12.</b> | Charles Crowley “Operating System A Design Approach” TMH.   |

## Detailed Syllabus

### Lab-wise Breakup

|                     |   |  |  |
|---------------------|---|--|--|
| <b>Subject Code</b> | 15B17CI472                                  | <b>Semester Even</b><br>(specify Odd/Even) | <b>Semester V Session</b> 2023-2024<br><b>Month:</b> July-Dec 2023 |
| <b>Subject Name</b> | Operating System and System Programming Lab |  | NBA Code: C275   |
| <b>Credits</b>      | 0-0-1                                       | <b>Contact Hours</b>                       | 2  |

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

| <b>COURSE OUTCOMES</b> |   | <b>COGNITIVE LEVELS</b>       |
|------------------------|---|-------------------------------|
| <b>C275.1</b>          | Demonstration of Various Unix Commands.   | Understand Level<br>(Level 2) |
| <b>C275.2</b>          | Develop programs to create different types of processes under Linux environment.  | Apply Level (Level 3)         |
| <b>C275.3</b>          | Develop programs to implement resource management task like CPU scheduling algorithms, deadlock handling.   | Apply Level (Level 3)         |
| <b>C275.4</b>          | Develop programs to implement and test various synchronization techniques like semaphores, binary semaphore and monitors via different classical test suites. | Apply Level (Level 3)         |
| <b>C275.5</b>          | Examine the various disk-scheduling algorithms, memory management schemes, file management systems.   | Analyze Level (Level 4)       |

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

#### **Evaluation Criteria**

|                   |   |
|-------------------|---|
| <b>Components</b> | <b>Maximum Marks</b>  |
| <b>Lab Test-1</b> | <b>20</b>   |
| <b>Lab Test-2</b> | <b>20</b>   |
| <b>Day-to-Day</b> | <b>60</b> (Mini Project-20, Lab Assessment-30, Attendance-10) |
| <b>Total</b>      | <b>100</b>  |

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

|   |   |
|---|---|
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc.) |   |
| <b>Text book(s)</b>   |   |
| 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”, 2 <sup>nd</sup> edition, Prentice Hall India.                         |
| 4.  | A.Silberschatz, P.Galvin, G. Gagne, “Operating systems concepts” Willey international company (Ninth edition)     |
| <b>Reference Book(s)</b>  |   |
| 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.  | <a href="http://www.vmware.com">www.vmware.com</a>  |

**Detailed Syllabus**  
**Lab-wise Breakup**

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

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

| <b>COURSE OUTCOMES</b> |   | <b>COGNITIVE LEVELS</b>    |
|------------------------|---|----------------------------|
| <b>C375.1</b>          | 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) |
| <b>C375.2</b>          | Implement python programs using lists, tuples, dictionaries, functions, Numpy, SciPy and Matplotlib.  | Apply Level (Level 3)      |
| <b>C375.3</b>          | Develop python programs to scrap and process data using Beautiful Soup, pandas and MongoDB.   | Apply Level (Level 3)      |
| <b>C375.4</b>          | Analyze baseline methods for pre-processing, clustering and classification algorithms using scikit-learn python libraries.  | Analyze Level (Level 4)    |
| <b>C375.5</b>          | Build J2EE Programs using JDBC Connectivity with SQL Database and Apache/ Glassfish as web servers.   | Create Level (Level 6)     |

| <b>Module No.</b> | <b>Title of the Module</b>                                     | <b>List of Experiments</b>  | <b>CO</b> | <b>#Labs</b> |
|-------------------|--|---|-----------|--------------|
| 1.                | Introduction to GitHub & Sustainable Development Goals (SDG's) | <ul style="list-style-type: none"> <li>Read and explore the Github and Sustainable Development Goals.</li> <li>Create a simple program and upload it on Github.</li> <li>Extract one open source project from Github. Perform the reverse engineering of the same.</li> </ul> | C375.1    | 1            |
| 2.                | Introduction To Python   | <ul style="list-style-type: none"> <li>Making use of lists, tuples, and dictionaries, indexing and slicing to access data</li> </ul>  | C375.2    | 1            |
| 3.                | Python   | <ul style="list-style-type: none"> <li>Create user defined functions using built-in functions such as <b>filter (f, a)</b> from python libraries.</li> </ul>  | C375.2    | 2            |
| 4.                | Numpy, SciPy, Matplotlib (Python)                              | <ul style="list-style-type: none"> <li>Write python programs using various functions of Numpy, SciPy and Matplotlib library.</li> </ul>   | C375.2    | 2            |
| 5.                | Beautiful Soup (Python), Pandas, MongoDB                       | <ul style="list-style-type: none"> <li>Write a program using Beautiful Soup for scrapping data from the web, store in csv files and process them.</li> <li>Write a program for processing data stored in MongoDB using Pandas.</li> </ul>                                     | C375.3    | 2            |

|                            |  |   |        |   |
|----------------------------|--|---|--------|---|
| 6.                         | Java Script, Java Servlet and Java Server Pages. | <ul style="list-style-type: none"> <li>• Write programs for building web-pages using java script.</li> <li>• Buildweb-based applications using server-side programming – Java Server Pages (JSP) and Java Servlet.</li> </ul> | C375.5 | 1 |
| 7.                         | Scikit-Learn (Python)                            | <ul style="list-style-type: none"> <li>• Write python programs for data analysis, feature engineering, clustering and classification.</li> </ul>  | C375.4 | 2 |
| <b>Evaluation Criteria</b> |  |   |        |   |
| <b>Components</b>          |  | <b>Maximum Marks</b>  |        |   |
| LabTest1                   |  | 20  |        |   |
| LabTest2                   |  | 20  |        |   |
| Evaluation /Quiz           |  | 30 Quiz 1 (15)+ Quiz 2 (15)   |        |   |
| Attendance                 |  | 15  |        |   |
| PBL                        |  | 15  |        |   |
| -----                      |  |   |        |   |
| <b>Total</b>               |  | <b>100</b>  |        |   |

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

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

**Detailed Syllabus.**

|                    |                   |                |  |   |
|--------------------|-------------------|----------------|--|---|
| <b>Course Code</b> | <b>15B28CI582</b> |                | <b>Semester ODD</b><br>(specify<br>Odd/Even) | <b>Semester V</b><br><b>Session 2023 -2024</b><br>Aug-Dec |
| <b>Course Name</b> |                   | Multimedia Lab |  |   |
| <b>Credits</b>     |                   | 1              | <b>Contact Hours</b>                         | 0-0-2   |

|                        |                       |  |
|------------------------|-----------------------|--|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b> | Dr. Suma Dawn  |
|                        | <b>Teacher(s)</b>     | Ms. Purtee Kohli, Dr. Niyati Aggrawal, Dr. Suma Dawn |

| <b>COURSE OUTCOMES</b> |   | <b>COGNITIVE LEVELS</b>    |
|------------------------|---|----------------------------|
| <b>C372.1</b>          | Discuss storyboard creation and work with various image formats for raster and vector graphics.             | Understand Level (Level 2) |
| <b>C372.2</b>          | Perform tasks of 3D effect on text, create sketch-works, image restoration, and masking in Photoshop / GIMP | Apply Level (Level 3)      |
| <b>C372.3</b>          | Demonstrate Perspective drawing, logo designing in Illustrator / Inkscape                                   | Apply Level (Level 3)      |
| <b>C372.4</b>          | Perform tasks related to designing a graphic book.  | Apply Level (Level 3)      |

| <b>Module No.</b> | <b>Title of the Module</b>       | <b>List of Experiments</b>   | <b>CO</b>             | <b>No. of Labs</b> |
|-------------------|----------------------------------|--|-----------------------|--------------------|
| <b>1</b>          | Introduction to Digital Graphics | <ul style="list-style-type: none"> <li>Exploring Gimp Manual</li> <li>Exploring image formats</li> <li>Understanding Tool Box and Canvas</li> </ul>  | <b>C372.1</b>         | 1                  |
| <b>2</b>          | Raster Image Editing             | <ul style="list-style-type: none"> <li>Transform tool, selection tool, Brush tool, Text tool, Gradients, transparency, etc.</li> <li>Working with GIMP Layers</li> <li>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.</li> </ul> | <b>C372.1, C372.2</b> | 5                  |
| <b>3</b>          | Vector Image Editing             | <ul style="list-style-type: none"> <li>Creating SVG files</li> <li>Operating Inkscape tools – selection, node, tweak, Zoom, pencil, pen, text.</li> <li>Creating 2D &amp; 3D Drawing.</li> </ul>   | <b>C372.1, C372.3</b> | 5                  |
| <b>4</b>          | Projects                         | Graphic Compositions – Graphic Book / Cartoon Strip, etc   | <b>C372.4</b>         | 3                  |



| <b>Evaluation Criteria</b>   |                      |
|--|----------------------|
| <b>Components</b>  | <b>Maximum Marks</b> |
| Lab Test 1   | 20                   |
| Lab Test 2   | 20                   |
| Day-to-Day   | 60                   |
| (Evaluations/ Mini-Project/ Lab Assignments / Sincerity/ Interaction/ Attendance)  |                      |
| <b>Total</b>   | <b>100</b>           |
| <p><u>Project Based Learning:</u> 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.</p> <p><u>Activities/Content with direct bearing on Employability/ Entrepreneurship/ Skill development:</u><br/>The students study various designs and drawing structures to help them with the development of visual creations or 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.</p> |                      |

| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) |   |
|--|---|
| Multimedia   | <ol style="list-style-type: none"> <li>1. “Multimedia – An Introduction” by John Villamil and Louis Molina (2016).</li> <li>2. “Multimedia Magic” by Gokul, S (2016).</li> <li>3. <a href="https://www.javatpoint.com/gimp">https://www.javatpoint.com/gimp</a></li> </ol>  |
| GIMP   | <ol style="list-style-type: none"> <li>1. <a href="https://www.gimp.org/books/">https://www.gimp.org/books/</a></li> <li>2. <a href="https://www.gimp.org/">https://www.gimp.org/</a></li> <li>3. <a href="https://howtogimp.com/help/help-with-gimp/gimp-tutorials/">https://howtogimp.com/help/help-with-gimp/gimp-tutorials/</a></li> </ol>  |
| Inkscape   | <ol style="list-style-type: none"> <li>1. <a href="https://inkscape.org/">https://inkscape.org/</a></li> <li>2. <a href="https://wiki.inkscape.org/wiki/images/f/f2/Introduction_to_Inkscape_by_Gavin_Corley.pdf">https://wiki.inkscape.org/wiki/images/f/f2/Introduction_to_Inkscape_by_Gavin_Corley.pdf</a></li> <li>3. <a href="https://www.selfmadedesigner.com/inkscape-logo-tutorial/">https://www.selfmadedesigner.com/inkscape-logo-tutorial/</a></li> </ol>  |
| Adobe Photoshop CS5  | <ol style="list-style-type: none"> <li>1. “Adobe Photoshop CS5”, Classroom in a Book series, by Adobe Creative Team, Publisher(s): Adobe Press, ISBN: 9780321712967, 2013</li> <li>2. “The Adobe Photoshop Cs5 Book for Digital Photographers”, by Scott Kelby, 2013</li> <li>3. <a href="https://helpx.adobe.com/in/photoshop/photoshop-cs5-cs55-tutorials.html">https://helpx.adobe.com/in/photoshop/photoshop-cs5-cs55-tutorials.html</a></li> <li>4. <a href="https://tutsplus.com/tutorials/search/photoshop+cs5">https://tutsplus.com/tutorials/search/photoshop+cs5</a></li> </ol> |
| Adobe Illustrator CS5  | <ol style="list-style-type: none"> <li>1. “Adobe Illustrator CS5”, Classroom in a Book series, Publisher: Adobe Press, ISBN: 9780321713032, 2013.</li> <li>2. “Adobe Illustrator CS5 One-on-One”, by Deke McClelland, Publisher(s): O'Reilly Media, Inc., ISBN: 9780596808013, 2013.</li> <li>3. <a href="https://helpx.adobe.com/in/illustrator/tutorials.html">https://helpx.adobe.com/in/illustrator/tutorials.html</a></li> <li>4. <a href="https://www.gct.com.au/illustrator-cs5.html">https://www.gct.com.au/illustrator-cs5.html</a></li> </ol>                                   |
| Additional reading material may be given to the students as and when required.   |   |

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

|                    |                 |                                      |  |
|--------------------|-----------------|--------------------------------------|--|
| <b>Course Code</b> | 15B29CI591      | <b>Semester Odd</b><br>(specify Odd) | <b>Semester V Session 2023- 2024</b><br><b>Month from July to December</b> |
| <b>Course Name</b> | Minor Project-1 |                                      |  |
| <b>Credits</b>     | 2               | <b>Contact Hours</b>                 | 4  |

|                        |                                       |                                    |
|------------------------|---------------------------------------|------------------------------------|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>                 | ANKIT VIDYARTHI, ANUBHUTI MOHINDRA |
|                        | <b>Teacher(s)</b><br>(Alphabetically) | ALL FACULTY                        |

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

| <b>Evaluation Criteria</b> |                      |
|----------------------------|----------------------|
| <b>Components</b>          | <b>Maximum Marks</b> |
| Viva-1                     | 20                   |
| Viva-2                     | 20                   |
| D2D                        | 60                   |
| <b>Total</b>               | <b>100</b>           |

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

**Detailed syllabus**  
**Lecture-wise Breakup**

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

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

| <b>Module No.</b> | <b>Subtitle of the Module</b>       | <b>Topics in the module</b>  | <b>No. of Lectures for the module</b> |
|-------------------|-------------------------------------|--|---------------------------------------|
| <b>1.</b>         | Introduction to Positive Psychology | Overview, Perspectives, Classification and Measures: Human Strengths and Positive Outcomes.  | <b>6</b>                              |
| <b>2.</b>         | Prosocial Behavior                  | Empathy and Egotism; Altruism, Gratitude, and Forgiveness.   | <b>6</b>                              |
| <b>3.</b>         | 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  | <b>6</b>                              |
| <b>4.</b>         | Happiness                           | Happiness and its Traditions; Determinants- Subjective Well-Being Hedonic Basis of Happiness; Life Satisfaction; Self-Realization: The Eudaimonic Basis of Happiness<br>Happiness and Emotional Experiences; Other Facts of Life-Work & Unemployment; Intelligence; Education; and Religion. | <b>6</b>                              |

|                              |                       |  |           |
|------------------------------|-----------------------|--|-----------|
| 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         |
| <b>Total number of Hours</b> |                       |  | <b>42</b> |
| <b>Evaluation Criteria</b>   |                       |  |           |
| <b>Components</b>            |                       | <b>Maximum Marks</b>   |           |
| T1                           |                       | 20   |           |
| T2                           |                       | 20   |           |
| End Semester Examination     |                       | 35   |           |
| TA                           |                       | 25 (Project, Quiz, Attendance)   |           |
| <b>Total</b>                 |                       | <b>100</b>   |           |

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

|  |   |
|--|---|
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) |   |
| 1.   | Snyder, C.R., Lopez, S. J., & Pedrotti, J.T. <i>Positive Psychology: The Scientific and Practical Explorations of Human Strengths</i> , 4 <sup>th</sup> Ed., Sage Publications, 2018. |
| 2  | Steve, B., & Marie, C. <i>Positive psychology</i> , 1st Ed., Pearson Education India, 2014.   |
| 3.   | Boniwell, I., & Tunariu, A. D., <i>Positive Psychology: Theory, Research and Applications</i> , 2 <sup>nd</sup> Ed., McGraw-Hill Education, 2019.                                     |
| 4.   | Zelenski, J., <i>Positive Psychology: The Science of Well-being</i> , 1st Ed., Sage Publications, 2019.   |
| 5.   | Snyder, C. R., Lopez, S. J., Edwards, L. M., & Marques, S. C. (Eds.), <i>The Oxford handbook of positive psychology</i> . 1st Ed., Oxford university press, 2020.                     |

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

|                    |                      |                      |  |
|--------------------|----------------------|----------------------|--|
| <b>Course Code</b> | <b>16B1NHS433</b>    | <b>Semester: Odd</b> | <b>Semester: Session 2023-2024</b><br><b>Month from: July to Dec</b> |
| <b>Course Name</b> | Financial Management |                      |  |
| <b>Credits</b>     | 3                    | <b>Contact Hours</b> | 3 (3-0-0)  |

|                        |  |                                    |
|------------------------|--|------------------------------------|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>                  | Dr Mukta Mani, Dr. Sakshi Varshney |
|                        | <b>Teacher(s)<br/>(Alphabetically)</b> | Dr Mukta Mani, Dr. Sakshi Varshney |

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

| <b>Mod<br/>ule<br/>No.</b>      | <b>Title of the Module</b>  | <b>Topics in the Module</b>  | <b>No. of<br/>Lectures for<br/>the module</b> |
|---------------------------------|---|--|---|
| 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   |
| <b>Total number of Lectures</b> |   |  | <b>42</b>                                     |
| <b>Evaluation Criteria</b>      |   | <b>Maximum Marks</b>   |   |

|                          |   |
|--------------------------|---|
| <b>Components</b>        | 20                                      |
| T1                       | 20                                      |
| T2                       | 35                                      |
| End Semester Examination | 25 (Project+ Quiz+ Class participation) |
| TA                       | <b>100</b>                              |
| <b>Total</b>             |   |

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

|  |   |
|--|---|
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Textbooks, Reference Books, Journals, Reports, Websites etc. in the IEEE format) |   |
| 1.   | Chandra, P., <i>Financial Management Theory and Practice</i> , 11th ed., Tata McGraw Hill, 2022.  |
| 2.   | Horne, J.C.V. and Wachowicz, J.M. <i>Fundamentals of Financial Management</i> , 13th ed., Pearson Publication, 2009. Accessed online: <a href="https://wps.pearsoned.co.uk/ema_uk_he_wachowicz_fundfinman_13/106/27149/6950308.cw/-/6950310/index.html">https://wps.pearsoned.co.uk/ema_uk_he_wachowicz_fundfinman_13/106/27149/6950308.cw/-/6950310/index.html</a> |
| 3.   | Khan, M.Y. and Jain, P.K. <i>Financial Management: Text, Problems and Cases</i> , 8th ed., McGraw Hill Education, 2020.   |
| 4.   | Kishore, R.M., <i>Financial Management</i> , 8th ed, Taxmann, 2020  |
| 5.   | Mukherjee, M and Hanif, M., <i>Financial Accounting</i> , 8th ed., Tata McGraw Hill, 2008.  |
| 6.   | Pandey, I.M., <i>Financial management</i> , 12 <sup>th</sup> ed, Vikas Publishing House Pvt Ltd, 2021   |

**Detailed Syllabus  
Lecture-wise Breakup**

|                     |  |                      |   |
|---------------------|--|----------------------|---|
| <b>Subject Code</b> | 16B1NHS434   | <b>Semester: ODD</b> | <b>Semester V Session 2023-24<br/>July - December</b> |
| <b>Subject Name</b> | <b>Introduction to Contemporary Form of Literature</b> |                      |   |
| <b>Credits</b>      | <b>3</b>   | <b>Contact Hours</b> | <b>3 (3-0-0)</b>                                      |

|                        |                                    |   |
|------------------------|------------------------------------|---|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>              | <b>Dr Monali Bhattacharya (Sector 62)</b> |
|                        | <b>Teacher(s) (Alphabetically)</b> | <b>Dr Monali Bhattacharya</b>             |

**Course Outcomes:**

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

| <b>Module No.</b> | <b>Subtitle of the Module</b>  | <b>Topics in the module</b>  | <b>No. of Hours for the module</b> |
|-------------------|--|--|------------------------------------|
| 1.                | <b>Introducing Literary Theories</b>   | <ul style="list-style-type: none"> <li>• From Formalism to Reader Response Theory: Major Terms &amp; Concepts</li> <li>• Narrative Art &amp; Narratology</li> <li>• Language &amp; Style: An Introduction</li> </ul> | 12                                 |
| 2.                | <b>Introducing New Forms &amp; Sub Genres Today: Features &amp; Portions</b> | <ul style="list-style-type: none"> <li>• New Fiction: Graphic Novels, Cyberpunk</li> <li>• Non-Fiction: Memoirs &amp; Autobiographies, Biographies</li> </ul>  | 4                                  |

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

### Evaluation Criteria

| Components               | Maximum Marks                                     |
|--------------------------|---|
| T1                       | 20  |
| T2                       | 20  |
| End Semester Examination | 35  |
| TA                       | 25 (Assignment, Quiz, Project, Class Interaction) |
| <b>Total</b>             | <b>100</b>  |

PBL Component: Project: The project is to be submitted in two parts, a Digital Poster and a report. It is to be done in a group of 5-6 students.

Project : Comparative Analysis of any text with Penelopiad or Hayavadana in Digital Poster Format through application of theories & Report on the analysis and team effort.

Poster is to be made in comparative mode in narrative format (as per sample shared) using archetypal symbols & by applying formalism and reader-response theory to analyze its contemporary significance.

Report is to be made in 2-3 pages.

Students would take a text (Novel /play/adaption) of their choice which is based on some of the myths of East or West, but it should not be any of the texts taught in V Semester syllabus of this course to compare it with Penelopiad or Hayavadana.

### Recommended Reading material:

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

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

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

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

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

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

| <b>Module No.</b> | <b>Title of the Module</b>                           | <b>Topics in the Module</b>   | <b>No. of Lectures for the module</b> |
|-------------------|--|---|---------------------------------------|
| 1.                | Introduction   | Introduction to the Course  | 1                                     |
| 2.                | Theoretical Orientation                              | <ul style="list-style-type: none"> <li>• Functionalist Approach to the Sociology of Media and Popular Culture</li> <li>• Critical Approach to the Sociology of Media and Popular Culture</li> <li>• Symbolic Interactionist Approach to the Sociology of Media and Popular Culture</li> <li>• Different theories of Media</li> </ul>  | 8                                     |
| 3.                | Concept of Popular Culture and its critical analysis | <ul style="list-style-type: none"> <li>• What is popular culture?</li> <li>• Difference between 'pop' culture and 'high' culture</li> <li>• What distinguishes popular culture from other kinds of culture (art, folk culture)? Is there a distinction at all anymore?</li> <li>• Visualizing Society through 'pop' culture/ media</li> <li>• Risks and rituals that come with Popular Culture</li> </ul> | 8                                     |
| 4.                | New media  | <ul style="list-style-type: none"> <li>• Difference between tradition media and new media</li> <li>• New media as technology</li> <li>• New Information Technology (brief history in case of India)</li> </ul>  | 5                                     |

|                                 |  |   |           |
|---------------------------------|--|---|-----------|
| 5.                              | Media & State                            | <ul style="list-style-type: none"> <li>• Mediatization of Society</li> <li>• Free-speech Media</li> </ul>   | 5         |
| 6.                              | Consumption of Media and Media reception | <ul style="list-style-type: none"> <li>• Social Actors as Audience/ Audience as market– Theory</li> <li>• Media effects: Media and representations (gender, ethnic)- the under-representation and misrepresentation of subordinate groups.</li> <li>• Media and the construction of reality: media logic and cultivation analysis theory</li> <li>• Information Society vs Informed Society</li> <li>• Cultural Consumption and Social Class</li> </ul> | 9         |
| 7.                              | Media in Global Age                      | <ul style="list-style-type: none"> <li>• Rise of Network Society- Manuel Castells</li> <li>• Global Media: impact of market &amp; state</li> <li>• Global Perspectives: The world on our doorstep</li> <li>• Marketing and aesthetics in everyday life</li> </ul>   | 7         |
| <b>Total number of Lectures</b> |  |   | <b>42</b> |
| <b>Evaluation Criteria</b>      |  |   |           |
| <b>Components</b>               |  | <b>Maximum Marks</b>  |           |
| T1                              |  | 20  |           |
| T2                              |  | 20  |           |
| End Semester Examination        |  | 35  |           |
| TA                              |  | 25 (Project, Presentation and attendance)   |           |
| <b>Total</b>                    |  | <b>100</b>  |           |

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

|   |   |
|---|---|
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) |   |
| 1.  | Joseph Turow, <i>Media Today: An Introduction to Mass Communication</i> , 3 <sup>rd</sup> Ed., Taylor & Francis. UK. (2008).                        |
| 2.  | JA Fisher ‘High Art v/s Low Art, in Berys Nigel Gaut & Dominic Lopes (eds.), <i>The Routledge Companion to Aesthetics</i> . Routledge 2001          |
| 3.  | G. Ritzer, ‘McDonaldization of Society’, <i>The Journal of American Culture</i> . Volume 6, Issue 1. (2001 [1983]) Pp. 100-107.                     |
| 4.  | Manuel. Castells, ‘Introduction’, in <i>Rise of Network Society: The Information Age: Economy, Society and Culture</i> , 2 <sup>nd</sup> Ed (1996). |

## Syllabus and Evaluation Scheme of Planning and Economic Development

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

|                        |                                    |                                       |
|------------------------|------------------------------------|---------------------------------------|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>              | Dr. Amba Agarwal<br>Dr. Amandeep Kaur |
|                        | <b>Teacher(s) (Alphabetically)</b> | Dr. Amba Agarwal<br>Dr. Amandeep Kaur |

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

| Module No. | Title of the Module                          | Topics in the Module  | No. of Lectures for the module |
|------------|--|---|--------------------------------|
| 1.         | Economic Development and its Determinants    | Economic growth and development. Indicators of development. Approaches to economic development. Rostows Stages of Growth.   | 5                              |
| 2.         | National Income Accounting                   | National Income Accounting, Green GNP and Sustainable development   | 5                              |
| 3.         | Indicators of development                    | PQLI, Human Development Index (HDI) and gender development indices.   | 4                              |
| 4.         | Demographic Features, Poverty and Inequality | Demographic features of Indian population; Rural-urban migration; Growth of Primary, Secondary and Tertiary Sector.   | 5                              |
| 5.         | Inflation and Business Cycles                | Inflation. Business cycle. Multiplier and Accelerator Interaction.  | 6                              |
| 6.         | Macro-Economic Stability & Policies          | Monetary Policy. Fiscal Policy. Role of Central Bank & Commercial banks in the development of the country. Balance of payments; currency convertibility and Issues in export-import policy. | 6                              |
| 7.         | Federal                                      | The Federal Set-up - The Financial Issues in a  | 6                              |

|                                 |                          |  |           |
|---------------------------------|--------------------------|--|-----------|
|                                 | Development              | Federal Set-up, Principles for Efficient Division of Financial Resources between Governments. Financial Federalism under Constitution. Finance Commissions in India, Terms of References and its Recommendations |           |
| 8.                              | Planning and Development | Need for planning, Decentralisation, Rural and Urban local bodies.   | 5         |
| <b>Total number of Lectures</b> |                          |  | <b>42</b> |
| <b>Evaluation Criteria</b>      |                          |  |           |
| <b>Components</b>               |                          | <b>Maximum Marks</b>   |           |
| T1                              |                          | 20   |           |
| T2                              |                          | 20   |           |
| End Semester Examination        |                          | 35   |           |
| TA                              |                          | 25 (Assignment + Quiz)   |           |
| <b>Total</b>                    |                          | <b>100</b>   |           |

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

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

|    |   |
|----|---|
| 1. | <b>Todaro, M.P., Stephen C. Smith,</b> Economic Development, Pearson Education, 2017  |
| 2. | <b>Thirwal, A.P.,</b> Economics of Development, Palgrave, 2011  |
| 3. | <b>Ahuja, H. L.,</b> Development Economics, S Chand publishing, 2016  |
| 4. | <b>Ray, Debraj,</b> Development Economics, Oxford University Press, 2016  |
| 5. | <b>Meier, G.M.,</b> Leading Issues in Economic Development, Oxford University Press, New Delhi, 2008  |
| 6. | <b>Ahuja, H. L.,</b> Development Economics, S Chand publishing, 2016  |
| 7. | <b>Benavot, Aaron.</b> "Education, gender, and economic development: A cross-national study." Sociology of education (1989): 14-32.                                     |
| 8. | <b>Falk, Armin, and Johannes Hermle.</b> "Relationship of gender differences in preferences to economic development and gender equality." Science 362, no. 6412 (2018). |

## Matrix Computations (16B1NMA533)

### Detailed Syllabus

|                                 |   |  |   |
|---------------------------------|---|--|---|
| <b>Course Code</b>              | 16B1NMA533  | <b>Semester - Odd</b><br>(specify Odd/Even)  | <b>Semester 5<sup>th</sup> Session 2023 -2024</b><br><b>Month from</b> July 2023 - Dec 2023 |
| <b>Course Name</b>              | Matrix Computations   |  |   |
| <b>Credits</b>                  | 3   | <b>Contact Hours</b>   | 3-0-0   |
| <b>Faculty (Names)</b>          | <b>Coordinator(s)</b>   | Dr. Amita Bhagat and Dr. Neha Singhal  |   |
|                                 | <b>Teacher (s)</b><br>(Alphabetically)  | Dr. Amita Bhagat, Dr. Neha Singhal, Dr. Pato Kumari  |   |
| <b>COURSE OUTCOMES</b>          |   |  | <b>COGNITIVE LEVELS</b>   |
| <b>C301-3.1</b>                 | recall the basics of matrix theory and system of linear equations.  |  | Remembering Level(C1)   |
| <b>C301-3.2</b>                 | explain matrix inversion by partitioning/elementary matrices, vector spaces, inner product spaces and matrix norms. |  | Understanding Level (C2)  |
| <b>C301-3.3</b>                 | solve the system of linear equations and eigen value problems using direct and iterative methods.                   |  | Applying Level (C3)   |
| <b>C301-3.4</b>                 | analyze systems of differential and difference equations arising in dynamical systems using matrix calculus         |  | Analyzing Level (C4)  |
| <b>Module No.</b>               | <b>Title of the Module</b>  | <b>Topics in the Module</b>  | <b>No. of Lectures for the module</b>   |
| <b>1.</b>                       | Matrix Algebra  | Review of matrices, partitioning, block diagonal matrix, elementary matrices, Inverse of a matrix by partitioning.   | 6   |
| <b>2.</b>                       | 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   |
| <b>3.</b>                       | 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   |
| <b>5.</b>                       | Orthogonality   | Orthogonal and orthonormal sets, Gram-Schmidt process, QR factorization.   | 4   |
| <b>4.</b>                       | Eigen value Problems  | Eigen values and Eigenvectors, spectral radius, Greshgorin's theorem, Jacobi method, Givens rotations method and Householder's method, Power and Inverse power methods, Q-R algorithm.                   | 12  |
| <b>6.</b>                       | Matrix Calculus   | Powers and functions of matrices, application to solve discrete dynamical systems $x(t+1) = Ax(t)$ , $x(0) = \alpha$ and a system of differential equations of the form $dx/dt = Ax$ , $x(0) = \alpha$ . | 8   |
| <b>Total number of Lectures</b> |   |  | <b>42</b>   |

**Evaluation Criteria**

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

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

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

- |           |   |
|-----------|---|
| <b>1.</b> | <b>Bronson, R.</b> , Matrix Methods an Introduction, Academic Press, 1991.  |
| <b>2.</b> | <b>Golub, G. H., Loan, C. F. V.</b> , Matrix Computations, 4 <sup>th</sup> Edition, Johns Hopkins University Press, 2013. |
| <b>3.</b> | <b>Datta, K. B.</b> , Matrix and Linear Algebra, 3rdEdition, Prentice Hall of India, 2016.                                |
| <b>4.</b> | <b>David, W. Lewis.</b> , Matrix Theory, World Scientific, 1991.  |

### Theory of Numbers (16B1NMA731)

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

### Course Description

|  |  |                      |   |
|--|--|----------------------|---|
| <b>Course Code</b>   | 16B1NMA731   | <b>Semester</b> Odd  | <b>B.Tech. V Semester Session</b><br><b>Month from July 2023 to</b><br><b>Dec. 2023</b> |
| <b>Course Name</b>   | Theory of Numbers  |                      |   |
| <b>Credits</b>   | 3  | <b>Contact Hours</b> | 3-0-0   |
| <b>Faculty (Names)</b>   | <b>Coordinator(s)</b>  | Dr. Himanshu Agarwal |   |
|  | <b>Teacher(s) (Alphabetically)</b>   | Dr. Himanshu Agarwal |   |
| <b>COURSE OUTCOMES</b>   |  |                      | <b>COGNITIVE LEVELS</b>   |
| After pursuing the above mentioned course, the students will be able to: |  |                      |   |
| C301-4.1   | explain concepts related to divisibility, congruences, numbers of special form, number theoretic functions, primitive roots and indices. |                      | Understanding (C2)  |
| C301-4.2   | solve the system of linear congruences using properties of congruences, Euclid algorithm and Chinese remainder theorem.                  |                      | Applying (C3)   |
| C301-4.3   | apply the concepts of primitive roots, indices, Legendre symbol and quadratic residue to solve the nonlinear congruences.                |                      | Applying (C3)   |
| C301-4.4   | analyze the concepts of number theory in hashing, cryptography, calendar and ISBN check digits problems.                                 |                      | Analyzing (C4)  |



| <b>Module No.</b> | <b>Subtitle of the Module</b>                                 | <b>Topics in the module</b>   | <b>No. of Lectures for the module</b> |
|-------------------|---|---|---------------------------------------|
| <b>1.</b>         | <b>Divisibility and Primes</b>                                | Division algorithm, Greatest common divisor, Euclid's algorithm, gcd as a linear combination of coprime integers, Linear Diophantine equations, primes, The fundamental theorem of arithmetic, The Sieve of Eratosthenes, Canonical prime factorization, Least common multiple, Prime number theorem(statement only), Goldbach and twin primes conjectures. | 5                                     |
| <b>2</b>          | <b>Theory of Congruences</b>                                  | Definitions and basic properties, Residue classes, complete residue systems, reduced residue systems, Linear congruences in one variable, Simultaneous linear congruences, Chinese remainder theorem and its applications, Linear congruences in more than one variable, Fermat's theorem, Pseudoprimes and Carmichael numbers, Wilson's Theorem            | 4                                     |
| <b>3.</b>         | <b>Number Theoretic Functions and Numbers of Special Form</b> | Greatest integer function, The number-of-divisors function, The sum-of-divisors function, Multiplicative function, The Mobius function, Mobius inversion formula, The Euler's totient function, Euler's theorem, Perfect numbers, characterization of even perfect numbers, Mersenne primes, Fermat primes  | 8                                     |
| <b>4.</b>         | <b>Primitive Roots and Indices</b>                            | The order of an integer, Primitive roots, Theory of indicies, Solution of non-linear congruences.   | 9                                     |
| <b>5.</b>         | <b>Quadratic Residues</b>                                     | Quadratic residues and non-residues, Euler's Criterion, The Legendre symbol, Gauss Lemma, Quadratic reciprocity, Solution of quadratic congruences.   | 8                                     |
| <b>6.</b>         | <b>Applications</b>   | Hashing functions, Cryptosystem, Calendar problem, ISBN check digits  | 8                                     |
|                   |   | <b>Total Number of Lectures</b>   | <b>42</b>                             |

|  |   |
|--|---|
| <p><b>Evaluation Criteria</b></p> <p><b>Components Maximum Marks</b></p> <p>T1 20</p> <p>T2 20</p> <p>End Semester Examination 35</p> <p>TA 25 (Quiz, Assignments, Tutorials, PBL)</p> <p><b>Total 100</b></p>   |   |
| <p>Project based learning: Each student in a group of 4-5 will analyse applications of Chinese remainder theorem in congruency problems. Also the students will explore the applications of secure communication techniques, Cyptosystem, Calendar problem, ISBN check digits.</p> |   |
| <p><b>Recommended Reading</b> (Books/Journals/Reports/Websites etc.: Author(s), Title, Edition, Publisher, Year of Publication etc. in IEEE format)</p>  |   |
| 1.   | <b>James Strayer</b> , Elementary Number Theory, Waveland Press, 1994/2002, ISBN 1-57766-224-5.                               |
| 2.   | <b>Kenneth Rosen</b> , Elementary Number Theory and its Applications, 5th Edition, McGraw Hill, ISBN 0-201-87073-8.           |
| 3.   | <b>I. Niven, H. Zuckerman, H. Montgomery</b> , An Introduction to the Theory of Numbers, 5th Edition, Wiley, ISBN 0471625469. |
| 4.   | <b>David M. Burton</b> , Elementary Number Theory, 7 <sup>th</sup> Edition, McGraw Hill Education (India) Private Limited.    |

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

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

|                        |  |                |
|------------------------|--|----------------|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>                  | Sandeep Mishra |
|                        | <b>Teacher(s)<br/>(Alphabetically)</b> | Sandeep Mishra |

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

| <b>Module No.</b> | <b>Title of the Module</b>           | <b>Topics in the Module</b>  | <b>No. of Lectures for the module</b> |
|-------------------|--------------------------------------|--|---------------------------------------|
| 1.                | Introduction                         | Wave particle duality, quantum physics (Planck and Einstein's ideas of quantized light), postulates of quantum mechanics, time dependent and time independent Schrodinger equation, operators, probability theory, expectation values, and uncertainty principle and its implications, no cloning applications | 8                                     |
| 2.                | Measurement Theory with Applications | Matrix and linear algebra, Eigen values and eigenfunctions Hilbert space, Kets, Bras and Operators, Bras Kets and Matrix representations, Measurements, Stern Gerlach Experiment, Observables and Uncertainty Relations, No-cloning theorem, Pauli Spin Matrices.  | 10                                    |
| 3.                | Potential problems                   | 1-D, 2-D, and 3-D potential problems (including infinite and finite square well). Tunneling, harmonic oscillator, separation in spherical polar coordinates, hydrogen atom, etc.),   | 08                                    |

|                                 |                       |  |           |
|---------------------------------|-----------------------|--|-----------|
| 4.                              | Approximation methods | Time independent perturbation theory for nondegenerate and degenerate energy levels.   | 4         |
| 5.                              | Advanced Applications | Kronig Penny model, Basic ideas of quantum computing, Qubit, Gate model of quantum computing: H, CNOT, Pauli Gates, BB84 protocol, Advantages of quantum computing, Quantum wire, Quantum dot and realization of CNOT using Quantum dot. | 10        |
| <b>Total number of Lectures</b> |                       |  | <b>40</b> |
| <b>Evaluation Criteria</b>      |                       |  |           |
| <b>Components</b>               |                       | <b>Maximum Marks</b>   |           |
| T1                              |                       | 20   |           |
| T2                              |                       | 20   |           |
| End Semester Examination        |                       | 35   |           |
| TA                              |                       | 25 [Attendance (05 M), Class Test, Quizzes, <i>etc</i> (06 M), Assignments in PBL mode (10 M), and Internal assessment (04 M)]   |           |
| <b>Total</b>                    |                       | <b>100</b>   |           |

|  |   |
|--|---|
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) |   |
| 1.   | The new quantum universe by Toney Hey and Patrick Walters, Cambridge University Press.    |
| 2.   | Quantum mechanics a new introduction by Kenichi Konishi and G Paffuti, OUP., 2009         |
| 3.   | Quantum physics by Eyvind H Wichman (Berkeley Physics course Vol 4) Tata McGraw Hill 2008 |
| 4.   | Elements of quantum computation and quantum communication by A Pathak, CRC Press 2013.    |
| 5.   | Introduction to Quantum Mechanics by David J. Griffiths, Second Edition, Pearson, 2015.   |

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

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

|                    |                   |                      |   |
|--------------------|-------------------|----------------------|---|
| <b>Course Code</b> | 16B1NPH532        | <b>Semester: ODD</b> | <b>Semester: 5<sup>th</sup> Session: 2022 -2023</b><br><b>Month from July 22 to December 22</b> |
| <b>Course Name</b> | Materials Science |                      |   |
| <b>Credits</b>     | 3                 | <b>Contact Hours</b> | 3   |

|                        |  |  |
|------------------------|--|--|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>                        | Dr. Vikas Malik and Dr Ashish Bhatanagar |
|                        | <b>Teacher(s)</b><br><b>(Alphabetically)</b> | Dr. Vikas Malik and Dr Ashish Bhatanagar |

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

| <b>Module No.</b> | <b>Title of the Module</b> | <b>Topics in the Module</b>  | <b>No. of Lectures for the module</b> |
|-------------------|----------------------------|--|---------------------------------------|
| 1.                | Dielectric Materials       | Polarization mechanism & Dielectric Constant, Behavior of polarization under impulse and frequency switching, Dielectric loss, Spontaneous polarization, Ferroelectrics, Piezoelectric effect; Applications of Dielectric Materials  | 10                                    |
| 2.                | 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                                     |

|                            |   |                                 |           |
|----------------------------|---|---------------------------------|-----------|
|                            |   |                                 |           |
|                            |   | <b>Total number of Lectures</b> | <b>40</b> |
| <b>Evaluation Criteria</b> |   |                                 |           |
| <b>Components</b>          | <b>Maximum Marks</b>  |                                 |           |
| T1                         | 20  |                                 |           |
| T2                         | 20  |                                 |           |
| End Semester Examination   | 35  |                                 |           |
| TA                         | 25 [Quiz/class test (7), attendance (7), PBL assignment (6) and teacher assessment (5)] |                                 |           |
| <b>Total</b>               | <b>100</b>  |                                 |           |

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

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

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

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

|                    |                                   |   |  |
|--------------------|-----------------------------------|---|--|
| <b>Course Code</b> | 16B1NPH533                        | <b>Semester Odd</b><br>(specify Odd/Even) | <b>Semester 5<sup>th</sup> Session 2023-2024</b><br><b>Month from July to December</b> |
| <b>Course Name</b> | Laser Technology and Applications |   |  |
| <b>Credits</b>     | 3                                 | <b>Contact Hours</b>                      | 3  |

|                        |                                       |                      |
|------------------------|---------------------------------------|----------------------|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>                 | Navneet Kumar Sharma |
|                        | <b>Teacher(s)</b><br>(Alphabetically) | Navneet Kumar Sharma |

| <b>COURSE OUTCOMES</b> |   | <b>COGNITIVE LEVELS</b> |
|------------------------|---|-------------------------|
| <b>C301-12.1</b>       | Defining the properties and principle of lasers   | Remember Level (C1)     |
| <b>C301-12.2</b>       | Understanding of various applications of lasers   | Understand Level (C2)   |
| <b>C301-12.3</b>       | Ability to apply the concepts of standard techniques for the pulsed operation of laser and stability of laser resonator | Apply Level (C3)        |
| <b>C301-12.4</b>       | Analysis of types of lasers   | Analyze Level (C4)      |

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

|                                 |  |             |           |
|---------------------------------|--|-------------|-----------|
|                                 |  | in sensors. |           |
| <b>Total number of Lectures</b> |  |             | <b>40</b> |
| <b>Evaluation Criteria</b>      |  |             |           |
| <b>Components</b>               | <b>Maximum Marks</b>   |             |           |
| T1                              | 20   |             |           |
| T2                              | 20   |             |           |
| End Semester Examination        | 35   |             |           |
| TA                              | 25 [Attendance (05 M), Class Test, Quizzes, <i>etc</i> (06 M),<br>Assignments in PBL mode (10 M), and Internal assessment<br>(04 M)] |             |           |
| <b>Total</b>                    | <b>100</b>   |             |           |

|  |   |
|--|---|
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) |   |
| <b>1.</b>  | Thyagarajan and Ghatak, <i>Lasers Theory and Applications</i> , Macmilan India. |
| <b>2.</b>  | W. T. Silfvast, <i>Laser Fundamentals</i> , Cambridge Univ-Press.               |
| <b>3.</b>  | O. Svelto, <i>Principles of Lasers</i> , Springer.                              |
| <b>4.</b>  | Saleh and Teich, <i>Fundamentals of Photonics</i> , John Wiley & Sons.          |

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



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

|                    |                                 |                      |  |
|--------------------|---------------------------------|----------------------|--|
| <b>Course Code</b> | 16B1NPH535                      | <b>Semester: ODD</b> | <b>Semester: V Session: 2023-24</b><br><b>Month from: July to December</b> |
| <b>Course Name</b> | Nuclear Science and Engineering |                      |  |
| <b>Credits</b>     | 3                               | <b>Contact Hours</b> | 3  |

|                        |                                    |                                    |
|------------------------|------------------------------------|------------------------------------|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>              | Dr. Manoj Tripathi/ Dr. Anuj Kumar |
|                        | <b>Teacher(s) (Alphabetically)</b> | Dr. Manoj Tripathi/ Dr. Anuj Kumar |

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

| <b>Module No.</b> | <b>Title of the Module</b>                                | <b>Topics in the Module</b>  | <b>No. of Lectures for the module</b> |
|-------------------|---|--|---------------------------------------|
| <b>1.</b>         | 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                                    |
| <b>2.</b>         | Nuclear Models  | Binding energies of nuclei, Liquid drop model: Semi-empirical mass formula, Mass parabolas, Prediction of Nuclear stability, Bohr-Wheeler theory of fission, Shell model, Spin-orbit coupling. Magic numbers, Angular momenta and parities of nuclear ground state, Magnetic   | 05                                    |

|                                 |  |   |           |
|---------------------------------|--|---|-----------|
|                                 |  | moments and Schmidt lines, Collective model of a nucleus.   |           |
| 3.                              | Nuclear decay and Nuclear reactions          | Alpha decay, Beta decay, Pauli's Neutrino hypothesis-Helicity of neutrino, Theory of electron capture, Non-conservation of parity, Fermi's theory, Gamma decay: Internal conversion, Multipole transitions in nuclei, Nuclear isomerism, Artificial radioactivity, Nuclear reactions and conservation laws, Q-value equation, Centre of mass frame in nuclear Physics, Scattering and reaction cross sections, compound nucleus, Breit-Wigner one level formula | 08        |
| 4.                              | Interaction of nuclear radiation with matter | Interaction of charge particles with matters: Bohr's ionization loss formula and estimation of charge, mass and energy. Interaction of electromagnetic radiation with matter, Linear absorption coefficient. Nuclear particle detectors and neutron counters.   | 07        |
| 5.                              | Accelerator and reactor Physics              | Different types of reactors, tracer techniques, activation analysis. Radiation induced effects and their applications: Accelerators: Linear accelerators, Van de Graff generator, LINAC, Cyclotrons, Synchrotrons, Colliders.   | 06        |
| 6.                              | Cosmic radiation and Elementary Particles    | Cosmic radiation: Discovery of cosmic radiation, its sources and composition, Latitude effect, altitude effect and east-west asymmetry, secondary cosmic rays, cosmic ray shower, variation of cosmic intensity and Van Allen radiation belt. Elementary particles: Classification of particles, K-mesons, Hyperons, particles and antiparticles, fundamental interactions, conservation laws, CPT theorem, resonance particles and hypernucleus, Quark model.  | 07        |
| <b>Total number of Lectures</b> |  |   | <b>40</b> |
| <b>Evaluation Criteria</b>      |  |   |           |
| <b>Components</b>               |  | <b>Maximum Marks</b>  |           |
| T1                              |  | 20  |           |
| T2                              |  | 20  |           |
| End Semester Examination        |  | 35  |           |
| TA                              |  | 25 [Attendance (05 M), Class Test, Quizzes (06 M), Assignments in PBL mode (10 M), and Internal assessment (04 M)]  |           |
| <b>Total</b>                    |  | <b>100</b>  |           |

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

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

|    |   |
|----|---|
| 1. | K.S. Krane, 1987, Introductory Nuclear Physics, Wiley, New York.                  |
| 2. | I. Kaplan, 1989, Nuclear Physics, 2nd Edition, Narosa, New Delhi.                 |
| 3. | B.L. Cohen, 1971, Concepts of Nuclear Physics, TMH, New Delhi.                    |
| 4. | R.R. Roy and B.P. Nigam, 1983, Nuclear Physics, New Age International, New Delhi. |
| 5. | H.A. Enge, 1975, Introduction to Nuclear Physics, Addison Wesley, London.         |
| 6. | Y.R. Waghmare, 1981, Introductory Nuclear Physics, Oxford-IBH, New Delhi.         |
| 7. | R.D. Evans, 1955, Atomic Nucleus, McGraw-Hill, New York.                          |

### Basic Numerical Methods (17B1NMA531)

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

#### Course Description

|  |   |   |   |
|--|---|---|---|
| <b>Course Code</b>   | 17B1NMA531  | <b>Semester</b> - Odd   | <b>Semester V Session</b> 2022-23<br><b>Month from</b> Jul 2023- Dec 2023 |
| <b>Course Name</b>   | Basic Numerical Methods   |   |   |
| <b>Credits</b>   | 3   | <b>Contact Hours</b>  | 3-0-0   |
| <b>Faculty (Names)</b>   | <b>Coordinator(s)</b>   | Dr. Dinesh C. S. Bisht  |   |
|  | <b>Teacher(s) (Alphabetically)</b>  | Dr. Dinesh C. S. Bisht  |   |
| <b>COURSE OUTCOMES</b>   |   |   | <b>COGNITIVE LEVELS</b>   |
| After pursuing the above-mentioned course, the students will be able to: |   |   |   |
| <b>C301-5.1</b>  | relate the concepts of approximation, numerical solution, and errors in computation.  | Remembering (C1)  |   |
| <b>C301-5.2</b>  | demonstrate the understanding of approximation and basic numerical methods  | Understanding (C2)  |   |
| <b>C301-5.3</b>  | apply numerical methods for interpolation, differentiation, integration, the solution of linear and nonlinear equations, and the solution of differential equations | Applying (C3)   |   |
| <b>C301-5.4</b>  | analyse the physical problem to establish mathematical model and use appropriate method to solve  | Analyzing (C4)  |   |
|  |   |   |   |
|  |   |   |   |
| <b>Module No.</b>  | <b>Title of the Module</b>  | <b>Topics in the Module</b>   | <b>No. of Lectures for the module</b>                                     |
| 1.   | Approximation and Errors in Computation   | Errors, relative error, absolute error, error in series approximation.  | 02  |
| 2.   | Algebraic and Transcendental Equations  | Bisection Method, Regula- Falsi Method, Secant Method, Iterative method, Newton-Raphson Method, convergence.                          | 07  |
| 3.   | Interpolation   | Finite Differences, Relation between difference operators, Newton's Forward and Backward Interpolation, Gauss Backward Interpolation, | 08  |

|   |   |  |           |
|---|---|--|-----------|
|   |   | Bessel's and Sterling's central difference operators, Laplace-Everett's formula, Newton's divided difference formula, Lagrange's interpolation formula.  |           |
| 4.  | Numerical Differentiation and Integration   | Derivatives using Newton's Forward and Backward Interpolation, Bessel's and Sterling's central difference operators, Maxima and minima of a tabulated function. Trapezoidal, Simpson's, Boole's and Weddle's rules, Euler-Maclaurin formula. | 11        |
| 5.  | System of Linear Equations  | Gauss Elimination method, LU decomposition method, Gauss-Seidel Method.  | 05        |
| 6.  | Numerical Solution of Ordinary Differential Equations   | Picard's method, Euler's method, Modified Euler's method, Fourth order Runge-Kutta method, Milne's method for first order, second order and simultaneous differential equations, Finite-Difference Method                                    | 09        |
| <b>Total number of Lectures</b>   |   |  | <b>42</b> |
| <b>Evaluation Criteria</b>  |   |  |           |
| <b>Components</b>   |   | <b>Maximum Marks</b>   |           |
| T1  |   | 20   |           |
| T2  |   | 20   |           |
| End Semester Examination  |   | 35   |           |
| TA  |   | 25 (Quiz, Assignments, Tutorials, PBL)   |           |
| <b>Total</b>  |   | <b>100</b>   |           |
| <b>Project Based Learning:</b> Students will be divided in a group of 4-5 to collect literature and submit a report on application of different numerical methods to solve practical problems based on systems of linear equations and ordinary differential equations. |   |  |           |
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)  |   |  |           |
| 1.  | <b>C. F. Gerald and P.O. Wheatley</b> , Applied Numerical Analysis, 7 <sup>th</sup> Ed., Pearson Education, 2004.   |  |           |
| 2.  | <b>M. K. Jain, S. R. K. Iyengar and R. K. Jain</b> , Numerical Methods for Scientific and Engineering Computation, 6 <sup>th</sup> Ed., New Age International, New Delhi, 2014. |  |           |
| 3.  | <b>R. S. Gupta</b> , Elements of Numerical Analysis, 2 <sup>nd</sup> Ed., Cambridge University Press, 2015.   |  |           |
| 4.  | <b>S.D. Conte and C. deBoor</b> , Elementary Numerical Analysis, An Algorithmic Approach, 3 <sup>rd</sup> Ed., McGraw-Hill, New York, 1980.                                     |  |           |

## Detailed Syllabus Lecture-wise Breakup

|   |   |  |   |
|---|---|--|---|
| <b>Subject Code</b>                                   | 18B11CS212  | <b>Semester: ODD</b><br>(specify Odd/Even)   | <b>Semester 5<sup>th</sup> Session 2023-24</b><br><b>Month from July, 2023 to Dec, 2023</b> |
| <b>Subject Name</b>                                   | Computers Networks & Security   |  |   |
| <b>Credits</b>  | 3   | <b>Contact Hours</b>   | 3   |
| <b>Faculty (Names)</b>                                | <b>Coordinator(s)</b>   | Mr. Janardan K Verma   |   |
|   | <b>Teacher(s) (Alphabetically)</b>  | Mr. Janardan K Verma   |   |
| <b>COURSE OUTCOMES</b>                                |   |  | <b>COGNITIVE LEVELS</b>   |
| After completion of this course students are able to: |   |  |   |
| C310.1  | Explain the fundamental concepts of computer networking and security.   |  | Understand (Level 2)  |
| C310.2  | Interpret data link layer protocols for multiple access communication, error detection and correction problems. |  | Understand (Level 2)  |
| C310.3  | Identify the application of number theory in the cryptographic algorithms.                                      |  | Apply (Level 3)   |
| C310.4  | Identify suitable transport layer protocol along with its security solutions.                                   |  | Apply (Level 3)   |
| C310.5  | Examine Internet Protocol (IP), routing principles, and IPSec architecture.                                     |  | Analyze (Level 4)   |
|   |   |  |   |
| <b>Module No.</b>                                     | <b>Subtitle of the Module</b>   | <b>Topics in the module</b>  | <b>No. of Lectures for the module</b>   |
| <b>1.</b>   | 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, etc.   | 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 layer Security aspects, SSL, TLS etc.  | 8         |
| 4.                              | The Network Layer                      | Introduction and Network Service Model, Internet Protocol (IP), Fragmentation & addressing, Routing Principles, Routing in the Internet, IPSec Architecture: Authentication Header (AH) and Encapsulating Security Payload (ESP)  | 9         |
| 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         |
| <b>Total number of Lectures</b> |  |   | <b>42</b> |

| <b>Evaluation Criteria</b>   |   |
|--|---|
| <b>Components</b>  | <b>Maximum Marks</b>  |
| T1   | 20  |
| T2   | 20  |
| End Semester Examination   | 35  |
| TA   | 25 (PBL=10 + Assignments =10, Attendance=5)   |
| <b>Total</b>   | <b>100</b>  |
| <b>Project Based Learning:</b>   |   |
| 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. |   |
| <b>Recommended Reading material:</b>   |   |
| <b>Text Books</b>  |   |
| 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", Pearson; 6e (6th Edition), 2020  |
| 3.   | William Stallings, "Data and Computer Communications", Pearson India, Tenth edition, 2017   |
| 4.   | Behrouz A Forouzan, Debdeep Mukhopadhyay, "Cryptography & Network Security", Chennai Mc Graw Hill Education (India) Private Limited, 13 <sup>th</sup> edition, 2015 |
| 5.   | William Stallings, "Cryptography and Network Security Principles and Practice", Pearson, Eight Edition, 2020  |
| <b>Reference Books</b>   |   |
| 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.   | Christof Paar, Jen Pelzl, "Understanding Cryptography", Springer  |
| <b>Journals</b>  |   |
| 9.   | USENIX Security Symposium   |
| 10.  | ACM Transactions on Information and system security   |
| 11.  | IEEE Press Computer Security and Privacy  |



## Detailed Syllabus Lab-wise Breakup

|                     |   |   |   |
|---------------------|---|---|---|
| <b>Subject Code</b> | <b>18B15CS212</b>                         | <b>Semester: ODD<br/>(specify Odd/Even)</b> | <b>Semester 5<sup>th</sup> Session 2023-2024<br/>Month from July, 2023 to Dec, 2023</b> |
| <b>Subject Name</b> | <b>Computer Networks and Security Lab</b> |   |   |
| <b>Credits</b>      | <b>1</b>                                  | <b>Contact Hours</b>                        | <b>0-0-2</b>  |

|                        |                       |                                   |
|------------------------|-----------------------|-----------------------------------|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b> | Janardan K Verma                  |
|                        | <b>Teacher(s)</b>     | Janardan K Verma, Dr. Raghu Vamsi |

| <b>S. No.</b> | <b>DESCRIPTION</b>   | <b>COGNITIVE LEVEL (BLOOMS TAXONOMY)</b> |
|---------------|--|--|
| <b>C370.1</b> | Demonstrate wired network technologies and basic building blocks in computer networks.                           | <b>Understand (Level 2)</b>              |
| <b>C370.2</b> | Experiment UDP and TCP client server applications using socket programming and secured key exchange algorithms.  | <b>Apply (Level 3)</b>                   |
| <b>C370.3</b> | Applying network routing algorithms and evaluate the performance of the Protocols using Network Simulator (NS2). | <b>Apply (Level 3)</b>                   |
| <b>C370.4</b> | Classify and analyze the packets and security protocols of TCP/IP Protocols in Wireshark.                        | <b>Analyze (Level 4)</b>                 |
| <b>C370.5</b> | Examine various security techniques to solve real world problems.  | <b>Analyze (Level 4)</b>                 |

| <b>Module No.</b> | <b>Subtitle of the Module</b>  | <b>Topics in the module</b>  | <b>CO</b> |
|-------------------|--------------------------------|--|-----------|
| <b>1.</b>         | <b>Introduction</b>            | Introduction to Computer Network devices / UNIX Commands for TCP/IP Protocol Suite   | C370.1    |
| <b>2.</b>         | <b>Wireshark Simulator</b>     | Capturing, study and analysis of Application Layer, Transport Layer and Network Layer packet communication (*.pcap) files and Security Protocols in Wireshark    | C370.4    |
| <b>3.</b>         | <b>Socket Programming</b>      | UDP and TCP client server socket programming. Client server communication for symmetric key, asymmetric key cryptographic techniques and key exchange algorithms | C370.2    |
| <b>4.</b>         | <b>Network Simulator (NS2)</b> | Modeling of wired communication network, Performance estimation of the protocols at Network and Transport layer.   | C370.3    |
| <b>5.</b>         | <b>Application Development</b> | Development of secured applications to solve real world problems   | C370.5    |

| <b>Evaluation Criteria</b>  |                      |
|---|----------------------|
| <b>Components</b>   | <b>Maximum Marks</b> |
| <b>Lab Test -1</b>  | <b>20</b>            |
| <b>Lab Test -2</b>  | <b>20</b>            |
| <b>Lab Evaluations</b>  | <b>30</b>            |
| <b>Project</b>  | <b>20</b>            |
| <b>TA</b>   | <b>10</b>            |
| <b>Total</b>  | <b>100</b>           |
| <b>Project Based Learning:</b>  |                      |
| 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. |                      |
| <b>Text Books</b>   |                      |

|                        |   |
|------------------------|---|
| 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.   |
| <b>Reference Books</b> |   |
| 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," Packet Publishing  |
| 8.                     | NS3 Documentation, available at <a href="https://www.nsnam.org/documentation/">https://www.nsnam.org/documentation/</a>   |
| 9.                     | Behrouz A Forouzan, Debdeep Mukhopadhyay, "Cryptography & Network Security", Chennai Mc Graw Hill Education (India) Private Limited, 13 <sup>th</sup> edition, 2015 |
| 10.                    | William Stallings, "Cryptography and Network Security Principles and Practice", Pearson, Eight Edition, 2020  |

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

|                    |                                  |                      |   |
|--------------------|----------------------------------|----------------------|---|
| <b>Course Code</b> | 20B12CS331                       | <b>Semester:</b> Odd | <b>Semester 5<sup>th</sup> Session</b> 2023-2024<br><b>Month:</b> July 2023 to Dec 2023 |
| <b>Course Name</b> | Fundamentals of Machine Learning |                      |   |
| <b>Credits</b>     | 3                                | <b>Contact Hours</b> | 3-0-0   |

|                        |  |   |
|------------------------|--|---|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>                  | Dharmveer Singh Rajpoot (62), Himani Bansal (128)   |
|                        | <b>Teacher(s)<br/>(Alphabetically)</b> | Anil Kumar Mahto, Dharamveer Rajpoot, Himani Bansal |

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

| <b>Module No.</b> | <b>Title of the Module</b>       | <b>Topics in the Module</b>  | <b>No. of Lectures for the module</b> |
|-------------------|----------------------------------|--|---------------------------------------|
| 1.                | Introduction to Machine learning | Why machine learning, learning problems, types of learning: supervised, unsupervised, semi-supervised learning, fundamentals of machine learning   | 02                                    |
| 2.                | Linear Algebra                   | Linear equations, solving linear equations, matrices, Cholesky Decomposition, singular value decomposition, matrix approximation, vector space, Norms, inner product, length and distances, angles and orthogonality, orthogonal complement, inner product, orthogonal projections and rotations, linear independence, linear mapping, Affine spaces | 09                                    |
| 3.                | Probability Theory               | Discrete and continuous probability, sum rule, product rule, Baye's Theorem, Gaussian Estimation, conjugacy and exponential family, inverse transform, Hidden Markov model   | 05                                    |
| 4.                | Regression Analysis              | Problem formulation, parameter estimation, linear regression vs non-linear regression models, univariate vs multivariate regression, regression using least squares, logistic regression in machine learning   | 05                                    |
| 5.                | Vector Calculus                  | Gradients of vector valued function, gradient descent learning, lagrange's function in supervised learning, automatic differentiation, linearization and multivariate taylor series in machine learning  | 07                                    |

|                                 |   |  |           |
|---------------------------------|---|--|-----------|
| 6.                              | Dimensionality Reduction and Density Estimation | Maximum variance, Low rank approximation, PCA, ICA, LDA, latent Variable, GMM, Maximum Likelihood estimation, expected maximization machine learning | 08        |
| 7.                              | Statistical Validations                         | T test, paired T test, Z test, hypothesis testing, ANOVA, Pearson coefficient, significance testing  | 06        |
| <b>Total number of Lectures</b> |   |  | <b>42</b> |
| <b>Evaluation Criteria</b>      |   |  |           |
| <b>Components</b>               |   | <b>Maximum Marks</b>   |           |
| <b>T1</b>                       |   | <b>20</b>  |           |
| <b>T2</b>                       |   | <b>20</b>  |           |
| <b>End Term</b>                 |   | <b>35</b>  |           |
| <b>TA</b>                       |   | <b>25</b> Attendance (10), Assignment/Quiz/Mini-Project (15)   |           |
| <b>Total</b>                    |   | <b>100</b>   |           |

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.

|  |  |
|--|--|
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text Books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) |  |
| <b>Text Book(s):</b>   |  |
| 1.   | Goodfellow, Ian, YoshuaBengio, and Aaron Courville. (2016). Deep learning. MIT press.  |
| 2.   | Deisenroth, Marc Peter, A. Aldo Faisal, and Cheng Soon Ong. (2020). Mathematics for machine learning. Cambridge University Press.  |
| <b>Reference Book(s):</b>  |  |
| 1.   | Mitchell, Tom M. (1997). Machine learning.   |
| 2.   | Bishop, Christopher M. (2006). Pattern recognition and machine learning. Springer.   |
| 3.   | Hastie, Trevor, Robert Tibshirani, and Jerome Friedman. (2009). The elements of statistical learning: data mining, inference, and prediction. Springer Science & Business Media. |

## Course Description

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

|                        |                                    |  |
|------------------------|------------------------------------|--|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>              | Dr.Charu Gandhi(128), Dr.Asmita Yadav(62)                          |
|                        | <b>Teacher(s) (Alphabetically)</b> | Dr. Amanpreet Kaur(62), Dr. Asmita Yadav(62), Dr.Charu Gandhi(128) |

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

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

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

### Evaluation Criteria

#### Components

#### Maximum Marks

|                          |  |
|--------------------------|--|
| T1                       | 20   |
| T2                       | 20   |
| End Semester Examination | 35   |
| TA                       | 25 ( <b>Attendance- 5, Class Test/ Quiz-10, Mini Project (for PBL) -10</b> ) |
| <b>Total</b>             | <b>100</b>   |

**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)

|    |  |
|----|--|
|    | <b>Text Books:</b>   |
| 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 |
|    | <b>Reference Books:</b>  |
| 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**

|                    |   |                      |  |
|--------------------|---|----------------------|--|
| <b>Course Code</b> | 20B12CS333                                  | <b>Semester: ODD</b> | <b>Semester: 5th Session:2023 -2024</b><br><b>Month from July 2023 - December 2023</b> |
| <b>Course Name</b> | Introduction to Big Data and Data Analytics |                      |  |
| <b>Credits</b>     | 3   | <b>Contact Hours</b> | 3-0-0  |

|                        |  |  |
|------------------------|--|--|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>                  | Dr. Pawan kumar Upadhyay (62), Dr. Neeraj Jain (128) |
|                        | <b>Teacher(s)<br/>(Alphabetically)</b> | Dr. Pawan kumar Upadhyay, Dr. Neeraj Jain            |

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

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



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

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

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

**Reference Books:**

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

**Text Books:**

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

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

|                    |   |                      |   |
|--------------------|---|----------------------|---|
| <b>Course Code</b> | 20B12CS334  | <b>Semester ODD</b>  | <b>Semester: 5<sup>th</sup> Session: 2023 - 2024</b><br><b>Month from: July to Dec 2023</b> |
| <b>Course Name</b> | <b>Object Oriented Analysis and Design Using JAVA</b> |                      |   |
| <b>Credits</b>     | 3-0-0   | <b>Contact Hours</b> | 3   |

|                        |                                    |   |
|------------------------|------------------------------------|---|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>              | Dr. Raju Pal (J128) and Shivendra Singh (J62) |
|                        | <b>Teacher(s) (Alphabetically)</b> | Dr. Raju Pal (J128) and Shivendra Singh (J62) |

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

| <b>Module No.</b> | <b>Title of the Module</b>  | <b>Topics in the Module</b>  | <b>No. of Lectures for the module</b> |
|-------------------|---|--|---------------------------------------|
| <b>1.</b>         | Introduction to Principles of Object-Oriented Analysis and Design | Programming Paradigms, Introduction to Object Oriented Paradigm, Principles of Object Orientation, Software Complexity: development process, flexibility, behaviour of discrete system, The canonical Form of the complex system, Benefits and Understanding the challenges OOAD can address, Overview of Software Development Life Cycle (SDLC), Object-Oriented Requirements Elicitation & Analysis and Systems Behavior, Quality Attributes | 5                                     |
| <b>2.</b>         | 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<br><br>Quality Check: Coupling, cohesion, sufficiency, completeness, premitiveness,   | 8                                     |

|                                 |  |  |           |
|---------------------------------|--|--|-----------|
| 3.                              | Structural modeling and its implementation in JAVA | UML structure: Overview of static and dynamic UML diagrams, Modeling System Behavior with use case diagram and notations, From Use Cases to Functional Requirements, Elements of object and class diagram with notations: object, class, link, association, multiplicity, link attributes, association end names, association classes, qualified association, association ends, N-ray association, aggregation and composition, generalization, abstract class.<br><br>Objects and Classes in JAVA, implementing various relationships in JAVA- Association, Inheritance, generalization, Abstraction in Java, Method Overriding and Overloading, Object Roles, Class Types, Implementing Polymorphism, Extensibility and UML, Generalization with Interfaces and Packages in Java | 15        |
| 4.                              | Behavioral modeling                                | Sequence & Collaboration diagram with notations, Object Collaborations, Interaction Diagrams, State Diagram - Event ,Change Event, Signal Event, Call Event, Time Event , States, Transition & Conditions, Transition, Guard Condition, Action, State Diagrams, One shot State Diagram, Creating State Diagram, State Diagram Behavior, Activity, Do-activity, Entry Activity, Exit Activity, Nested State Diagram, Nested States, Signal Generalization, Concurrency, Activity and Swim lane diagram  | 4         |
| 5.                              | Design Principles                                  | SOLID principles, Cohesion, Coupling, techniques for good Object-Oriented design, separation of concerns, information hiding, and conceptual integrity   | 6         |
| 6.                              | OO Design Metrics                                  | Understanding and Analyzing Software Design Metrics for Object Oriented Software.  | 4         |
| <b>Total number of Lectures</b> |  |  | <b>42</b> |
| <b>Evaluation Criteria</b>      |  |  |           |
| <b>Components</b>               |  | <b>Maximum Marks</b>   |           |
| T1                              |  | 20   |           |
| T2                              |  | 20   |           |
| End Semester Examination        |  | 35   |           |
| TA                              |  | 25 [Attendance (10) + Assignment/Quiz/Mini-project (15)]   |           |
| <b>Total</b>                    |  | <b>100</b>   |           |

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

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

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

|                        |                                    |   |
|------------------------|------------------------------------|---|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>              | Dr. Ila Joshi (62) & Dr Gaurika Chugh (128)   |
|                        | <b>Teacher(s) (Alphabetically)</b> | <ul style="list-style-type: none"> <li>• Dr. Aviral Mishra</li> <li>• Dr Gaurika Chugh</li> <li>• Dr. Ila Joshi</li> <li>• Dr. Namreeta Kumari</li> <li>• Ms. Shikha Kumari</li> <li>• Dr Shweta Verma</li> </ul> |

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

| <b>Module No.</b> | <b>Title of the Module</b> | <b>Topics in the Module</b>  | <b>No. of Lectures for the module</b> |
|-------------------|----------------------------|--|---------------------------------------|
| 1.                | The Indian Constitution    | <ul style="list-style-type: none"> <li>• Historical Background to the Indian Constitution</li> <li>• Salient features of the Indian Constitution</li> <li>• Fundamental Rights (Part III of the Indian Constitution)</li> <li>• Fundamental Duties (Part IVA of the Indian Constitution)</li> <li>• Directive Principles of the State Policy (Part IV of the Indian Constitution)</li> </ul> | 8                                     |

|                                 |                                |  |           |
|---------------------------------|--------------------------------|--|-----------|
|                                 |                                | <ul style="list-style-type: none"> <li>• Amendments to the constitution</li> </ul>   |           |
| 2.                              | Organs of the Government       | <ul style="list-style-type: none"> <li>• The Executive: President, Prime Minister and Governor- appointment, powers and functions</li> <li>• The Legislature: Parliament and its components- Lok Sabha and Rajya Sabha (composition and functions)</li> <li>• The Judiciary: Supreme Court-composition, functions, appointment and jurisdiction</li> </ul> | 8         |
| 3.                              | Nature of Federalism in India  | <ul style="list-style-type: none"> <li>• Centre-State Legislative Relations</li> <li>• Centre-State Administrative Relations</li> <li>• Centre-State Financial Relations</li> <li>• Special Provisions of some state and the 5<sup>th</sup> and 6<sup>th</sup> schedule</li> <li>• Emergency provision</li> </ul>  | 8         |
| 4.                              | Local Governance in India      | <ul style="list-style-type: none"> <li>• Urban local governance: Municipality- Structure &amp; Functions</li> <li>• Rural Local governance: Panchayat- Organization and Powers</li> <li>• Civil Society: the participation of the people in local governance</li> </ul>  | 8         |
| 5.                              | Traditional knowledge          | <ul style="list-style-type: none"> <li>• Kautilya- Theory of state</li> <li>• Mandala theory</li> <li>• Saptanga theory</li> </ul>   | 6         |
| 6.                              | Challenges to Indian Democracy | <ul style="list-style-type: none"> <li>• Caste as a critical factor in the Indian Constitution</li> <li>• Gender as critical to the process of Constitutionalization</li> </ul>  | 4         |
| <b>Total number of Lectures</b> |                                |  | <b>42</b> |

#### Evaluation Criteria

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

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

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

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

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

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

|                 |                                |                      |
|-----------------|--------------------------------|----------------------|
| Faculty (Names) | Coordinator(s)                 | Dr. Purwa Srivastava |
|                 | Teacher(s)<br>(Alphabetically) | Dr Purwa Srivastava  |

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

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



|                                 |                                  |   |           |
|---------------------------------|----------------------------------|---|-----------|
|                                 | accounting system                | accounting systems, Ethical conduct for accountants   |           |
| 3.                              | Cost Concepts and cost behaviour | Identifying resources, Activities, Costs and Cost drivers; Variable and Fixed cost behaviour; Cost-Volume-Profit Analysis   | 7         |
| 4.                              | Cost Management Systems          | Direct, Indirect cost; Cost allocation; Traditional and Activity Based costing systems, special orders, pricing decision, cost-plus pricing, target costing, make or buy decision | 7         |
| 5.                              | Budgetary Control                | Introduction to budgets; Functional budgets, Master budgets, Fixed and flexible budgets, Budgets as financial planning models, Variance analysis                                  | 8         |
| 6.                              | Management control system        | Organizational goal and performance measures, designing a management control system   | 6         |
| <b>Total number of Lectures</b> |                                  |   | <b>42</b> |
| <b>Evaluation Criteria</b>      |                                  |   |           |
| <b>Components</b>               |                                  | <b>Maximum Marks</b>  |           |
| T1                              |                                  | 20  |           |
| T2                              |                                  | 20  |           |
| End Semester Examination        |                                  | 35  |           |
| TA                              |                                  | 25 (assignments, class test, project)   |           |
| <b>Total</b>                    |                                  | <b>100</b>  |           |

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

|  |   |
|--|---|
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) |   |
| 1.   | 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, 5 <sup>th</sup> Edition, Pearson Publication, 2009. |
| 3.   | Arora, M.N. Cost and Management Accounting, Himalaya Publishing, 4 <sup>th</sup> Edition, 2018.   |

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

### Detailed Syllabus

|                    |                                      |                      |   |
|--------------------|--------------------------------------|----------------------|---|
| <b>Course Code</b> | 22B12PH311                           | <b>Semester:</b> Odd | <b>Semester:</b> 5 <sup>th</sup> <b>Session:</b> 2023-2024<br><b>From:</b> July to December |
| <b>Course Name</b> | Engineering Materials and Technology |                      |   |
| <b>Credits</b>     | 3                                    | <b>Contact Hours</b> | 3   |

|                        |  |                               |
|------------------------|--|-------------------------------|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>                  | Dr. Alok P. S. Chauhan        |
|                        | <b>Teacher(s)<br/>(Alphabetically)</b> | Dr. Alok Pratap Singh Chauhan |

| <b>COURSE OUTCOMES</b><br>After completion of the course, students will be able to: |  | <b>COGNITIVE LEVELS</b> |
|---|--|-------------------------|
| <b>C301-2.1</b>   | Recall the importance of engineering materials existing in the environment around us.  | Remembering (C1)        |
| <b>C302-2.2</b>   | Explain and compare the different properties of the materials along with their broad classifications.                          | Understanding (C2)      |
| <b>C303-2.3</b>   | Apply the knowledge to analyze and use the different processes of the materials manufacturing.                                 | Applying (C3)           |
| <b>C304-2.4</b>   | Apply the knowledge to develop/ choose materials for advanced engineering applications including robotic, drone and aerospace. | Analyzing (C4)          |

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

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

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

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

## Economics of Agriculture: Issues & Development

|                    |   |                      |  |
|--------------------|---|----------------------|--|
| <b>Course Code</b> | <b>23B12HS312</b>   | <b>Semester: ODD</b> | <b>Semester V Session 2023 -2024</b><br><b>Month from: July 2023-Dec2023</b> |
| <b>Course Name</b> | <b>Economics of Agriculture: Issues &amp; Development</b> |                      |  |
| <b>Credits</b>     | 03  | <b>Contact Hours</b> | 2-1-0  |

|                        |  |                    |
|------------------------|--|--------------------|
| <b>Faculty (Names)</b> | <b>Coordinator(s)</b>                  | Dr. Vandana Sehgal |
|                        | <b>Teacher(s)<br/>(Alphabetically)</b> | Dr. Vandana Sehgal |

| <b>COURSE OUTCOMES</b>   |   | <b>COGNITIVE LEVELS</b>  |
|--|---|--------------------------|
| After pursuing the above mentioned course, the students will be able to: |   |                          |
| CO1  | Understand the significance of agricultural sector in economic development<br><div style="text-align: center; border: 1px solid black; padding: 2px;">Skill Development</div>   | Understanding Level (C2) |
| CO2  | Examine the working of marketing institutions and the players in marketing of agricultural commodities and the major sources of agricultural finance<br><div style="text-align: center; border: 1px solid black; padding: 2px;">Skill Development</div> | Applying Level (C3)      |
| CO3  | Link the agricultural policies and its effect on sustainable agricultural development<br><div style="text-align: center; border: 1px solid black; padding: 2px;">Skill Development</div>  | Analyzing Level (C4)     |
| CO4  | Assess the impact of globalization on agricultural development.<br><div style="text-align: center; border: 1px solid black; padding: 2px;">Skill Development</div>  | Evaluating Level (C5)    |

| <b>Module No.</b> | <b>Title of the Module</b>                         | <b>Topics in the Module</b>   | <b>No. of Lectures for the module</b> |
|-------------------|--|---|---------------------------------------|
| Module-I          | <b>ROLE OF AGRICULTURE IN ECONOMIC DEVELOPMENT</b> | Nature and scope of Agricultural Economics; Role of agriculture in economic/rural development - Inter-sector Linkages of Agriculture- Barriers to Agricultural Growth-Schultz Theory of Transformation of Traditional Agriculture; Mellor's theory of Agricultural development - Boserup's Theory of Agricultural Development - The Chayanov Farm Household model - Barnum-Squire Farm Household Model - Hayami-Ruttan Induced Innovation Hypothesis<br><div style="text-align: center; border: 1px solid black; padding: 2px;">Skill Development</div> | 8                                     |
| Module-II         | <b>AGRICULTURAL</b>                                | Market intermediaries and their role-Problems in  | 8                                     |

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

**Total number of Lectures -42**

**Evaluation Criteria**

| <b>Components</b>        | <b>Maximum Marks</b>            |
|--------------------------|---------------------------------|
| T1                       | 20                              |
| T2                       | 20                              |
| End Semester Examination | 35                              |
| TA                       | 25 (Project, Assignment & Quiz) |
| <b>Total</b>             | <b>100</b>                      |

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

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

|    |   |
|----|---|
| 1. | Agricultural Economics: Principles and Policy" by David L. Debertin,2012  |
| 2. | Principles of agricultural economics markets and prices in less developed countriesby David Colman And Trevor Young, Cambridge University Press |
| 3. | Agricultural Development: An International Perspective" by Alain de Janvry and Elisabeth Sadoulet   |
| 4. | Agricultural Economics" by H. Evan Drummond and John W. Goodwin,2013  |
| 5. | Lekhi R.K. & Singh Joginder, Agricultural Economics, Kalyani Publishers, New Delhi.   |
| 6. | Principles of Agricultural Economics by Andrew Barkley and Paul W. Barkley, Routledge Taylor and Francis Publications, 2013                     |