| Subject Code | 15B11CI411 | Semester Even<br>(specify Odd/Even) | Semester IV   Session  2021 -2022 |
|---|---|---|---|
| | | | Month from:  Feb 2022 to June 2022 |
| Subject Name | Algorithms and Problem Solving | | |
| Credits | 3 | Contact Hours | 3 |

| Faculty<br>(Names) | Coordinator(s) | Dr.Tribhuwan Kumar Tewari (J62), Dr. Pulkit Mehndiratta (J128) |
|---|---|---|
| | Teacher(s)<br>(Alphabetically) | J62 – Dr.Jyoti ,Dr. Suma Dawn, Dr. Taj Alam, Dr.Tribhuwan Kumar Tewari, Dr.Vivek Kumar Singh<br>J128 – Dr. Krishna AsawaDr. Pulkit Mehndiratta,Dr. Shikha Mehta, Dr.Varsha Garg |

| COURSE OUTCOMES | | COGNITIVE LEVELS |
|---|---|---|
| C214.1 | Analyse the complexity of different algorithms using asymptotic analysis. | Analyze Level (Level 4) |
| C214.2 | Select an appropriate data structure and apply related operations for a given problem. | Apply Level (Level 3) |
| C214.3 | Apply algorithmic principles for solving a given problem. | Apply Level (Level 3) |
| C214.4 | Identify, formulate and design an efficient solution to a given problem using appropriate data structure and algorithm design technique. | Create Level (Level 6) |

| Module No. | Subtitle of the Module | Topics in the Module | No. of Lectures for the module |
|---|---|---|---|
| 1. | Introduction | Introduction to problem solving approach; Asymptotic Analysis: Growth of Functions and Solving Recurrences; Notations- Big O, big omega, big theta, little o; Empirical analysis of sorting and searching algorithms – Merge sort, Quick sort, Heap sort, Radix sort, Count sort, Binary search, and Median search | 7 |
| 2. | Design Technique: Divide and Conquer | Fundamentals of Divide and Conquer (D&C) approach using Binary search, Quick sort, and Merge sort; Strassen's matrix multiplication; and Closest pair, etc. | 3 |
| 3. | Design Technique: Greedy Algorithms | Introduction to greedy based solution approach; Minimum Spanning Trees (Prim's and Kruskal algorithms); Shortest Path using Dijkstra's algorithm; Fractional and 0/1 Knapsack; Coinage problem; Bin packing; Job scheduling – Shortest job first, Shortest remaining job first, etc.; Graph coloring; and Text compression using Huffman coding and Shannon-Fanon coding, etc. | 6 |
| 4. | Design Technique: Backtracking Algorithms | Review of backtracking based solution approach using N queen, and Rat in a maze; M-coloring problem; Hamiltonian Cycle detection; Travelling salesman problem; Network flow | 6 |
| 5. | Dynamic Programming | Fundamentals of Dynamic programming based solution approach; 0/1 Knapsack ; Shortest path using Floyd Warshall; Coinage problem; Matrix Chain Multiplication; Longest common subsequence; Longest increasing sequence, String editing | 7 |

| 6. | String Algorithms | Naïve String Matching, Finite Automata Matcher, Rabin Karp matching algorithm, Knuth Morris Pratt, Solving string problems using string data structures like Tries, Suffix Tree,and Suffix Array | 6 |
|---|---|---|---|
| 7. | Problem Spaces and Problem solving by search | Problem Spaces: States, goals and operators, Factored representation (factoring state into variables) Uninformed search (BFS, DFS, DFS with iterative deepening), Heuristics and informed search (hill-climbing, generic best-first, A*) | 5 |
| 8. | Tractable and Non-Tractable Problems | Efficiency and Tractability, P, NP, NP-Complete, NP- Hard problems | 2 |
| | | **Total number of Lectures** | **42** |

**Project based learning:** Each student in a group of 3-4 will have to develop a mini project based on data structures algorithms. The students can opt any real-world application where these algorithms can be applied. The students have to implement the mini project using C/C++/Java language. Project development and its presentation will enhance coding skills, knowledge and employability of the students in IT sector.

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

| 1. | Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein , Introduction to Algorithms, MIT Press, 3rd Edition, 2009 |
|---|---|
| 2. | Steven Skiena ,The Algorithm Design Manual, Springer; 2nd edition , 2008 |
| 3. | Knuth, The art of Computer Programming Volume 1, Fundamental Algorithms, Addison-Wesley Professional; 3 edition,1997 |
| 4. | Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 2008 |
| 5. | Sedgewick, Algorithms in C, 3rd edition. Addison Wesley, 2002 |
| 6. | Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley Series in Computer Science and Information Processing, 1983 |
| 7. | ACM Transactions on Algorithms (TALG) |
| 8. | Algorithmica Journal, Springer |
| 9. | Graphs and Combinatorics, Journal, Springer |
| 10. | The ACM Journal of Experimental Algorithmics |

**Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. **( Text books**)

| 1. | Tim Roughgarden, Algorithms Illuminated: Part 1: The Basics, Soundlikeyourself Publishing, September 27, 2017 |
|---|---|
| 2. | Tim Roughgarden, Algorithms Illuminated:Part 2: Graph Algorithms and DataStructures ,Soundlikeyourself Publishing, First Edition, 2018. |
| 3. | Tim Roughgarden, Algorithms Illuminated :Part3:Greedy Algorithms and Dynamic Programming,Soundlikeyourself Publishing, First Edition, 2019. |
| 4. | Weiss, Data Structures and Algorithm Analysis in C++, 4th Edition**,** Pearson, 2014 |

# Probability and Random Processes (15B11MA301)

Conditional probability, Bayes theorem, random variables, probability and cumulative density functions, MGF and CF, joint, marginal and conditional distributions, probability distributions, Bernoulli, Binomial, Poisson, Negative binomial, Geometric distributions. Uniform, Exponential, Normal, Gamma, Earlang, Weibull distributions, reliability, MTTF, system reliability, random processes, averages, stationary processes, random walk, Wiener process, semi-random telegraph signal process, ergodic processes, PSDF, Poisson processes, Markov chains.

## Course Description

| Course Code | 15B11MA301 | Semester Even | Semester IV Session 2021-22 Month from Jan - Jun 2022 | |
|---|---|---|---|---|
| Course Name | Probability and Random Processes | | | |
| Credits | 4 | Contact Hours | 3-1-0 | |
| Faculty (Names) | Coordinator(s) | Prof. B. P. Chamola, Dr. Rajanish Kumar Rai | | |
| | Teacher(s) (Alphabetically) | Prof. B. P. Chamola, Dr. Rajanish Kumar Rai, Dr. Pato Kumari, Dr. Yogesh Gupta, Dr. Vipin Chandra Dubey, Dr. Shikha Pandey, Dr Lakhveer Kaur, Dr. Amit Srivastava, Dr. Amita Bhagat, Dr. Neha Ahlawat, Dr. Pinkey Chauhan | | |

| COURSE OUTCOMES: | | COGNITIVE LEVELS |
|---|---|---|
| After pursuing the above mentioned course, the students will be able to: | | |
| C201.1 | explain the basic concepts of probability, conditional probability and Bayes' theorem | Understanding Level (C2) |
| C201.2 | identify and explain one- and two-dimensional random variables along with their distributions and statistical averages | Applying Level (C3) |
| C201.3 | apply some probability distributions to various discrete and continuous problems. | Applying Level (C3) |
| C201.4 | solve the problems related to the component and system reliabilities. | Applying Level (C3) |
| C201.5 | identify the random processes and compute their averages. | Applying Level (C3) |
| C201.6 | solve the problems on Ergodic process, Poisson process and Markov chain. | Applying Level (C3) |

| Module No. | Title of the Module | Topics in the Module | No. of Lectures for the module |
|---|---|---|---|
| 1. | Probability | Three basic approaches to probability, conditional probability, total probability theorem, Bayes' theorem. | 5 |
| 2. | Random Variables | One dimensional random variables (discrete and continuous), distribution of a random variable (density function and cdf). MGF and characteristic function of a random variable and its utility. | 8 |

| | | Bivariate random variable, joint, marginal and conditional distributions, covariance and correlation. | |
|---|---|---|---|
| 3. | Probability Distributions | Bernoulli, binomial, Poisson, negative binomial, geometric distributions. Uniform, exponential, normal, gamma, Earlang and Weibull distributions. | 8 |
| 4. | Reliability | Concept of reliability, reliability function, hazard rate function, mean time to failure (MTTF). Reliability of series, parallel, series-parallel, parallel-series systems. | 6 |
| 5. | Random Processes I | Introduction, Statistical description of random processes, Markov processes, processes with independent increments. Average values of random processes. Strict sense and wide sense stationary processes, their averages. Random walk, Wiener process. Semi-random telegraph signal and random telegraph signal process. Properties of autocorrelation function. | 7 |
| 6. | Random Processes II | Ergodic processes. Power spectral density function and its properties. Poisson processes. Markov chains and their transition probability matrix (TPM). | 8 |
| **Total number of Lectures** | | | **42** |

**Evaluation Criteria**

Components          Maximum Marks

T1                              20
T2                              20
End Semester Examination    35
TA                              25 (Quiz, Assignments, Tutorials)
**Total**                       **100**

**Project based learning:** Each student in a group of 4-5 will apply the concepts of probability distributions, Poisson processes and Markov chains to solve some practical problems.

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

| 1. | **Veerarajan, T.,** Probability, Statistics and Random Processes, 3rd Ed. Tata McGraw-Hill, 2008. |
|---|---|
| 2. | **Papoulis, A. & Pillai, S.U.,** Probability, Random Variables and Stochastic Processes, Tata McGraw-Hill, 2002. |
| 3. | **Ross, S. M.,** Introduction to Probability and Statistics for Engineers and Scientists, 4th Ed., Elsevier, 2004. |
| 4. | **Palaniammal, S.,** Probability and Random Processes, PHI Learning Private Limited, 2012. |
| 5. | **Prabha, B. and Sujata, R.,** Statistics, Random Processes and Queuing Theory, 3rd Ed., Scitech, 2009. |

## CO-PO and CO-PSO Mapping:

| COs | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO 10 | PO 11 | PO 12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **C201.1** | 3 | 2 | 2 | 1 | | | | | | | | 2 | | |

| C201.2 | 3 | 3 | 1 | 1 | | | | | | | | 3 | | |
| C201.3 | 3 | 3 | 2 | 1 | | | | | | | | 3 | | |
| C201.4 | 3 | 3 | 3 | 2 | | | | | | | | 2 | | |
| C201.5 | 3 | 3 | 2 | 1 | | | | | | | | 2 | | |
| C201.6 | 3 | 3 | 2 | 1 | | | | | | | | 2 | | |

| Subject Code | 15B17CI471 | Semester Even (specify ~~Odd~~/Even) | Semester IV   Session  2021-2022 Month from: Jan to June 2022 |
|---|---|---|---|
| Subject Name | Algorithms and Problem Solving Lab | | |
| Credits | 1 | Contact Hours | 2 |

| Faculty (Names) | Coordinator(s) | Sherry Garg(62), Akanksha Mehndiratta (128) |
|---|---|---|
| | Teacher(s) (Alphabetically) | **J62:** Ankita Wadhwa, Bharat Gupta, Dhanalekshmi G, Hema N, Mahendra Gurve, Nitish A, Jyoti, Tribhubhan K Tiwari, Sherry Garg, Suma Dawn, Vivek K Singh<br>**J128:** Akanksha Mehndiratta, Himani Bansal, Pulkit Mehndiratta, Raju Pal, Shikha Mehta, Surendra Kumar |

| | COURSE OUTCOMES | COGNITIVE LEVELS |
|---|---|---|
| C274.1 | Choose and define appropriate data structure to a given problem | Remember Level (Level 1) |
| C274.2 | Understand various data structures and algorithm design techniques with the help of examples. | Understand Level (Level 2) |
| C274.3 | Apply and build various algorithms and design techniques to solve the given problem. | Apply Level (Level 3) |
| C274.4 | Analyze the algorithm by their complexity using asymptotic analysis. | Analyze Level (Level 4) |
| C274.5 | Evaluate the correctness and complexity of the algorithm for a given problem. | Analyze Level (Level 4) |
| C274.6 | Formulate, elaborate and design an efficient solution to a given problem using appropriate data structure and algorithm design technique | Apply Level (Level 3) |

| Module No. | Title of the Module | List of Experiments | CO |
|---|---|---|---|
| 1. | Analysis of algorithms, Searching and sorting based problems | Introduction to problem solving approach; Asymptotic Analysis; Solving Recurrences; Empirical analysis of sorting and searching algorithms – Merge sort, Quick sort, Heap sort, Radix sort, Count sort, Binary search, and Median search | CO1, CO2, CO3, CO4 |
| 2. | Design Technique: Divide and Conquer | Problems based on Divide and Conquer (D&C) approach such as Binary search, Quick sort, and Merge sort; and Closest pair, etc. | CO3, CO5 |
| 3. | Design Technique: Greedy Algorithms | Introduction to greedy based solution approach; Minimum Spanning Trees (Prim's and Kruskal algorithms); Shortest Path using Dijkstra's algorithm; Fractional and 0/1 Knapsack; Coinage problem; Bin packing; Job scheduling – Shortest job first, Shortest remaining job first, etc.; Graph coloring; and Text compression using Hamming coding and Shannon-Fano coding, etc. | CO3, CO5 |
| 4. | Design Technique: Backtracking Algorithms | Review of backtracking based solution approach using N queen, and Rat in a maze; M-coloring problem; Hamiltonian Cycle detection; Travelling salesman problem; Network flow | CO3, CO5 |
| 5. | Dynamic Programming | Fundamentals of Dynamic programming based solution approach; 0/1 Knapsack ; Shortest path using Floyd Warshall; Coinage problem; Matrix Chain Multiplication; Longest | CO3, CO5 |

| | | common subsequence; Longest increasing sequence, String editing | |
|---|---|---|---|
| **6.** | String Algorithms | Naïve String Matching, Finite Automata Matcher, Rabin Karp matching algorithm, Knuth Morris Pratt, Tries; Suffix Tree; and Suffix Array | CO3, CO5 |
| **7.** | Problem Spaces and Problem solving by search | Problem Spaces: States, goals and operators, Factored representation (factoring state into variables) Uninformed search (BFS, DFS, DFS with iterative deepening), Heuristics and informed search (hill-climbing, generic best-first, A*) | CO3, CO5 |
| **8.** | Case-study / Assignment / Mini-Project | Designing an efficient solution to a given problem using appropriate data structure and algorithm design technique | CO5, CO6 |

**Evaluation Criteria**

| Components | Maximum Marks |
|---|---|
| **Lab Test 1** | **20** |
| **Lab Test 2** | **20** |
| **Evaluation 1** | **10** |
| **Evaluation 2** | **15** |
| **PBL/Mini Project** | **20** |
| **Attendance** | **15** |
| **Total** | **100** |

**Project based learning:** Students in a group of 4-5 will be designing an efficient solution to a given problem / case-studies using appropriate data structure and algorithm design technique studies in the course. The students have to implement the mini project using C/C++/Java language. Project development and its presentation will enhance coding skills, knowledge and employability of the students in IT sector.

| **Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. **(Reference Books,** Journals, Reports, Websites etc. in the IEEE format) | |
|---|---|
| **1.** | Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, MIT Press, 3rd Edition, 2009 |
| **2.** | Steven Skiena ,The Algorithm Design Manual, Springer; 2nd edition , 2008 |
| **3.** | Knuth, The art of Computer Programming Volume 1, Fundamental Algorithms, Addison-Wesley Professional; 3 edition,1997 |
| **4.** | Horowitz and Sahni, Fundamentals of Computer Algorithms, Computer Science Press, 2008 |
| **5.** | Sedgewick, Algorithms in C, 3rd edition. Addison Wesley, 2002 |
| **6.** | Alfred V. Aho, J.E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Addison-Wesley Series in Computer Science and Information Processing, 1983 |
| **7.** | ACM Transactions on Algorithms (TALG) |
| **8.** | Algorithmica Journal, Springer |
| **9.** | Graphs and Combinatorics, Journal, Springer |
| **10.** | The ACM Journal of Experimental Algorithmics |

| | |
|---|---|
| **Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( **Text books**) | |
| **1.** | Tim Roughgarden, Algorithms Illuminated: Part 1: The Basics, Soundlikeyourself Publishing, September 27, 2017 |
| **2.** | Tim Roughgarden, Algorithms Illuminated:Part 2: Graph Algorithms and DataStructures ,Soundlikeyourself Publishing, First Edition, 2018. |
| **3.** | Tim Roughgarden, Algorithms Illuminated :Part3:Greedy Algorithms and Dynamic Programming,Soundlikeyourself Publishing, First Edition, 2019. |
| **4.** | Weiss, Data Structures and Algorithm Analysis in C++, 4th Edition**,** Pearson, 2014 |

| Course Code | 15B1NHS431 | Semester : EVEN | Semester IV Session 2021-2022 Month: February 2022 to June 2022 |
|---|---|---|---|
| **Course Name** | **Introduction to Literature** | | |
| **Credits** | 3 | **Contact Hours** | **3 (2-1-0)** |

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

| COURSE OUTCOMES | | COGNITIVE LEVELS |
|---|---|---|
| C206-5.1 | Understand figurative language to demonstrate communication skills individually and in a group. | CL-2 Understanding |
| C206-5.2 | Develop a critical appreciation of life and society through a close reading of select texts. | CL-3 Applying |
| C206-5.3 | Analyse a literary text thematically and stylistically and examine it as representing different spectrum of life, human behavior and moral consciousness of society. | CL-4 Analysing |
| C206-5.4 | To interpret Literature as reflection of cultural and moral values of life and society. | CL-5 Evaluating |

| Module No. | Title of the Module | Topics in the Module | No. of Lectures for the module |
|---|---|---|---|
| 1. | Introduction to Literature & Genres | Introduction Literary Genres Literary Devices Learning Communication Skills through Literature | 5 |
| 2. | Poems | On His Blindness: John Milton My Last Duchess: Robert Browning "Hope" is the thing with feathers: Emily Dickinson A Prayer before Birth: Louis MacNeice Goodbye Party for Miss Pushpa T.S.: Nissim Ezekiel | 6 |
| 3. | Prose & Short Stories | The Spectator Club: Richard Steele Evidence: Isaac Asimov Toba Tek Singh: Saadat Hasan Manto | 6 |
| 4. | Plays & Drama | Andher Nagari Chaupat Raja: Bhartendu Harishchandra The Characters of Macbeth & Lady Macbeth as Universal Characters. Arms & The Man: G B Shaw | 7 |
| 5. | Novel | To Sir With Love: E.R. Braithwaite | 4 |

| | Total number of Lectures | 28 |
|---|---|---|

**Evaluation Criteria**

| Components | Maximum Marks |
|---|---|
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25 (Assignment, Project and class description ) |
| **Total** | **100** |

Project Based Learning:

The students take up a project in a group of 4-5. The Project consists of 2 components: A Digital Poster & a Report. The students pick a text (Novel /Play) of their choice which has not been covered in the syllabus. The analysis of the text is to be submitted in the form of a Narrative Digital Poster. The analysis should include: Introduction, Objectives/Research Questions, Background Study / literature review, Method/ Discussion(Themes, Narrative Structure, Plot in the context of Conflicts, Freitag's model and any 3 Major Literary Devices used by the writer and application of Psychoanalysis) & Analysis. The students should identify the themes in context of the following: a)Different spectrum of life as explored in the text b) Human behavior as exhibited in the text c) Cultural aspects as portrayed in the text d) Moral consciousness of an individual and the society as analysed in the text. The project includes a brief 2-3 pages report which should highlight the following: a) The Names of the team members along with individual contribution in the whole. b) The channels undertaken for team coordination and for remote collaboration.c) Challenges faced and Lessons learnt in virtual coordination/communication. d) Rationale for choosing the particular text. e) Abstract of the entire poster in 250 words, highlighting introduction, objectives, methodology adopted, discussion, analysis and conclusion. f) Learning of the team from the poster based project work done. g) Relevance of the findings/ study for the society and future h) Limitations of the study done.

| Recommended Reading material: | |
|---|---|
| 1 | John E. Eck, '*Writing with Sweet Clarity'* 1st Edition. Routledge. 2022 https://doi.org/10.4324/9781003167532 |
| 2 | M.H. Abrams, Geoffrey Harpham *'A Glossary of Literary Terms'*, 11th Edition, Cengage Learning, 2014, |
| 3 | Mark William Roche, *'Why Literature matters in the 21st Century'*, 1st Edition, Yale University Press, 2004. |
| 4 | E.R. Braithwaite, *'To Sir With Live'*, First Edition, Bodley Head, UK, 1959. Susie Thomas(Ed), "E. R. Braithwaite: 'To Sir, with Love' – 1959", Available at http://www.londonfictions.com |
| 5 | Khalid Hasan ( Translator), *'Saadat Hasan Maanto : Toba Tek Singh'* Reprint, Penguin Books, India, 2008. |
| 6 | G.B Shaw, '*Arms & The Man'*, Paperback, 2013 https://onemorelibrary.com/index.php/en/?option=com_djclassifieds&format=raw&view=download&task=download&fid=10428 |
| 7 | Anon, (a.n.d.). *The Spectator Club. Sir Richard Steele*. 1909-14. Available at: https://www.bartleby.com/27/7.html |
| 8 | *All poems online: http://www.poetryfoundation .org* |
| 9 | Wolfgang Clemen, '*Shakespeare's Soliloquies'*, First Edition, Routledge, London, 1987. |

| Subject Code | 15B1NHS432 | | Semester: Even | Semester IV   Session  2021-2022 |
|---|---|---|---|---|
| | | | | Months: from  Feb.  to  June 2022 |
| Subject Name | INTRODUCTION TO PSYCHOLOGY | | | |
| Credits | 3 | | Contact Hours | (2-1-0) |
| Faculty (Names) | Coordinator(s) | | Dr. Badri Bajaj    Dr. Amba Agarwal | |
| | Teacher(s) (Alphabetically) | | Dr. Amba Agarwal     Dr. Badri Bajaj | |

| | COURSE OUTCOMES | COGNITIVE LEVELS |
|---|---|---|
| C206-6.1 | Demonstrate a basic understanding of different perspectives and concepts of psychology | Understanding (Level 2) |
| C206-6.2 | Apply the concepts of psychology in day to day life | Applying (Level 3) |
| C206-6.3 | Examine the different theoretical perspectives and models of psychology | Analyzing (Level 4) |
| C206-6.4 | Develop solutions for problems related to psychology using appropriate tools/models | Creating (Level 6) |

| Module No. | Subtitle of the Module | Topics in the module | No. of Lectures for the module |
|---|---|---|---|
| 1. | Introduction to Psychology | Definition, Nature, and Scope of Psychology; Approaches: Biological, Psychodynamic, Behaviorist, and Cognitive. Methods: Experimental, Observation and Case study; Fields of application. | 3 |
| 2. | Basic Concepts | Person, Consciousness, Behavior and Experience, Perception and learning | 5 |
| 3. | Memory | Process of Memory: Encoding, Storage, Retrieval; Stages of Memory: Sensory, Short term and Long term | 3 |
| 4. | Motivation | Motives: Intrinsic and Extrinsic Frame Work, Theories of Motivation; Techniques of Assessment of Motivations; Frustration and Conflict. | 3 |
| 5. | Emotions | Concept, Development, Expression, Theories of Emotions. | 2 |
| 6. | Intelligence | Nature, Theories, Measurement and Approaches - Genetic and Environmental | 3 |
| 7. | Personality | Nature, Approaches, Determinants and Theories; Techniques of Assessment: Psychometric and Projective Techniques. | 5 |

| 8. | **Psychology of Adjustment** | Psychological Disorders: Anxiety, Stress, Depression; Psychotherapies. | 4 |
|---|---|---|---|
| | | **Total:** | **28** |

### Evaluation Criteria

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

Project based learning: Students in a group will choose a research topic from the syllabi of psychology. Students will cover the following points to prepare project reports: Understanding of concept, related theories and perspectives; describe the relevance of the chosen concept for personal growth; discuss the application of chosen topic for their professional life; elaborate the relevance of the topic at group level and societal level. Discussions on these practical aspects will enhance students' understanding & application of concepts of psychology in day to day life.

| **Recommended Reading material:** Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, Reference Books, Journals, Reports, Websites etc. in the IEEE format) | |
|---|---|
| 1. | R.A. Baron and G. Misra, Psychology, 5th Ed., Pearson, 2015 |
| 2. | S. Nolen-Hoeksema, B. L. Fredrickson, G. R. Loftus, and C. Luts, Introduction to Psychology, 16th Ed., Cengage Learning, 2014. |
| 3. | S. K. Ciccarelli and G. E. Meyer, Psychology, Pearson, 5th Ed., 2017. |
| 4. | Clifford Morgan, Richard King, John Weisz, John Schopler, Introduction to Psychology, 7th Ed., McGraw Hill Education, 2017. |
| 5. | S. Pandit, Introduction to Psychology, 1st Ed., SAGE Publications; 2022 |
| 6. | Gregory Feist and Erika Rosenberg, Psychology: Perspectives and Connections, 5th Ed., McGraw-Hill Education, 2021 |

## Detailed Syllabus
## Lecture-wise Breakup

| Course Code | 15B1NHS433 | Semester EVEN (specify Odd/Even) | Semester IV Session 2020 -2021 Month Jan 2021- June2021 |
|---|---|---|---|
| Course Name | INTRODUCTION TO SOCIOLOGY | | |
| Credits | 3 | Contact Hours | 3(2-1-0) |

| Faculty (Names) | Coordinator(s) | Prof Alka Sharma |
|---|---|---|
| | Teacher(s) (Alphabetically) | Prof Alka Sharma |

| COURSE OUTCOMES | | COGNITIVE LEVELS |
|---|---|---|
| C206-7.1 | Demonstrate an understanding of sociological perspectives and concepts. | Remembering (C1) |
| C206-7.2 | Explain the concept of social stratification and types of stratification as class, caste and gender. | Understanding (C2) |
| C206-7.3 | Apply the major sociological perspectives, social concepts and methods in the systematic study of society | Applying(C3) |
| C206-7.4 | Analyze the relevance of various social Institutions and how it shapes and influences social interactions. | Analyzing (C4) |

| Module No. | Title of the Module | Topics in the Module | No. of Lectures for the module |
|---|---|---|---|
| 1. | Introduction | Emergence of Sociology- forces and historical background, nature and scope, relationship with other social sciences, difference between common sense and sociology, Major sociological perspective and methods, the sociological imagination | 5 |
| 2. | Basic Concepts of Sociology | Society, Culture, Groups, sub-groups, Communities, Association, Organization, social interaction and social structure: status and role | 4 |
| 3. | Social stratification | Stratification-concept, theories and type. Basis of stratification caste, class, gender and race, status and Roles | 4 |
| 4. | Sociology of Institutions | Kinship, Family ,Religion, Education  &Economy in Society | 5 |
| 5. | Process of Change and Mobility | Concept, theories and Agents of Social Change, Process of Social Change in Indian Society: Sanskritization, Westernization, Modernization, Urbanization | 6 |
| 6. | Politics and Society | Power, Elite, Bureaucracy, Pressure groups, Political parties, nation, state and civil society, protest, agitation and Social Movements | 4 |
| | | Total number of Lectures | 28 |

**Evaluation Criteria**

| Components | Maximum Marks |
|---|---|
| T1 | 20 |
| T2 | 20 (Project based) |
| End Semester Examination | 35 |
| TA | 25 (Presentation, assignment, quiz and tutorial participation) |
| **Total** | **100** |

Project: Each student will be assigned a project based on primary data collection through in-depth interviews with their parents, grandparents and other relatives. Topic of the project- the students will conduct a multidimensional analysis of their class with the Occupation, Education, Income, and Wealth variable, using their parents, grandparents, and themselves as examples to find out how do these variables relate to Social Class and social mobility? How has the Social Class of their family changed (or not) over the past three generations?

| | **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** | Johnson, Harry M. *Sociology: a systematic introduction*. Routledge, 2013. |
| **2** | Rawat, H. K. *Sociology: basic concepts*. Rawat Publications, 2007. |
| **3** | Macionis, John J. *Society: the basics*. Pearson/Prentice Hall, 2009. |
| **4** | C. Wright. And Mills, *The Sociological Imagination*, Oxford: Oxford University Press, 1959. |
| **5** | Peter L Berger, *The Social Construction of Reality: a Treatise in the Sociology of Knowledge. Garden City,* New York: Anchor, 1966. |
| **6** | Conley and Dalton, *You May Ask Yourself: An Introduction to Thinking Like a Sociologist*, 2nd Ed, W. W. Norton & Company New York, 2011. ISBN: 0393935175 or 978-0393935172 |
| **7** | Ballentine and Roberts, *Our Social World: Introduction to Sociology*, 4th Edition, Sage. 2013. |
| **8** | Robert Parkinand Linda Stone, (ed.). *Kinship and Family: An Anthropological Reader*, U.S.A.: Blackwell, 2000, selected chapters |

| Course Code | 15B1NHS434 | Semester: Even | Semester IV    Session  2021 -2022 |
|---|---|---|---|
| | | | Month from Jan 2022 to June 2022 |

| Course Name | Principles of Management |
|---|---|

| Credits | 3 | Contact Hours | 2-1-0 |
|---|---|---|---|

| Faculty (Names) | Coordinator(s) | Dr. Shirin Alavi |
|---|---|---|
| | Teacher(s) (Alphabetically) | Dr.  Shirin Alavi |

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

| Module No. | Title of the Module | Topics in the Module | No. of Lectures for the module |
|---|---|---|---|
| 1. | Introduction to Managers and Management | Management an Overview: Introduction, Definition of Management, Role of Management, Functions of Managers, Levels of Management, Management Skills and Organizational Hierarchy, Social and Ethical Responsibilities of Management: Arguments for and against Social Responsibilities of Business, Social Stakeholders, Measuring Social Responsiveness and Managerial Ethics, Omnipotent and Symbolic View, Characteristics and importance of organizational culture, Relevance of political,legal,economic and Cultural environments to global business, Structures and techniques organizations use as they go international . | 7 |
| 2. | Planning | Nature & Purpose, Steps involved in Planning, Objectives, Setting Objectives, Process of Managing by Objectives, Strategies, Policies & Planning Premises, Competitor Intelligence, Benchmarking, Forecasting, Decision-Making. | 5 |
| 3. | Organizing | Organizing ,Benefits and Limitations-De-Centralization and Delegation of Authority, Authority versus Power ,Mechanistic Versus Organic Organization ,Common Organizational Designs, Contemporary Organizational Designs and Contingency Factors, The Learning Organization Nature and Purpose, Formal and Informal Organization, Organization Chart, Structure and Process, Departmentalization by difference strategies, Line and Staff authority- Benefits and Limitations-De-Centralization and Delegation of Authority Versus, Staffing ,Human Resource | 7 |

| | | | |
|---|---|---|---|
| | | Inventory, Job Analysis , Job Description, Recruitment and Selection, Selection Tools Staffing, Managerial Effectiveness, Staffing, Training, Employee Performance Management, Compensation and Benefits, Contemporary Issues in Managing Human Resources . | |
| 4. | Directing | Scope, Human Factors, Creativity and Innovation, Harmonizing Objectives, Leadership, Types of Leadership, Directing, Managers as leaders, Early Leadership Theories…Trait Theories, Behavioral Theories, Managerial Grid, Contingency Theories of Leadership, Directing ...Path Goal Theory, contemporary views of Leadership, Cross Cultural Leadership, Leadership Training, Substitutes of Leadership | 4 |
| 5. | Controlling | Controlling, Introduction to Controlling System and process of Controlling, Requirements for effective control, The planning Contol link, The process of control, types of control The Budget as Control Technique, Information Technology in Controlling, Productivity, Problems and Management, Control of Overall Performance, Direct and Preventive Control, Financial Controls , Tools for measuring organizational Performance ,Contemporary issues in control Workplace concerns, employee theft, employee violence | 5 |
| | | **Total number of Lectures** | **28** |

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

**Project Based Learning:** The project is to be done in group size of 4-5 members each. Student groups can choose an organization from one of the following themes-Staffing and Controlling in a virtual world, Staffing and controlling in the Banking Sector, Staffing and Controlling and the IT industry, Staffing and Controlling in Hospitality/Telecom/Airlines, Staffing and Controlling in Logistics, Staffing and Controlling in International Business and Staffing and Controlling in Consulting. Study the staffing and controlling processes of the chosen organization. Students were asked to submit their research analysis in the form of a project report. This adds to the management related employability skills in an organization as staffing and controlling are important aspects of overall management function.

| | 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.** | Koontz H, Weihrich H. Essentials of management: an international, innovation, and leadership perspective. McGraw-Hill Education; 10th Edition 2018. |
| **2.** | Tripathi PC. Principles of management. Tata McGraw-Hill Education; 6th Edition 2017. |
| **3.** | Principles of Management Text and Cases, Pravin Durai , Pearson ,2015 |
| **4.** | Robbins, S.P. & Decenzo, David A. Fundamentals of Management,7th ed., Pearson, 2010 |
| **5.** | Robbins, S.P. & Coulter, Mary Management; 14 ed.,Pearson , 2009 |

| Course Code | 15B1NHS435 | **Semester**: Even | **Semester Session**:2021-22 |
| --- | --- | --- | --- |
| | | | **Month from**: Jan-June 2022 |

| Course Name | Financial Accounting | | |
| --- | --- | --- | --- |
| **Credits** | 3 | Contact Hours | 3 (2-1-0) |

| Faculty (Names) | Coordinator(s) | Dr. Mukta Mani (Sec-62), Dr. Sakshi Varshney (Sec-128) |
| --- | --- | --- |
| | Teacher(s) (Alphabetically) | Dr. Mukta Mani, Dr. Sakshi Varshney |

| COURSE OUTCOMES | | COGNITIVE LEVELS |
| --- | --- | --- |
| **C206-8.1** | Understand the basic concepts of Accounting. | Understanding level (C2) |
| **C206-8.2** | Apply accounting concepts for recording of business transactions. | Applying level (C3) |
| **C206-8.3** | Compare and reconcile the accounting records with other sources of information. | Analyzing level (C4) |
| **C206-8.4** | Evaluate the accounting records to identify and rectify the errors made during accounting process. | Evaluating level (C5) |
| **C206-8.5** | Construct the final accounts and cash flow statement of a business. | Creating (C6) |

| Module No. | Title of the Module | Topics in the Module | No. of Lectures for the module |
| --- | --- | --- | --- |
| 1. | Introduction to Accounting | Meaning of Accounting, Objectives of Accounting, Understanding Company Management, Stakeholders versus Shareholders, Financial Reporting Standards, Financial Reporting | 2 |
| 2. | Understanding Accounting Elements | Elements of Financial Statements- Assets, Current assets, Liabilities, Current liabilities, Equity, Income, Expenses, Accounting Equation | 2 |
| 3. | Accounting Concepts | Business entity concept, Money measurement concept, Going concern, Consistency, Matching concept, Cost concept, Dual aspect concept, Materiality, Full disclosure, Generally Accepted Accounting Principles (GAAP) | 2 |
| 4. | Journal Transactions | Journal, Rules of Debit and Credit, Compound Journal entry, Opening entry | 2 |
| 5. | Ledger Posting and Trial Balance | Ledger, Posting, relationship between Journal and Ledger, Rules regarding Posting, Trial balance | 3 |

| 6. | Rectification of Errors | Different types of errors, their effect on trial balance, rectification and preparation of suspense account | 5 |
|---|---|---|---|
| 7. | Bank Reconciliation Statement | Meaning of Bank Reconciliation Statement, technique of preparing BRS, Causes of difference | 2 |
| 8. | Final Accounts | Trading account, Profit and Loss account, Balance sheet, Adjustment entries | 6 |
| 9. | Cash Flow Statement | Introduction of Cash Flow Statement, Classification of Cash inflows and Cash Outflows Activities, Elements of the Cash Flow Statement, Methods of Cash Flow Statement, Limitations Of Cash Flow Statement | 4 |
| | | **Total number of Lectures** | **28** |

**Evaluation Criteria**

| Components | Maximum Marks |
|---|---|
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25 (Project+ Class test/Quiz+ Class Participation) |
| **Total** | **100** |

**Project Based learning:** Students form a group of 4-5 students. Each group is required to choose a company listed in Indian stock exchange and download its latest annual report. Students are required to describe the company, composition of board of directors, number of company's executives, independent directors, and background of independent directors. They are required to find out financing, investing and operating activities and examine the change in total assets, sales and net profit of the company. As per auditor's report, company's position and future plans for growth of the company is also analyzed.

| **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. | Maheshwari, S. N., Maheshwari, S.K. Maheshwari, S.K., Financial Accounting, 6th Ed., S. Chand & Sons Publication, 2018. |
| 2. | Narayanswamy,R., Financial Accounting: A Managerial Perspective, 6th Ed., Taxmann Publications, 20017 |
| 3. | Tulsian,P., Financial Accounting,1st Ed., Pearson Education India,2002 |
| 4. | Bhattacharya, A., Financial Accounting for Business Managers, 4th Ed., Prentice Hall of India,2012 |
| 5. | Weygandt.J., Kimmel, P., Kieso,D., Accounting Principles, 12th Edition, John Wiley & Sons,2015 |
| 6. | Barton,M., Bhutta, P.,S. O'Rourke,J.,Satyam Computer Services Ltd: Accounting fraud in India,London,SAGE Publications Ltd, 2017 |

| Course Code | 16B1NHS332 | Semester:Even (specify Odd/Even) | Semester: III  Session  2021-22 |
|---|---|---|---|
| | | | Month from: Feb-June |
| Course Name | Quantitative Methods for Social Sciences | | |
| Credits | 03 | Contact Hours | 2-1-0 |

| Faculty (Names) | Coordinator(s) | Manas Ranjan Behera |
|---|---|---|
| | Teacher(s) (Alphabetically) | Manas Ranjan Behera |

| COURSE OUTCOMES | | COGNITIVE LEVELS |
|---|---|---|
| After pursuing the above mentioned course, the students will be able to: | | |
| C206-3.1 | *Demonstrate* the key concepts of different quantitative methods used in social sciences. | Understanding Level- (C2) |
| C206-3.2 | *Classify and summarize the* data to be used for analysis. | Understanding Level- (C2) |
| C206-3.3 | *Apply* the theoretical concept toperform basic data analysis in social sciences. | Apply Level –(C3) |
| C206-3.4 | *Examine* different statistical methods and be able to discuss the merits and limitations of a particular method | Analyze Level –(C4) |
| C206-3.5 | *Recommend* appropriate conclusions following empirical analysis | Evaluation Level- (C5) |

| Module No. | Title of the Module | Topics in the Module | No. of Lectures for the module |
|---|---|---|---|
| 1. | Introduction | Introduction to Quantitative Methods, Classification & Presentation of Data: Tabulation-Types of Table, Diagrammatical and Graphical presentation. | 3 |
| 2. | Mathematical | Mathematical basis of Managerial Decision-Concepts, | 3 |

| | Concepts | Frequency Distribution and their Analysis | |
|---|---|---|---|
| **3.** | Statistical Concepts | Measures of Central Tendency, Measures of Dispersion, Measures of Association, Sampling and sample size estimation, Point estimation, Statistical Intervals based on Single sample. | 4 |
| **4.** | Hypothesis Testing | Hypothesis Testing based on single sample, Inferences based on Two samples, t, Z and chi- square and F tests | 8 |
| **5.** | Regression Analysis | Simple Linear Regression and Correlation, Multiple Regression Model | 3 |
| **6.** | Time Series Analysis | Trend Projection, Moving averages and Exponential smoothing Techniques, Index Numbers | 3 |
| **7.** | Multivariate Analysis | ANOVA, MANOVA, Factor Analysis, Discriminant Analysis | 4 |
| | | **Total number of Lectures** | **28** |

| **Evaluation Criteria** | |
|---|---|
| **Components** | **Maximum Marks** |
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25 (Quiz+ Project+Viva-voce) |
| **Total** | **100** |

**Project based Learning:** Students have to form a group (maximum 5 students in each group) and have to do a project on quantitative research techniques and strategies. The project emphasizes on objective measurement and the statistical analysis of data collected through surveys, questionnaires and polls. The students will gain a first-hand experience of data analysis which will help them in entering an analytical or research career.

| | **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.** | Sirkin, RM. Statistics for the Social sciences. 3rd ed. Thousand Oaks, Calif: Sage Publications; 2006. |
| **2.** | Montgomery, DC. , George C. Runger. Applied statistics and probability for engineers. 3rd ed. Hoboken, NJ: Wiley.,2007 |
| **3.** | Healey, JF. Statistics: A Tool for Social Research. 9th ed. Calif: Wadsworth Cengage Learning; 2012. |

| 4. | Stockemer, D.Quantitative Methods for Social Sciences: A Practical Introduction with examples in SPSS and STATA 1st ed., Springer International Publishing, 2019 |
|---|---|
| 5. | Kaplan, DW. The SAGE Handbook of Quantitative Methodology for the Social Sciences. 1st ed. SAGE Publications Inc,2004 |

| Course Code | 16B1NHS431 | Semester **Even** (specify Odd/Even) | **Semester IV Session 2021-22** Month from **Jan-June** |
|---|---|---|---|
| **Course Name** | HUMAN RESOURCE MANAGEMENT | | |
| **Credits** | 3 | **Contact Hours** | 3(LTP: 2-1-0) |

| Faculty (Names) | **Coordinator(s)** | Dr.Praveen Kumar Sharma |
|---|---|---|
| | **Teacher(s) (Alphabetically)** | Dr. Praveen Kumar Sharma |

| COURSE OUTCOMES | | COGNITIVE LEVELS |
|---|---|---|
| **C206-1.1** | Demonstrate a basic understanding of different functions of human resource management: Employer Selection, Training and Learning, Performance Appraisal and Remuneration, Human Relations and Industrial Relations. | Understand Level (C2) |
| **C206-1.2** | Apply various tools and techniques in making sound human resource decisions. | Apply level (C3) |
| **C206-1.3** | Analyze the key issues related to administering the human resource management activities such as recruitment, selection, training, development, performance appraisal, compensation and industrial relation. | Analyze Level (C4) |
| **C206-1.4** | Critically assess and evaluate different human resource & industrial relation practices and techniques and recommend solutions to be followed by the organization | Evaluate Level (C5) |

| Module No. | Title of the Module | Topics in the Module | No. of Lectures for the module |
|---|---|---|---|
| **1.** | Introduction | Introduction to Human Resource Management and its definition, HRM functions and its relation to other managerial functions, Nature, Scope and Importance of Human Resource Management in Industry, Role & position of Personnel function in the organization. Human Resource Planning | 3 |
| **2.** | Employer Selection | Recruitment Process; Selection Process - Job and Worker Analyses, Matching Job with the Person; Selection Methods - Application Blank, Biographical Inventories, References and Recommendation Letters, Interviews | 8 |
| **3.** | Training and Learning | Need Identification; Psychological Factors in Learning; Training Methods in the Workplace; Effective Training Programme | 6 |
| **4.** | Performance Appraisal and Remuneration | Different methods of Performance Appraisal, Basic concepts in wage administration, company's wage policy, Job Evaluation, Issues in wage administration, Bonus & Incentives | 6 |

| 5. | Human Relations and Industrial Relations, Trends in Human Resource Management | Factors influencing industrial relations - State Interventions and Legal Framework - Role of Trade unions - Collective Bargaining - Workers' participation in management. Trends in Human Resource Management: Analytics, Artificial Intelligence | 5 |
|---|---|---|---|
| | | **Total number of Lectures** | **28** |

### Evaluation Criteria

| Components | Maximum Marks |
|---|---|
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25(Project, assignment, class performance, attendance) |
| **Total** | **100** |

Project-based learning: Each student in a group 4 to 5 will select a company which is registered in India. To make subject application based, the student will analyze Human Resource management policies and employed performing different functions at various levels related to recruitment, training, development, performance appraisaland compensation.

| | **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.** | G. Dessler and B. Varrkey, *Human Resource Management, 15e*. Pearson Education India, 2005. |
| **2.** | V. S. P. Rao and V. H. Krishna, *Management: Text and cases*. Excel Books India, 2009. |
| **3.** | K. Aswathappa, *Human resource management: Text and cases*. Tata McGraw-Hill Education, 2013. |
| **4.** | P. M. Noe, R. A., Hollenbeck, J. R., Gerhart, B. A., & Wright, *Fundamentals of Human Resource Management*. Tata McGraw-Hill Education, 2019. |
| **5.** | B. Pattanayak, "Human Resource Management, PHI Learning Pvt," *Ltd., New Delhi*, vol. 2, 2018. |
| **6.** | D. A. DeCenzo, S. P. Robbins, and S. L. Verhulst, *Fundamentals of human resource management*. John Wiley & Sons, 2016. |

| Course Code | 18B11EC213 | Semester Even | Semester IV Session 2021 -2022 Month from Feb-June |
|---|---|---|---|

| Course Name | **DIGITAL SYSTEMS** | |
|---|---|---|
| **Credits** | 4 | **Contact Hours** 3+1 |

| Faculty (Names) | **Coordinator(s)** | Vimal Kumar Mishra, Monika |
|---|---|---|
| | **Teacher(s) (Alphabetically)** | Atul Kumar, Jashmine Saini, Juhi Gupta, Nisha Venkatesh, Ruby Beniwal, Saurabh Chaturvedi |

| COURSE OUTCOMES | | COGNITIVE LEVELS |
|---|---|---|
| **C207.1** | Familiarize with the fundamentals of number system, Boolean algebra and Boolean function minimization techniques. | Applying Level (C3) |
| **C207.2** | Analyze and design combinational circuits using logic gates. | Analyzing Level (C4) |
| **C207.3** | Analyze state diagram and design sequential logic circuits using flip flops. | Analyzing Level (C4) |
| **C207.4** | Understand the classification of signals & systems and learn basic signal operations & Fourier analysis. | Analyzing Level (C4) |
| **C207.5** | Understand various steps involved in digitization and transmission of a signal. | Understanding Level (C2) |

| Module No. | Title of the Module | Topics in the Module | No. of Lectures for the module |
|---|---|---|---|
| 1. | Boolean Function Minimization Techniques and Combinational Circuits | Number systems, Karnaugh Map, Quine-McCluskey method, Prime Implicants, Essential Prime implicants, Adder, Subtractor, Multiplexer, Demultiplexer, Encoder, Decoder, Comparator and Code Converters | 9 |
| 2. | Flip Flops | SR, JK, Master Slave JK, T And D; Excitation Tables, Conversion of Flip-Flops | 3 |
| 3. | Counters | Synchronous and Asynchronous Counters, Design of Counters Using Flip- Flops, Registers, Shift Registers, Counters Using Shift Registers; State Diagram Design, Analysis of Sequential Circuits Using Flip-Flops | 9 |
| 4. | Signals and systems | Signals and classification of signals: Continuous time anddiscrete time, Even and odd, periodic and non-periodic,Energy and Power signals, Basic signals: unit impulse, unitstep and unit ramp. Basic operations of signals: timescaling,time- shifting, etc. Systems and classification of systems: continuous and discrete, Linear and non-linear, causal and non-causal. | 5 |
| 5. | Fourier Analysis | Fourier Series, Fourier Transform Fourier Transform pair of standard signals and properties of Fourier transform. Discrete Fourier Transform (DFT), Properties and DFT, standard signal pairs. | 5 |
| 6. | Sampling and Pulse code modulation | Sampling theorem, Proof of sampling theorem, Nyquist rate and Nyquist interval. Quantization (Mid rise and Mid tread), Quantization error, PCM (modulator and demodulator), Transmission bandwidth in PCM, Signal to quantization noise ratio of PCM. | 6 |

| 7. | Digital modulation techniques and Line coding | BASK, BFSK and BPSK modulation techniques with modulator and demodulator. Linear DM and basics of ADM. Line coding formats- UNRZ, URZ, BNRZ, BRZ, AMINRZ, AMI-RZ and Manchester. | 5 |
|---|---|---|---|
| | | **Total number of Lectures** | **42** |

**Evaluation Criteria**

| Components | Maximum Marks |
|---|---|
| T1 | 20 |
| T2 | 20 |
| End Semester Examination | 35 |
| TA | 25 (Assignment = 10, Quiz = 5, Attendance = 10 ) |
| **Total** | **100** |

**Program Based Learning:** Students will be able to design and implement the projects using decoders, comparators and multiplexers. Desiging of new flip flops, counters and shift resistors enhance the application ability in students. Applying DFT and FFT to design novel systems also develop aptitude among students. Analog to digital signal transimission techniques and several digital communication techniques develop latest knowledge wireless/communication based Industries.

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

| 1. | S. Salivahanan, and S. Arivazhagan, "Digital circuits and design", Vikas publishing house PVT Limited. Fifth edition (March 2018) |
|---|---|
| 2. | Oppenheim, Alan V., Alan S. Willsky, and Syed Hamid Nawab. "Signals and Systems," Prentice-HallEnglewood Cliffs 2 edition (2015) |
| 3. | S. Haykin, "Digital Communications Systems", John Wiley & Sons, 1 edition, 2013 |
| 4. | H. Taub & D. L. Schilling, "Principles of Communication Systems", 2nd edition, McGraw-Hill HigherEducation. 3 edition (September 2007) |

# Course Description

| Course Code | 18B15EC213 | **Semester :** Even (specify Odd/Even) | **Semester:** IV, **Session** 2021 -2022 **Month- :** Feb - June |
|---|---|---|---|
| **Course Name** | Digital Systems Lab | | |
| **Credits** | 1 | **Contact Hours** | 2 |

| Faculty (Names) | **Coordinator(s)** | Mandeep Singh Narula |
|---|---|---|
| | **Teacher(s)** | Jasmine Saini, Neetu Singh, Mandeep Singh Narula, Monika, Gaurav Khanna |

| COURSE OUTCOMES | | COGNITIVE LEVELS |
|---|---|---|
| **C208.1** | Recall the basics of combinational digital circuits and their implementation. | Remembering Level (C1) |
| **C208.2** | Recall the basics of sequential digital circuits and its implementation. | Understanding Level (C2) |
| **C208.3** | Apply the theory of signals & systems and digital signal processing. | Applying Level (C3) |
| **C208.4** | Apply the concepts of digital communication. | Applying Level (C3) |

| Module No. | Title of the Module | List of Experiments | COs |
|---|---|---|---|
| 1. | Introduction to basic logic gates | Verification of truth tables of basic logic gates and their realization using universal logic gates using MATLAB | C208.1 |
| 2. | Basics of adder and substractor circuits | Design and simulate half adder, half subtractor, full adder, and full subtractor using MATLAB | C208.1 |
| 3. | Decoder logic circuits | Design and simulation of binary to gray and gray to binary code converter using MATLAB. | C208.1 |
| 4. | Multiplexer logic circuits | Design and simulation of 2-to-1, 4-to-1, and 8-to-1 multiplexers using MATLAB | C208.1 |
| 5. | Introduction to sequential circuit: SR-Latch, D and JK Flip Flop | (a) Realization of SR Latch using using MATLAB. (b) Realization of D flip flop using using MATLAB. (c) Realization of JK flip flop using using MATLAB | C208.2 |
| 6. | Continuous time and discrete time signals | Write Matlab programs for the generation of elementary continuous time signals and discrete time signals. | C208.3 |
| 7. | Sampling and reconstruction | Write Matlab program to study the sampling and reconstruction process. | C208.3 |

| | | | |
|---|---|---|---|
| | process | | |
| 8. | Quantization process of the signals. | Write Matlab program to study the quantization process of sinusoid signals. | C208.3 |
| 9. | Digital Modulation Techniques | Write Matlab programs to compute Discrete Fourier Transform (DFT) and Inverse Discrete Fourier Transform (IDFT) for the spectral analysis of signals. | C208.3 |
| 10. | Introduction to Discrete Fourier Transform (DFT) and Inverse Discrete Fourier Transform (IDFT) | Write Matlab programs to study the binary phase shift keying and frequency shift keying modulation process.keying and frequency shift keying modulation pocess | C208.4 |

**Evaluation Criteria**

| Components | Maximum Marks |
|---|---|
| Mid Term Viva | 20 |
| End Term Viva | 20 |
| Report file, Attendance, and D2D | 60 |
| **Total** | **100** |

**Project based learning:** Students will learn about Combinational and Sequential logic circuits and design them using open source softare SCILAB. Additionally, students in group sizes of two-three will realize various applications of Digital Systems employing these circuits.

| | **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.** | Salivahanan, S., and S. Arivazhagan. *Digital circuits and design*. Vikas publishing house PVT Limited. Fifth edition ( March 2018) |
| **2.** | Oppenheim, Alan V., Alan S. Willsky, and Syed Hamid Nawab. "Signals and Systems," *Prentice-Hall Englewood Cliffs* 2 edition (2015) |
| **3.** | S. Haykin *Digital Communications Systems* John Wiley & Sons, 1 edition,2013 |
| **4.** | H. Taub & D. L. Schilling, *Principles of Communication Systems*, 2nd edition, McGraw-Hill Higher Education. *3 edition (September 2007)* |