| Course Code             |   | 15B11CI611 Semester Eve<br>(specify Odd/   |                       | en Semester 6 <sup>th</sup><br>Even) Month from J |                            | Session 2018 -2019<br>January |        |           |                                      |
|-------------------------|---|--|-----------------------|---|----------------------------|-------------------------------|--------|-----------|--------------------------------------|
| Course Name Theory of C |   | omputation and Compiler Design   |                       |   |                            |                               |        |           |                                      |
| Credits                 |   |  | 4 (3-1-0)             |   | Contact Hours              |                               |        | Z         | ł                                    |
| Faculty (N              | ames)   | Coordinato   | r(s)                  | Ambalika Sark                                     | ar                         |                               |        |           |                                      |
|                         |   | Teacher(s)<br>(Alphabetica   | ully)                 | y) Mukta Goel<br>Sanjeev Patel                    |                            |                               |        |           |                                      |
| COURSE                  | OUTCO   | OMES   |                       |   |                            |                               |        | COGNIT    | IVE LEVELS                           |
| C314.1                  | Unders<br>langua  | stand the regulation ges and its acc   | ar expre<br>eptance   | ssion, regular laı<br>using automata.             | nguages, co                | ntext free                    |        | Understan | d level (C2)                         |
| C314.2                  | Identif<br>constru  | y the phases of<br>act the parsing   | f compil<br>table for | ers for a progran<br>r a given syntax             | nming lang                 | uage and                      |        | Apply Lev | vel (C3)                             |
| C314.3                  | Build s<br>gramm  | syntax directed<br>ar by analyzin  | translat<br>g S-attri | ion schemes for<br>buted and L-attr               | a given cor<br>ibuted gran | ntext free nmars.             |        | Analyze L | Level (C4)                           |
| C314.4                  | Constr<br>sensitiv  | uct grammars a ve languages.   | and mac               | hines for a conte                                 | ext free and               | context                       |        | Apply Lev | vel (C3)                             |
| C314.5                  | C314.5 Generate the intermediate code and utilize various optimization Apply Level (C. techniques to generate low level code for high level language program.   |  |                       |   | vel (C3)                   |                               |        |           |                                      |
| Module<br>No.           | Title o<br>Modu   | f the<br>le  | Topics                | in the Module                                     |                            |                               |        |           | No. of<br>Lectures for<br>the module |
| 1.                      | Unit-1  | iit-1       Finite automata:       14         Review of Automata, its types and regular expressions,       14         Equivalence of NFA, DFA and €-NFA, Conversion of       14         automata and regular expression, Applications of Finite       14 |                       |   |                            |                               | 14     |           |                                      |
| 2.                      | Unit-2 PDA and Parser: Push down automata, Context Free 12<br>grammars, top down and bottom up parsing, YACC programming specification [12 L]   |  |                       |   |                            | 12                            |        |           |                                      |
| 3.                      | Unit-3<br>Unit-3<br>Chomsky hierarchy and Turing Machine: Chomsky<br>hierarchy of languages and recognizers, Context Sensitive<br>features like type checking, Turing Machine as language<br>acceptors and its design.[6L]                      |  |                       |   |                            |                               | 6      |           |                                      |
| 4.                      | 4. Unit-4 Code generation and optimization: Syntax directed 10 translation, S-attributed and L-attributed grammars, Intermediate code generation, type conversions, and equivalence of type expression, Code generation and optimization. [10L] |  |                       |   |                            | 10                            |        |           |                                      |
|                         |   |  |                       |   | T                          | 'otal num                     | ber of | Lectures  | 42                                   |
| Evaluation              | Criter  | ia   |                       |   |                            |                               |        |           |                                      |
| <b>Components</b><br>T1 |   |  | Maxim 20              | um Marks  |                            |                               |        |           |                                      |

| T2                       | 20               |      |  |
|--------------------------|------------------|------|--|
| End Semester Examination | 35               |      |  |
| ТА                       | 25 (Assignments  | : 10 |  |
|                          | Quizzes/Tutorial | : 10 |  |
|                          | Attendance       | : 5) |  |
| Total                    | 100              |      |  |
|                          |                  |      |  |

| Reco<br>Refe | <b>pmmended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence Books, Journals, Reports, Websites etc. in the IEEE format) |
|--------------|---|
| Text         | Book(s):  |
| 1.           | Peter Linz, "An Introduction to Formal Languages and Automata," 3 <sup>rd</sup> Edition, Narosa Publisher 2005.   |
| 2.           | Alfred Aho, Monica S. Lam, Ravi Sethi, and Jeffrey D. Ullman, "Compilers: principles, techniques, and tools," 2 <sup>nd</sup> Edition, Pearson Education                        |
| Refe         | rence Book(s):  |
| 3.           | John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages, and Computation", 2 <sup>nd</sup> Edition, Pearson Education Asia 2002        |
| 4.           | K. L. P. Mishra, N. Chandrasekaran, "Theory of Computer Science Automata, Languages and Computation", 3 <sup>rd</sup> Edition, PHI 2007   |
| 5.           | John C. Martin, "Introduction to Language and the Theory of Computation", TMH 2004  |
| 6.           | S.P.Eugene, "Theory of automata, formal language and computation", New Age International Publishers, New Delhi 2003   |
| 7.           | Sipser, M., Introduction to the Theory of Computation, Second Edition, Thomson Course Technology, 2007  |
| 8.           | ACM Transactions on Computation Theory  |
| 9.           | ACM Journal on Theory of Computation.   |
|              |   |

| Course Code     | 15B11CI671                      | Semester Even<br>(specify Odd/Even)   |                 | Semeste<br>Month : | er 6 Session 2018-2019<br>from Jan to May |
|-----------------|---------------------------------|---|-----------------|--------------------|---|
| Course Name     | Theory of Computati             | on and Compile  | r Design La     | ıb                 |   |
| Credits         | 2                               |   | Contact Hours 2 |                    | 2   |
| Faculty (Names) | Coordinator(s) Dr. Chetna Dabas |   |                 |                    |   |
|                 | Teacher(s)<br>(Alphabetically)  | Ankit Vidyarthi, Chetna Dabas, Dharmveer Rajpoot, Kavita Pandey,<br>Kirti Aggarwal, Monali Mavani |                 |                    |   |

| COURSE | OUTCOMES   | COGNITIVE LEVELS   |
|--------|--|--------------------|
| C376.1 | Design different types of automata.  | Apply (level 3)    |
| C376.2 | Design programs using Lex and Yaac tools.  | Apply(level 3)     |
| C376.3 | Applying lex and yacc programs to create lexical analyzer and language scanners and parsers. | Apply (level 3)    |
| C376.4 | Evaluate different lexical analyzers and parsers   | Evaluate (level 5) |

| Module<br>No.  | Title of the Module                        | List of Experiments   | СО |  |  |  |
|--|--|---|----|--|--|--|
| 1.   | Automata Design                            | Experiments to design different types of automata (NFA, DFA),<br>Language recognized by specific strings like Implementation of<br>scenario based automata, Simulating the automata recognition a<br>Language, Implementation of extended transition function using<br>C Language. Extraction of email ids from text files.   | 1  |  |  |  |
| 2.   | Lex and Yacc Tools                         | Experiments to design programs for lexical analysis and parsing<br>using Lex and Yaac tools, Study of Lex and Yacc Tools, like<br>Lex programs for recognizing and stripping of comments in a<br>file, count number of characters, words, lines, Design Lex<br>programs for recognizing all HTML tags in a file, extraction of<br>valid IP addresses, Lex programs for Recognition and extraction<br>of vowels in English Language. | 2  |  |  |  |
| 3.   | Designing Lexical<br>Analyzers and Parsers | Experiments for applying lex and yacc programs to create lexical<br>analyzer and language scanners and parsers, like design a<br>Scanner which stores all the identifiers and literals encountered<br>in an input stream in the form of a STACK and prints the<br>STACK, Interpret and analyze given examples in Lex, Design<br>Lex and yacc calculator using yylex(), yywrap(),yyin(), Design<br>of standalone scanner using Lex.  | 3  |  |  |  |
| 4.   | Combined Lexical<br>Analyzer and Parsers   | Experiments to evaluate different lexical analyzers and parsers<br>while combining lexical analyzer and syntax analytics parts, like<br>Design and evaluate lex and yacc program to recognize nested if<br>control statement and display the levels of nesting, Lex and Yacc<br>Program to recognize and evaluate the string corresponding to a<br>specified grammar.   | 4  |  |  |  |
| Evaluation Criteria       Components     Maximum Marks       Lab Test     20 |  |   |    |  |  |  |

| Project      | 30  |  |
|--------------|-----|--|
| Evaluation 2 | 20  |  |
| Lab Test 2   | 20  |  |
| ТА           | 10  |  |
| Total        | 100 |  |

| Reco<br>Refe | <b>ommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence Books, Journals, Reports, Websites etc. in the IEEE format) |
|--------------|---|
| 1.           | Compilers: Principles, Tools and Techniques fourth editon   |
| 2.           | Lab Material for lex and yacc supplied by the department  |

| Course Code  |   | 15B11CI612   | Semester EVEN 2019<br>(specify Even)   |                                   | EN 2019<br>)               | 9 Semester VI Session 2018 -2019<br>Month from January to July |                    |                                      | 2018 -2019<br>July |
|--|---|--|--|-----------------------------------|----------------------------|--|--------------------|--------------------------------------|--------------------|
| Course Na  | me  | Theory of Pro                                      | gramming Languages   |                                   |                            |  |                    |                                      |                    |
| Credits  |   |  | 04   |                                   | Contact I                  | Hours  |                    | (L+T)                                | (3+1)              |
| Faculty (N   | ames)   | Coordinato   | r(s)   | Dr. P. Raghu V                    | Vamsi                      |  |                    |                                      |                    |
|  |   | Teacher(s)<br>(Alphabetica                         | ally)  | Dr. P. Raghu V                    | Vamsi                      |  |                    |                                      |                    |
| COURSE   | OUTCO   | OMES   |  |                                   |                            |  |                    | COGNIT                               | IVE LEVELS         |
| C315.1   | Define<br>functio   | the characteris                                    | stics of p<br>us phase   | programming lar                   | nguages and                | l the  |                    | Remember<br>(Level 1)                | er Level           |
| C315.2   | Demor<br>paradig<br>progra  | nstrate the form<br>gms, Logic pro<br>mming concep | nal gram<br>grammi<br>ts.  | mars, functionand ng paradigms, a | l programm<br>nd multi-lai | ing<br>nguage  |                    | Understar<br>(Level 2)               | nd Level           |
| C315.3   | Constr  | uct determinist                                    | tic top-d  | own and bottom                    | -up parsers                |  |                    | Apply Let (Level 3)                  | vel                |
| C315.4 Examine fundamental i<br>different programming<br>sequence control, stora |   |  | l issues underlying the design decisions of<br>g languages such as data types, sub programs,<br>rage management, event handling, parameter   |                                   |                            | Analyze Level<br>(Level 4)                                     |                    |                                      |                    |
| C315.5   | Explai  | n concurrency                                      | using C  | ++, Java and Py                   | thon.                      |  |                    | Analyze I<br>(Level 4)               | Level              |
| C315.6   | Perform comparative evaluation of programming languages with<br>respect to readability, writability, reliability, and cost of execution by<br>selecting an appropriate programming language for evaluation of a<br>computational problem. |  |  |                                   |                            |  | Evaluate (Level 5) | Level                                |                    |
| Module<br>No.  | Title o<br>Modu   | f the<br>le  | Topics in the Module   |                                   |                            |  |                    | No. of<br>Lectures for<br>the module |                    |
| 1.   | Introdu   | action   | Need to study concepts of Programming Languages (PLs),<br>History of PLs, Characteristics of good PL, Language<br>Design Principles, Compiler, Interpreter, Assembler, Linker<br>and Loader, Language evaluation criteria, PL translators,<br>compilers and interpreters   |                                   |                            |  |                    | 2                                    |                    |
| 2.   | Lexica  | ll Analysis  | Formal grammars – Chomsky hierarchy of grammars –8Type 1, 2, 3 grammars; DFA and NFA construction,<br>Minimizing DFA, Attribute Grammars; Weakness in<br>Grammars; Derivation of Languages – Left and Right most<br>derivation; Derivation trees; Ambiguity in grammars –<br>Cause of ambiguity, removing ambiguity, eliminating<br>epsilon productions, eliminating unit productions,<br>eliminating useless productions; Chomsky Normal Form;<br>Bakus Norm Form.8 |                                   |                            |  |                    |                                      |                    |
| 3.   | Parsin  | g  | Deterministic Top-Down parsing – LL(1) grammars5-6without epsilon rules, LL(1) with epsilon rules, recursive<br>descent parsing; Deterministic Bottom-up parsing – LR5-6   |                                   |                            |  |                    | 5-6                                  |                    |
| 4.   | Data 7  | ſypes  | Elementary data types, user defined data types, pointer     2  |                                   |                            |  |                    |                                      |                    |

|  |  | types type checking type conversion  |       |
|--|--|--|-------|
|  |  | types, type enceking, type conversion  |       |
| 5.   | Expressions and<br>Assignment<br>Statements            | Arithmetic expressions, overloaded operators, type<br>conversion, relational and Boolean expression, short circuit<br>evaluation, assignment statements, mixed mode assignment.  | 2     |
| 6.   | Sub Programs   | Design issues of subprograms, Local referencing<br>environments, parameter passing methods, parameters that<br>are subprograms, calling subprograms directly, generic<br>subprograms, design issues, user defined overloaded<br>operators, subprograms with static and dynamic variables,<br>nested subprograms, blocks, dynamic scoping, recursion. | 3     |
| 7.   | Sequence control                                       | Implicit and explicit sequence control, statement level<br>control structures, selection statements, iterative statements,<br>unconditional branching, guarded commands;   | 2     |
| 8.   | Storage<br>Management                                  | Run time elements requiring storage, storage management<br>phases, stack storage, heap storage, fixed and variable size<br>elements  | 2     |
| 9.   | Event and<br>Exception<br>Handling                     | Bug, Error, exception, event, Exception handling in C++<br>and Java, Event handling in Java  | 2     |
| 10.  | Support for<br>Object-Oriented<br>Programming<br>(OOP) | Object Orientation, Design issues for Object Oriented<br>Languages, OOP in Ada, C++, C#, Java, Objective-C,<br>Ruby, and Smalltalk.  | 2     |
| 11.  | Concurrent<br>Programming                              | Subprogram level concurrency, semaphores, Monitors,<br>message passing, statement level concurrency, Java<br>Threads, concurrency in C++ and Python.   | 5-6   |
| 12.  | Functional<br>Programming                              | Functions and Lambda calculus, Scheme, Haskell   | 3     |
| 13.  | Logic<br>Programming                                   | Logic and Horn Clauses, Logic programming in Prolog,<br>Prolog examples.   | 3     |
| 14.  | Program<br>correctness                                 | Axiomatic semantics, correctness of object oriented<br>programs, correctness of functional programs, Formal<br>methods and Tools.  | 2     |
|  |  | Total number of Lectures   | 43-45 |
| Evaluation                                       | n Criteria   |  |       |
| Componer<br>T1<br>T2<br>End Semes<br>TA<br>Total | nts<br>ter Examination                                 | Maximum Marks 20 20 35 25 100  |       |
|  |  |  |       |

| <ol> <li>Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Pearson Publisher, 2014.</li> <li>A.B. Tucker, R.E. Noonan, "Programming Languages: Principles and Paradigms", 2nd Edition, TMH, 2015.</li> <li>Daniel I. A. Cohen, "Introduction to Computer Theory", 2nd edition, Wiely.</li> <li>Kenneth C. Louden, Programming Languages: Principle and practice, Cengage Learning, 2012.</li> <li>Robert Harper, Practical Foundations for Programming Languages (Second Edition). Cambridge University Press, 2016.</li> </ol> | Reco<br>Refe | ecommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, eference Books, Journals, Reports, Websites etc. in the IEEE format) |  |  |  |  |  |  |  |
|--|--------------|---|--|--|--|--|--|--|--|
| <ol> <li>A.B. Tucker, R.E. Noonan, "Programming Languages: Principles and Paradigms", 2nd Edition, TMH, 2015.</li> <li>Daniel I. A. Cohen, "Introduction to Computer Theory", 2nd edition, Wiely.</li> <li>Kenneth C. Louden, Programming Languages: Principle and practice, Cengage Learning, 2012.</li> <li>Robert Harper, Practical Foundations for Programming Languages (Second Edition). Cambridge University Press, 2016.</li> </ol>  | 1.           | Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Pearson Publisher, 2014.   |  |  |  |  |  |  |  |
| <ol> <li>Daniel I. A. Cohen, "Introduction to Computer Theory", 2nd edition, Wiely.</li> <li>Kenneth C. Louden, Programming Languages: Principle and practice, Cengage Learning, 2012.</li> <li>Robert Harper, Practical Foundations for Programming Languages (Second Edition). Cambridge University Press, 2016.</li> </ol>  | 2.           | A.B. Tucker, R.E. Noonan, "Programming Languages: Principles and Paradigms", 2nd Edition, TMH, 2015.  |  |  |  |  |  |  |  |
| <ol> <li>Kenneth C. Louden, Programming Languages: Principle and practice, Cengage Learning, 2012.</li> <li>Robert Harper, Practical Foundations for Programming Languages (Second Edition). Cambridge University Press, 2016.</li> </ol>  | 3.           | Daniel I. A. Cohen, "Introduction to Computer Theory", 2nd edition, Wiely.  |  |  |  |  |  |  |  |
| 5. Robert Harper, Practical Foundations for Programming Languages (Second Edition). Cambridge University Press, 2016.  | 4.           | Kenneth C. Louden, Programming Languages: Principle and practice, Cengage Learning, 2012.   |  |  |  |  |  |  |  |
|  | 5.           | Robert Harper, Practical Foundations for Programming Languages (Second Edition). Cambridge University Press, 2016.  |  |  |  |  |  |  |  |

| 6. | Friedman, Wand and Haynes, Essentials of Programming Languages, 2nd or 3rd ed., MIT Press. |
|----|--|
| 7. | D. A. Watt, Programming Language Design Concepts, Wiley dreamtech – 2007                   |
| 8. | NPTEL Video Lecture: http://nptel.ac.in/courses/106102067/                                 |

| Course Code     | 15B17CI672                     | Semester EVEN 2019<br>(specify Even)      |                      | Semester 6 <sup>th</sup> Session 2018 -2019<br>Month from January-June |    |  |
|-----------------|--------------------------------|---|----------------------|--|----|--|
| Course Name     | Programming Languages Lab      |   |                      |  |    |  |
| Credits         | 01                             |   | <b>Contact Hours</b> |  | 02 |  |
| Faculty (Names) | Coordinator(s)                 | Dr. P. Raghu Vamsi                        |                      |  |    |  |
|                 | Teacher(s)<br>(Alphabetically) | Dr. P. Raghu Vamsi and Dr. Satish Chandra |                      |  |    |  |

| COURSE | OUTCOMES   | <b>COGNITIVE LEVELS</b>       |
|--------|--|-------------------------------|
| C377.1 | Understand the principle to program in an imperative (or procedural),<br>an object-oriented, a functional, and a logical programming language.   | Understand Level<br>(Level 2) |
| C377.2 | Improve the ability of applying appropriate programming languages for various classes of programming problems.   | Apply Level<br>(Level 3)      |
| C377.3 | Construct and apply programming languages parsers, programming<br>abstractions, Graphical User Interfaces, Common Gate Way<br>applications, database programming using Java and Python<br>programming languages. | Apply Level<br>(Level 3)      |
| C377.4 | Analyze and examine the behaviour of simple programs in imperative<br>languages using concepts such as binding, scope, control structures,<br>subprograms and parameter passing mechanisms.                      | Analyze Level<br>(Level 4)    |
| C377.5 | Evaluate multi-language programming concepts using applicable concurrent programming features of C++, Java, and Python.  | Evaluate Level<br>(Level 5)   |

| Module<br>No. | Title of the Module  | List of Experiments           | CO |
|---------------|--|-------------------------------|----|
| 1.            | Introduction to<br>Java/Python<br>programming –<br>Control statements,<br>String handling,<br>Functions, and File<br>I/O | Lab Assignments 01 and 02     | 1  |
| 2.            | Regular expressions (Lex and Yacc).  | Lab Assignments 03, 04 and 05 | 2  |
| 3.            | Java/Python data<br>structures – Lists,<br>Tuples, Sets, and<br>Dictionaries   | Lab Assignments 01 and 02     | 2  |
| 4.            | Object oriented<br>programming with<br>C++/Java/Python.  | Lab Assignments 08 and 09     | 3  |
| 5.            | GUI Programming  | Lab Assignments 08 and 09     | 3  |
| 6.            | Database Access  | Lab Assignment 10             | 3  |
| 7.            | CGI programming  | Lab Assignment 10             | 3  |
| 8.            | Exception Handling   | Lab Assignment 11             | 4  |
| 9.            | Concurrent<br>programming  | Lab Assignment 12 and 13      | 5  |

| 10.   | Functional<br>programming using<br>Haskell and Logic<br>programming using<br>Prolog | Lab Assignment 14 |   | 1 |
|---|---|-------------------|---|---|
| <b>Evaluation Criteria</b><br><b>Components</b><br>Lab evaluation -1 + Lab Test – 1 (After T1 Examination)<br>Lab evaluation -2 + Lab Test – 2 (After T2 Examination)<br>Lab Project and Viva<br>Attendance * |   |                   | Maximum Marks<br>10 + 20 = 30<br>10 + 20 = 30<br>25<br>15 |   |
|   |   |                   | Total <b>100</b>  |   |

| Reco<br>Refe | <b>ommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence Books, Journals, Reports, Websites etc. in the IEEE format) |
|--------------|---|
| 1.           | Y. Daniel Liang, "Introduction to Programming using Python", Person, 2013.  |
| 2.           | Fabrizio Romano, "Learning Python", Open source, Packet Publishing, 2015.   |
| 3.           | Magnus Lie, "Beginning Python from Novice to Professional", 2nd Edition, Apress, 2008.  |
| 4.           | Zed A. Shaw, "Learn Python the Hard Way", 3rd Edition, Addison-Wesley, 2014.  |
| 5.           | Mark Lutz, "Learning Python", O'reilly, 2013.   |
| 6.           | Mark Lutz, "Python Pocket Reference", O'relly, 2014.  |
| 7.           | Schildt, H. (2002). "The Complete Reference Java 2. Williams", 2009. 1034 p.  |
| 8.           | Schildt, Herbert. C++: The Complete Reference. McGraw-Hill, 2003.   |
| 9.           | Kanetkar, Yashavant P. Let us C. BPB publications, 2016.  |

| Course Code     | 15B22CI621                     | Semester : Even      |                      | <b>Semester</b> 6 <sup>th</sup> <b>Session</b> 2018 -2019<br><b>Month from Jan 19 to June 19</b> |        |  |
|-----------------|--------------------------------|----------------------|----------------------|--|--------|--|
| Course Name     | Data Mining And W              | Web Algorithms       |                      |  |        |  |
| Credits         | 3                              |                      | <b>Contact Hours</b> |  | 4(3+1) |  |
| Faculty (Names) | Coordinator(s)                 | Mahendra Kumar Gurve |                      |  |        |  |
|                 | Teacher(s)<br>(Alphabetically) |                      |                      |  |        |  |

| COURSE OUTCOMES COGNITIV |  |                            |  |  |  |
|--------------------------|--|----------------------------|--|--|--|
| C313.1                   | Understand the basics of data mining and pre-processing of data.   | Understand Level (Level 2) |  |  |  |
| C313.2                   | Analyze the transactional data for finding frequent and interesting patterns using association rule mining techniques like Apriori and FP-Growth.  | Analyse Level<br>(Level 4) |  |  |  |
| C313.3                   | Apply a wide range of classification techniques like Naïve-bayes,<br>decision tree, and KNN for the numerous application including fraud<br>detection, target marketing, medical diagnosis, etc. | Apply Level<br>(Level 3)   |  |  |  |
| C313.4                   | Cluster the similar/dissimilar objects using different methods like partitioning, hierarchical and density based clustering.   | Create Level<br>(Level 6)  |  |  |  |
| C313.5                   | Analyze the link structure of web using page rank and HITS algorithms.   | Analyse Level<br>(Level 4) |  |  |  |
| C313.6                   | Develop recommendation system using collaborative filtering techniques   | Create Level<br>(Level 6)  |  |  |  |

| Module<br>No. | Title of the<br>Module       | Topics in the Module   | No. of<br>Lectures for<br>the module |
|---------------|------------------------------|--|--------------------------------------|
| 1.            | Course overview              | What Motivated Data Mining? Why Is It Important? What<br>Is Data Mining? Data Mining—On What Kind of Data?<br>Data Mining Functionalities—What Kinds of Patterns Can<br>Be Mined? Are All of the Patterns Interesting? Data mining<br>process, Types of datasets and attributes, Major Issues in<br>Data Mining. | 03                                   |
| 2.            | Data Preprocessing           | Getting To know your data, Data extraction, Data cleaning,<br>Data Integration and transformation, Data reduction  | 06                                   |
| 3.            | Association Rule<br>mining   | Usability and Complexity Analysis of Apriori Algorithm,<br>Sampling Algorithm, Partitioning, Using multiple minimum<br>supports  | 05                                   |
| 4.            | Classification<br>Algorithms | Issues Regarding Classification and Prediction, Bayesian<br>Classification, Usability and Complexity Analysis of<br>Bayesian algorithm, Nearest Neighbor algorithm, Decision<br>Tree based algorithm.  | 07                                   |
| 5.            | Clustering<br>Algorithms     | Clustering Algorithms: Types of Data in Cluster Analysis,<br>Similarity Measures, A Categorization of Major Clustering<br>Methods, Partitioning Methods, Hierarchical Methods,<br>Usability and Complexity Analysis of Agglomerative<br>Hierarchical Algorithm, k-means and K-Mediod                             | 08                                   |

|                  |                             | Partitioning Algorithm. Applications of clustering.          |              |
|------------------|-----------------------------|--|--------------|
| 6.               | Web algorithms:             | Web algorithms: Link Based Search Algorithm, Web             | 04           |
|                  |                             | Crawling, Indexing, Searching, Zone Indexing, Term-          |              |
|                  |                             | Frequency, Link Analysis Algorithm.                          |              |
| 7.               | Ranking                     | Ranking Algorithms: Page rank, Hits ranking algorithms       | 03           |
|                  | Algorithms:                 |  |              |
| 8                | Web caching                 | Web caching Algorithm : LRV, FIFO, LRU, Random, OPT          | 03           |
| 0                | Algorithm :                 |  |              |
| 0                | Recommendation              | Recommendation Algorithms: Collaborative Filtering.          | 03           |
| 9                | Algorithms:                 | Item-to-Item recommendation. Memory Based                    |              |
|                  | 8                           | Recommendation.  |              |
|                  |                             |  | 42           |
|                  |                             | l otal number of Lectures                                    | 42           |
| Evaluatio        | on Criteria                 |  |              |
| Compone          | ents                        | Maximum Marks  |              |
| T1               |                             | 20   |              |
| T2               |                             | 20   |              |
| End Seme         | ster Examination            | 35   |              |
| ТА               |                             | 25   |              |
| Total            |                             | 100  |              |
| 1 0 0001         |                             |  |              |
| Reference        | Books, Journals, Repo       | brts, Websites etc. in the IEEE format)                      | (Text books, |
| Jiawei           | Than, Micheline Kani        | sei, Data winning, worgan Kaumann rubisners,Eisevier,2005    |              |
| Kimba            | all R. and Ross M ,The      | Data Warehouse Toolkit", Wiley                               |              |
| Pujari           | , Arun K,Data mining        | and statistical analysis using SQL, Universities press       |              |
| Pang-N           | Ning Tan, Michael Stei      | nbach, Vipin Kumar, Introduction to Data Mining              |              |
| Soume<br>Elsevie | n Chakrabarti, Mining<br>er | g the Web: Discovering knowledge from hypertext data", Morga | an Kaufmann, |
| Alex, I          | Berson, Stephen J. Smitl    | h, Data Warehousing, data mining and OLAP, McGraw-Hill,20    | )04          |
| Inmon            | W.H.,Building the Da        | ta Warehouse, 4th Edition, Wiley                             |              |
| Anaho            | ry S. and Murray D, D       | ata Warehousing in the Real World, Addison-Wesley            |              |
| Marga            | aret H. Dunham, Data M      | Mining: Introductory and Advanced Topics, Prentice Hall,2003 |              |
| Mattiso          | on R., Web Warehousi        | ng and Knowledge Management", Tata McGraw-Hill.              |              |
| David            | Hand, Heikki Mannila        | and Padhraic Smyth ,Principles of Data Mining,PHI            |              |
| Transa           | actions on Database Sy      | vstems (ACM)   |              |
| IEEE             | Transactions on Know        | ledge & Data Engineering                                     |              |
| The V            | LDB Journal The Inter       | national Journal on Very Large Data Bases                    |              |
|                  |                             |  |              |

| Course Code  |                    | 15B28CI68  | 1                                     | Semester Eve   | en                           | Semester VI Session 2018 -2019<br>Month from Jan – June 2019 |                                  |                    |   |
|--|--------------------|--|---------------------------------------|--|------------------------------|--|----------------------------------|--------------------|---|
| Course Name  | e                  | Data Minin   | g And W                               | eb Algorithms L  | ab                           |  |                                  |                    |   |
| Credits  |                    |  | 0-0-1                                 |  | Contact I                    | Hours  |                                  | 2                  |   |
| Faculty (Nan   | nes)               | Coordinat  | or(s)                                 | Dr Dharmveer   | Singh Rajp                   | oot  |                                  |                    |   |
| Teacher(s)<br>(Alphabetically)                             |                    |  |                                       | Dr. Dharmveer  | r Singh Rajj                 | poot, Mr.  | Mahendra Gurve                   |                    |   |
| COURSE OU  | UTCO               | OMES   |                                       |  |                              |  |                                  | COGNITIV<br>LEVELS | Έ |
| C375.1   | App<br>info        | ply the data p<br>prmation, dup  | ore-proces                            | Sormation etc.   | on the datas                 | set to han   | dle missing                      | C3                 |   |
| C375.2   | Imp<br>ana         | plement assoc  | ciation rul                           | le mining technic<br>resting patterns i  | ques like Ap<br>n the transa | priori and   | FP-Growth to                     | C3                 |   |
| C375.3   | Apj<br>tree<br>mai | ply a wide ran<br>e, and KNN for<br>rketing medi   | nge of cla<br>or the nur<br>cal diagn | assification techn<br>nerous application   | iques like N<br>on including | Naïve-Bay<br>g fraud de                                      | ves, decision<br>tection, target | C3                 |   |
| C375.4   | Im                 | Implement and validate the Clustering methods and outcomes of different C5 methods like partitioning hierarchical and density based clustering using SSF |                                       |  |                              |  |                                  |                    |   |
| C375.5   | Ar                 | Analyze the link structure of web using page rank and HITS algorithms. C4  |                                       |  |                              |  |                                  |                    |   |
| C375.6   | Dev<br>like        | Develop a project using data mining technique to solve the real world problems C5 like fraud detection, hand writing recognition, stock prediction etc.  |                                       |  |                              |  |                                  |                    |   |
| Module No.   | Tit                | tle of the Mo  | dule                                  |  | List                         | of Expe  | riments                          |                    | C |
| 1.   | Da                 | Data Preprocessing   |                                       | Explore the various data mining tools.<br>Apply Data pre-processing i.e. Cleaning, Integration, and Missing<br>Value etc.<br>Perform Data Similarity Measure (Euclidean, Manhattan Distance)<br>Implement Jaccard coefficient for documents similarity |                              |  | and Missing<br>tan Distance).    | C3                 |   |
| 2.   | As<br>Mi           | Association Rule<br>Mining   |                                       | Develop Apriori algorithm to mine frequent item-sets.<br>Implement FP-growth algorithm to identify the frequent item<br>Implement ECLAT algorithm for rule mining.   |                              |  | nt item sets.                    | C3                 |   |
| 3.   | Ch                 | Clustering   |                                       | Develop K-Means Algorithm to generate clusters.<br>Develop K-Medoids Algorithm to generate clusters.<br>Develop Hierarchical Approach to generate clusters   |                              |  |                                  | C5                 |   |
| 4.   | Cla                | assification   |                                       | Do Practice of Decision Tree Algorithm for classification.   |                              |  | C3                               |                    |   |
| 5.   | Va                 | Validity Measures  |                                       | Implement Validity Measures to evaluate the quality of Data<br>Mining Algorithms   |                              |  |                                  | C5                 |   |
| 6.   | Web Application    |  |                                       | Analyze the link structure of web using page rank algorithms.<br>Analyze the link structure of web using HITS algorithms.  |                              |  | orithms.<br>ms.                  | C4                 |   |
| Evaluation Scheme       Lab Te         Lab Te       Day-to |                    | Lab Tes<br>Lab Tes<br>Day-to-  | st 1<br>st 2<br>Day (Evaluation       | s, Project,  | Attendan                     | ce)  | 20<br>20<br>60                   | <u> </u>           |   |

| Total |
|-------|
| Total |

| <b>Recommended</b><br>Reference Book | <b>Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, is, Journals, Reports, Websites etc. in the IEEE format) |
|--------------------------------------|---|
| 1.                                   | Jiawei Han, Micheline Kamber, Data Mining, Morgan Kaufmann Publishers, Elsevier, 2005   |
| 2.                                   | Kimball R. and Ross M, The Data Warehouse Toolkit", Wiley   |
| 3.                                   | Soumen Chakrabarti, Mining the Web:Discovering knowledge from hypertext data", Morgan Kaufmann, Elsevier  |
| 4                                    | Alex, Berson, Stephen J. Smith, Data Warehousing, data mining and OLAP, McGraw-Hill, 2004   |
| 5.                                   | Inmon W.H.,Building the Data Warehouse ,4 <sup>th</sup> Edition, Wiley  |
| 6.                                   | Anahory S. and Murray D, Data Warehousing in the Real World, Addison-Wesley   |
| 7.                                   | Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Prentice Hall,2003   |
| 8.                                   | Mattison R., Web Warehousing and Knowledge Management", Tata McGraw-Hill.   |
| 9.                                   | David Hand, Heikki Mannila and Padhraic Smyth ,Principles of Data Mining,PHI  |
| 10.                                  | Pujari, Arun K, Data mining and statistical analysis using SQL, Universities press  |
| 11.                                  | Transactions on Database Systems (ACM)  |
| 12.                                  | IEEE Transactions on Knowledge & Data Engineering   |
| 13.                                  | The VLDB Journal The International Journal on Very Large Data Bases   |

| Course Code   |                                     | 15B11CI518   |   | Semester : Even<br>(specify Odd/Even)   |                              | Semester VI Session<br>Month from Jan '19 to I |                                  | Session 2<br>an '19 to N | 2018 -2019<br><b>/lay '19</b>        |
|---------------|-------------------------------------|--|---|---|------------------------------|--|----------------------------------|--------------------------|--------------------------------------|
| Course Name   |                                     | Data Structures & algorithms                         |   |   |                              |  |                                  |                          |                                      |
| Credits       |                                     | 3-1-0  |   |   | Contact H                    | lours  |                                  | 2                        | 1                                    |
| Faculty (N    | ames)                               | Coordinator  | r(s)                                    | K Vimal Kuma  | ır                           |  |                                  |                          |                                      |
|               |                                     | Teacher(s)<br>(Alphabetica                           | ully)                                   | Prantik Biswas<br>Kumar   | , Shardha P                  | Porwal, Di                                     | r. Tribl                         | nuwan Tew                | ari, K Vimal                         |
| COURSE        | OUTCO                               | OMES   |   |   |                              |  |                                  | COGNIT                   | IVE LEVELS                           |
| C311.1        | Explain<br>binary                   | n the fundamer search trees, A                       | ntal Data<br>VL tree                    | a Structures incluss, heap trees, gra   | uding linked<br>aphs, and ha | l-lists, tre<br>ash-tables                     | es,                              | Understan<br>(C2)        | nd level                             |
| C311.2        | Analyz<br>sort, Sl                  | ze and compare<br>hell sort and B                    | e differen<br>ucket Sc                  | nt sorting algorit  | hms - Merg                   | ge Sort, Q                                     | uick                             | Evaluating<br>(C5)       | g Level                              |
| C311.3        | Develo<br>practic                   | op basic progra<br>al problems                       | ms using                                | g data structures   | in various                   | real-time                                      |                                  | Apply Lev<br>(C3)        | vel                                  |
| C311.4        | Formu<br>existin<br>and Bo          | late novel solu<br>g code using le<br>ound, Greedy a | tions for<br>earned al<br>lgorithm      | ons for programming problems or improve<br>rned algorithms such as, Backtracking, Branch<br>gorithm and Dynamic programming   |                              |  | Apply Lev<br>(C3)                | vel                      |                                      |
| Module<br>No. | Title of the Top<br>Module          |  | Topics                                  | in the Module   |                              |  |                                  |                          | No. of<br>Lectures for<br>the module |
| 1.            | Introduction                        |  | Introdu<br>circula<br>matrix<br>represe | introduction to data structures, lists, Doubly linked list,<br>circular linked list, multi linked list, Applications - sparse<br>matrix representation, Stack and queue (array and linked list<br>representation) |                              |  |                                  | 6                        |                                      |
| 2.            | Algorithm<br>Complexity             |  | Abstra<br>tradeof<br>analysi            | bstract data type, Growth of function, Space-Time<br>adeoffs, Complexity analysis of algorithms - Asymptotic<br>nalysis   |                              |  | ne<br>/mptotic                   | 2                        |                                      |
| 3.            | Sorting &<br>Searching              |  | Merge<br>search,                        | ge Sort, Quick sort, Shell sort, Bucket Sort, Median<br>h, Interpolation search   |                              |  | edian                            | 6                        |                                      |
| 4.            | Trees                               |  | Binary<br>Tree, F                       | nary Tree, Binary Search tree, AVL Tree, RB Tree, B<br>ee, B+ Tree  |                              |  | ree, B                           | 7                        |                                      |
| 5.            | Heaps                               |  | Introdu                                 | luction, Binary heap, Binomial heap, Skew heaps   |                              |  | eaps                             | 5                        |                                      |
| 6.            | Graph Intro<br>adja<br>spar<br>path |  | Introdu<br>adjacen<br>spannin<br>path – | luction to graphs, Representation – adjacency list,<br>ency matrix, Traversal – BFS, DFS, Minimum<br>ing tree – Prims and Kruskal's algorithm, Shortest<br>- Dijkstra algorithm and Floyd–Warshall algorithm      |                              |  | y list,<br>m<br>ortest<br>orithm | 8                        |                                      |
| 7.            | Hashi                               | ng   | Introdu<br>closed                       | action to hashing, Collision resolution – open and hashing methods  |                              |  | en and                           | 4                        |                                      |
| 8.            | Algorithm Back<br>Bran<br>prog      |  | Backtr<br>Branch<br>program             | racking Algorithm (n-queens puzzle, rat in a m<br>h and Bound, Greedy algorithm, Dynamic<br>mming   |                              | maze),   | 6                                |                          |                                      |
|               |                                     |  |   |   | Т                            | otal num                                       | ber of                           | Lectures                 | 44                                   |

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

| -            |   |
|--------------|---|
| Reco<br>Refe | <b>ommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence Books, Journals, Reports, Websites etc. in the IEEE format) |
| 1.           | Yedidyah Langsam, Moshe J., Augenstein and Aaron M. Tenenbaum: Data Structures Using C and C++, 2 <sup>nd</sup> Edition, PHI, 2001  |
| 2.           | Kurt Mehlhorn: Data Structures and Algorithms 3, Springer, 1984   |
| 3.           | Dinesh P Mehta, Sartaj Sahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004  |
| 4.           | Mark Allen Weiss: Data Structures and Algorithm Analysis in C, 2 <sup>nd</sup> Edition, Pearson   |
| 5.           | Sahni: Data Structures, Algorithms and applications in C++, Universities press, Hyderabad, 2005   |
| 6.           | Kruse, Tonso, Leung: Data Structures and Program Design in C, 2rd Edition, Pearson Education Asia, 2002   |
| 7.           | Weiss, Mark Allen: Data Structures and Algorithm Analysis in C/C++, 2nd Edition, Pearson Education Asia, 2003   |
| 8.           | Cormen et al: Introduction to Computer Algorithms, 2nd edition, PHI New Delhi 2003  |
| 9.           | Aho, Hopcraft, Ullman: Data Structures and Algorithms, Pearson Education Asia (Adisson Wesley), New Delhi, 2001   |
| 10.          | Standish: Data Structures in Java, Pearson Education Asia (Adisson Wesley), New Delhi, 2000   |
| 11.          | Knuth: The Art of Computer programming Vol I, Vol III, 2nd edition, Pearson Education Asia (Adisson Wesley), New Delhi, 2002  |
| 12.          | Heileman: Data Structures, Algorithms and Object Oriented Programming, Tata Mc-Graw Hill, New Delhi, 2002   |
| 13.          | Sorenson and Tremblay: An Introduction to Data Structures with Algorithms, 2nd Edition, Tata Mc-Graw Hill, New Delhi, 2003  |

# **Detailed Syllabus**

| Subject Code | 15B11CI578             | Semester: EVEN<br>(specify Odd/Even) | Semester 6 Session 2018-2019<br>Month from Jan'19 to Jun'19 |
|--------------|------------------------|--------------------------------------|---|
| Subject Name | Data Structures & Algo | prithms Lab                          |   |
| Credits      | 0-0-1                  | Contact Hours                        | 2   |

| Faculty | Coordinator(s)                 | Suma Dawn   |
|---------|--------------------------------|---|
| (Names) | Teacher(s)<br>(Alphabetically) | K Vimal Kumar, Neetu Sardana, Prashant Kaushik, Suma Dawn, Taj Alam, Tribhuwan Tewari |

| COURSE | OUTCOMES  | COGNITIVE LEVELS         |
|--------|---|--------------------------|
| C371.1 | Demonstrate the use of basic data structure and algorithm design such<br>as Linked lists, Stacks, Queues, and others, for various applications.           | Understanding Level (C2) |
| C371.2 | Interpret the complexity of algorithms for given problems.  | Understanding Level (C2) |
| C371.3 | Apply Searching, Sorting, and Trees and use their properties for<br>abstractions and defining modules for implementing functionalities.                   | Apply Level (C3)         |
| C371.4 | Examine case-study specific application of Heaps, Graphs, and Hashing methods.  | Apply Level (C3)         |
| C371.5 | Model algorithmic solutions for small real-life problems using<br>Backtracking, Greedy algorithm and Dynamic programming, Branch<br>and Bound, and others | Apply Level (C3)         |

| Module<br>No. | Title of the<br>Module                    | List of Experiments   | СО   |
|---------------|---|---|--|
| 1.            | Introduction &<br>Algorithm<br>Complexity | Lab Assignments 1, 2: Conversion from one<br>number system to another; Manipulation with<br>arrays and strings, structures; Manipulation with a<br>single Linked lists of integers; Stacks and Queues<br>Finding Complexity: Big O, Big Omega<br>Lab Assignment 6: Cost Analysis                                  | CO1, CO2,<br>Understanding Level (C2)                      |
| 2.            | Sorting, Searching<br>& Trees             | <ul> <li>Lab Assignments 2, 3: Doubly Linked List,<br/>Circular Linked List, Multi-Linked Lists</li> <li>Lab Assignments 4, 5: Sorting, Searching,<br/>Application based.</li> <li>Lab Assignments 6: Binary Tree, Binary Search<br/>Trees, AVL Tree, Case-study: Priority Queue with<br/>Binary Trees</li> </ul> | CO1<br>Understanding Level (C2)<br>CO3<br>Apply Level (C3) |
| 3.            | Heaps, Graph                              | Lab Assignments 7: B Trees, Heaps,<br>Lab Assignments 8: Directed and undirected<br>graphs, weighted graphs, etc.   | CO4<br>Apply Level (C3)                                    |
| 4.            | Hashing & other<br>Algorithms             | Lab Assignments 9: Hashing, Backtracking,<br>Branch and Bound, Greedy Algorithms, Dynamic<br>Programming.   | CO5<br>Apply Level (C3)                                    |

| <b>Evaluation Criteria</b> |               |  |
|----------------------------|---------------|--|
| Components                 | Maximum Marks |  |
| Lab Test 1                 | 20            |  |
| Lab Test 2                 | 20            |  |
| Day-to-Day Evaluations     | 45            |  |
| Day-to-Day - Attendance    | 15            |  |
|                            | 100           |  |
| Total                      | 100           |  |

| Reco<br>Refe | <b>ommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence Books, Journals, Reports, Websites etc. in the IEEE format) |
|--------------|---|
| 1            | Yedidyah Langsam, Moshe J., Augenstein and Aaron M. Tenenbaum: Data Structures Using C and C++, 2 <sup>nd</sup> Edition, PHI, 2001  |
| 2            | Kurt Mehlhorn: Data Structures and Algorithms 3, Springer, 1984   |
| 3            | Dinesh P Mehta, Sartaj Sahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004  |
| 4            | Mark Allen Weiss: Data Structures and Algorithm Analysis in C, 2 <sup>nd</sup> Edition, Pearson   |
| 5            | Sahni: Data Structures, Algorithms and applications in C++, Universities press, Hyderabad, 2005   |
| 6            | Kruse, Tonso, Leung: Data Structures and Program Design in C, 2rd Edition, Pearson Education Asia, 2002   |
| 7            | Weiss, Mark Allen: Data Structures and Algorithm Analysis in C/C++, 2nd Edition, Pearson Education Asia, 2003   |
| 8            | Cormen et al: Introduction to Computer Algorithms, 2nd edition, PHI New Delhi 2003  |
| 9            | Aho, Hopcraft, Ullman: Data Structures and Algorithms, Pearson Education Asia (Adisson Wesley), New Delhi, 2001   |
| 10           | Standish: Data Structures in Java, Pearson Education Asia (Adisson Wesley), New Delhi, 2000   |
| 11           | Knuth: The Art of Computer programming Vol I, Vol III, 2nd edition, Pearson Education Asia (Adisson Wesley), New Delhi, 2002  |
| 12           | Heileman: Data Structures, Algorithms and Object Oriented Programming, Tata Mc-Graw Hill, New Delhi, 2002   |
| 13           | Sorenson and Tremblay: An Introduction to Data Structures with Algorithms, 2nd Edition, Tata Mc-<br>Graw Hill, New Delhi, 2003  |

| Course Code   |   | 16B1NCI643                           |  | Semester EVEN, 2019 Semester VI<br>Month from   |   | r VI<br>rom .          | /I Session 2018-2019<br>n January to June |                        |                                      |
|---------------|---|--------------------------------------|--|---|---|------------------------|---|------------------------|--------------------------------------|
| Course Name   |   | Computational Intelligence           |  |   |   |                        |   |                        |                                      |
| Credits       |   |                                      | 4  |   | Contact H   | lours                  |   | 3-                     | -1                                   |
| Faculty (N    | ames)   | Coordinato                           | r(s)   | Parul Agarwal   |   |                        |   |                        |                                      |
|               |   | Teacher(s)<br>(Alphabetica           | ully)  | Parul Agarwal   |   |                        |   |                        |                                      |
| COURSE        | OUTCO   | OMES                                 |  |   |   |                        |   | COGNIT                 | IVE LEVELS                           |
| C330-1.1      | Infer v<br>fuzzy l  | agueness, amb<br>ogic concepts.      | oiguity a  | ind uncertainty in  | n natural laı   | nguage us              | ing                                       | Understan<br>(Level-2) | nding Level-                         |
| C330-1.2      | Apply<br>genetic<br>problem   | the intelligent<br>and hybrid terms. | techniqu<br>chniques                                       | ues using rough s<br>s to solve differe   | set theory, f<br>nt type of r   | uzzy Log<br>eal world  | ic,                                       | Apply- (I              | Level-3)                             |
| C330-1.3      | Analyz<br>applica   | the principle<br>ations in different | es of fuzz<br>ent set o                                    | zification, defuzz<br>f problems.   | zification ar   | nd their               |   | Analyze-               | (Level-4)                            |
| C330-1.4      | Integra<br>engine   | te and develop                       | ) hybrid<br>on.  | Intelligent techn   | iques for re  | al time                |   | Create Le              | evel (Level-6)                       |
| C330-1.5      | Compare and conclude the writing technical reports                        |                                      |  | results of different techniques through   |   |                        | Evaluate( Level-5)                        |                        |                                      |
| Module<br>No. | Title of the '<br>Module  |                                      | Topics   | Topics in the Module  |   |                        |   |                        | No. of<br>Lectures for<br>the module |
| 1.            | Introduction  |                                      | Introdu<br>synerg<br>learnin<br>organiz                    | Introduction to CI: Pitfalls of AI, formal definition of CI,<br>synergism in soft computing, Types of Adaptation and<br>learning, Computational intelligence as Adaptation and Self<br>organization   |   |                        | n of CI,<br>and<br>n and Self             | 03                     |                                      |
| 2.            | Methods of<br>Knowledge<br>representation                                 |                                      | Rough<br>of kno  | Rough Set Theory, Fuzzy sets and Fuzzy relations, methods of knowledge representation   |   |                        | , methods                                 | 04                     |                                      |
| 3.            | Fuzzy InferenceRuleSystem withRuleapplicationsfuzzsystemsystem            |                                      | Rule-E<br>Rule-b<br>fuzzy s<br>system                      | e-Based Expert Systems and Fuzzy Expert Systems:<br>e-based expert systems, Fuzzy sets and operations of<br>y sets, Fuzzy rules and fuzzy inference, Fuzzy expert<br>ems. Case Studies (data clustering, pattern recognition)                                 |   |                        | ons of<br>expert<br>cognition)            | 09                     |                                      |
| 4.            | Neural Network<br>with Applications<br>identi<br>Unsuj<br>featur<br>netwo |                                      | Pattern<br>unsupe<br>identif<br>Unsup<br>feature<br>networ | n recognition and neural networks: Supervised and<br>ervised learning, machine perception, object<br>fication and speech recognition<br>pervised learning neural networks: self-organizing<br>e maps, Radial basis function networks, ART<br>rk, case studies |   | ed and<br>nizing<br>&T | 9   |                        |                                      |
| 5.            | Evolut<br>Compu   | ionary<br>itations                   | Introdu<br>ACO.  | action to evolutionary computing: GA, DE, PSO,  |   |                        | PSO,                                      | 8                      |                                      |
| 6.            | ComputationsAIntelligent SystemsHEEEN                                     |                                      | Hybrid<br>Evolut<br>Evolut<br>Neuro                        | l Intelligent syste<br>ionary algorithm<br>ionary algorithm<br>Fuzzy Systems of   | Intelligent systems:<br>onary algorithms in designing neural network<br>onary algorithms vs. fuzzy system<br>uzzy Systems concepts and applications |                        | orks,                                     | 9                      |                                      |

Total number of Lectures

42

| <b>Evaluation Criteria</b> |               |  |
|----------------------------|---------------|--|
| Components                 | Maximum Marks |  |
| T1                         | 20            |  |
| Τ2                         | 20            |  |
| End Semester Examination   | 35            |  |
| ТА                         | 25 ()         |  |
| Total                      | 100           |  |

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

| 1.  | Ross, Timothy J. Fuzzy logic with engineering applications. John Wiley & Sons, 2005.   |
|-----|--|
| 2.  | Poole, David Lynton, Alan K. Mackworth, and Randy Goebel. <i>Computational intelligence: a logical approach</i> . Vol. 1. New York: Oxford University Press, 1998. |
| 3.  | Jang, Jyh-Shing Roger, Chuen-Tsai Sun, and Eiji Mizutani. "Neuro-fuzzy and soft computing; a computational approach to learning and machine intelligence." (1997). |
| 4.  | Konar, Amit. Computational intelligence: principles, techniques and applications. Springer Science & Business Media, 2006.   |
| 5.  | Rutkowski, Leszek. Computational intelligence: methods and techniques. Springer Science & Business Media, 2008.  |
| 6.  | Eberhart, Russell C., and Yuhui Shi. <i>Computational intelligence: concepts to implementations</i> . Elsevier, 2011.  |
| 7.  | Fulcher, John. "Computational intelligence: an introduction." In <i>Computational intelligence: a compendium</i> , pp. 3-78. Springer, Berlin, Heidelberg, 2008.   |
| 8.  | Cox, Earl, Michael O'Hagan, Rodman Taber, and Michael O'Hagen. <i>The fuzzy systems handkbook with cdrom</i> . Academic Press, Inc., 1998.                         |
| 9.  | Haykin, Simon. Neural networks: a comprehensive foundation. Prentice Hall PTR, 1994.   |
| 10. | De Jong, Kenneth A. Evolutionary computation: a unified approach. MIT press, 2006.   |

| Course Code                 |   | 16B1NCI631  |   | Semester EvenSemester VISess(specify Odd/Even)Month from Jan 20 |                              | Session 1<br>Jan 2019   | ession 2019-2020<br>2019 |                                      |            |
|-----------------------------|---|---|---|---|------------------------------|-------------------------|--------------------------|--------------------------------------|------------|
| Course Name                 |   | Advanced Data Structures and Applications   |   |   |                              |                         |                          |                                      |            |
| Credits                     |   |   | 4   |   | Contact H                    | lours                   |                          | 3-1                                  | 1-0        |
| Faculty (N                  | ames)   | Coordinato  | r(s)  | Mr. Prantik Bis   | swas, Prof.                  | Krishna A               | Asawa                    |                                      |            |
|                             |   | Teacher(s)<br>(Alphabetica  | ully)   | Prof. Krishna A   | Asawa, Mr.                   | Prantik B               | siswas,                  | Mr. Vimal                            | Kumar K    |
| COURSE                      | OUTCO   | <b>DMES:</b> At the   | complet   | ion of the course   | e, students v                | will be ab              | le to                    | COGNIT                               | IVE LEVELS |
| CI631.1                     | Compr<br>partitic   | ehend insights<br>oning data strue  | of varic  | ous variants of st  | ring proces                  | sing and s              | space                    | Understar<br>(Level 2)               | nd level   |
| CI631.2                     | Build end   | efficient storag  | e and so<br>sort algo   | rting mechanism   | ns for large                 | datawith                | the                      | Apply Lev<br>(Level 3)               | vel        |
| CI631.3                     | Analys<br>BST V   | se various adva<br>ariants, Heap  | inced da  | ta structures-<br>Indexed Trees,                                | Disjoint Se                  | t etc.                  |                          | Analyse L<br>(Level 4)               | Level      |
| CI631.4                     | Compa   | are performanc  | e of vari   | ious Hashing alg  | orithms.                     |                         |                          | Evaluating<br>(Level 5)              | g Level    |
| CI631.5                     | Propos<br>structu   | Propose solutions for the real life problems with the aid of suitable data Creati (Level) |   |   |                              | Creating I<br>(Level 6) | g Level<br>5)            |                                      |            |
| Module<br>No.               | Title of the<br>ModuleTopics in   |   |   | in the Module   |                              |                         |                          | No. of<br>Lectures for<br>the module |            |
| 1.                          | Amort   | ized Analysis   | Aggreg<br>tables  | gate, Accounting  | g and Potent                 | tial Meth               | od, Dy                   | mamic                                | 3          |
| 2.                          | Extern  | al Sorting  | Introdu<br>mergin   | action to externa   | l sorting. Se<br>on. Optimal | election tr             | ees & of run             | k-way<br>s.                          | 3          |
| 3.                          | Binary<br>Varian  | Trees<br>ts   | Optin<br>AA-T   | nal Binary Searc  | h Tree, Spl                  | ay tree,                |                          |                                      | 5          |
| 4.                          | Indexe  | d Tree  | T-tree  | e, Dancing tree,  | Queaps                       |                         |                          |                                      | 3          |
| 5.                          | String<br>Data S  | Processing<br>tructures   | Rope<br>tree,C  | , Tries, S <b>u</b> ffix Tr<br>Bap buffer                       | ree,Ternary                  | search                  |                          |                                      | 4          |
| 6.                          | Disjoir<br>Structu  | nt SetData<br>ares  | Disjoir<br>Disjoir  | nt-set operations   | , representa                 | tion of dis             | sjoint s                 | sets,                                | 6          |
| 7.                          | Heap  | S   | Pairing   | g heap, Beap, Le  | ftist tree.                  |                         |                          |                                      | 3          |
| 8.                          | Space tree  | partitioning  | Binary<br>Tree, S   | space partitioni<br>Segment Tree, Pr                            | ng, KD tree                  | e, Quad tro<br>ch Tree. | ee, Inte                 | erval                                | 6          |
| 9.                          | Hashes Introduction, Perfect hash function - Cuckoo hashing,<br>Coalesced hashing, Universal Hashing, |   |   |   | 5                            |                         |                          |                                      |            |
| 10.ApplicationsSearchData S |   |   | ing, Memory Indexing, Computer Graphics, Image Structures, Computational Biology. |   |                              | , Image                 | 4                        |                                      |            |
| Total number of Lectures    |   |   |   |   |                              | Lectures                | 42                       |                                      |            |
| Evaluation                  | n Criteri   | ia  |   |   |                              |                         |                          |                                      |            |
| Componen                    | nts   |   | Maxim   | um Marks  |                              |                         |                          |                                      |            |

| T1                       | 20    |
|--------------------------|-------|
| T2                       | 20    |
| End Semester Examination | 35    |
| ТА                       | 25 () |
| Total                    | 100   |

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

| 1  | HananSamet: Foundations of Multidimensional and Metric Data Structure, Morgan Kaufman, 2006                                  |
|----|--|
| 2  | Kurt Mehlhorn: Data Structures and Algorithms 3, Springer, 1984  |
| 3  | Dinesh P Mehta, SartajSahani: Handbook of Data Structure and Applications, Chapman & Hall, 2004                              |
| 4  | Langsam, Augestein, Tenenbaum: Data Structures using C and C++, 2nd Edition, PHI, 2001                                       |
| 5  | Sahni: Data Structures, Algorithms and applications in C++, Universities press, Hyderabad, 2005                              |
| 6  | Kruse, Tonso, Leung: Data Structures and Program Design in C, 2rd Edition, Pearson Education Asia, 2002                      |
| 7  | Weiss, Mark Allen: Data Structures and Algorithm Analysis in C/C++, 2nd Edition, Pearson Education Asia, 2003                |
| 8  | Cormen et al: Introduction to Computer Algorithms, 2nd edition, PHI New Delhi 2003   |
| 9  | Aho, Hopcraft, Ullman: Data Structures and Algorithms, Pearson Education Asia (Adisson Wesley), New Delhi, 2001              |
| 10 | Standish: Data Structures in Java, Pearson Education Asia (Adisson Wesley), New Delhi, 2000                                  |
| 11 | Knuth: The Art of Computer programming Vol I, Vol III, 2nd edition, Pearson Education Asia (Adisson Wesley), New Delhi, 2002 |
| 12 | Heileman: Data Structures, Algorithms and Object Oriented Programming, Tata Mc-Graw Hill, New Delhi, 2002                    |
| 13 | Sorenson and Tremblay: An Introduction to Data Structures with Algorithms, 2nd Edition, Tata Mc-Graw Hill, New Delhi, 2003   |

| Subject Code | 16B1NCI635          | Semester Even | Semester VI Session 2018<br>Month from January to June |
|--------------|---------------------|---------------|--|
| Subject Name | Data and Web Mining |               |  |
| Credits      | 4                   | Contact Hours | 4  |

| Faculty | Coordinator(s)                 | 1. Neetu Sardana  |
|---------|--------------------------------|---|
| (Names) | Teacher(s)<br>(Alphabetically) | <ol> <li>Anuja Arora</li> <li>Megha Rathi</li> <li>Neetu Sardana</li> </ol> |

| S. No.   | Description  | <b>Cognitive Level</b>      |
|----------|--|-----------------------------|
|          |  | (Bloom's<br>Taxonomy)       |
| C330-3.1 | Apply the pre-processing techniques to nominal, binary, categorical and ordinal data.  | Apply Level<br>(Level III)  |
| C330-3.2 | Design a Data warehouse using star, snowflake and galaxy schema<br>and perform OLAP operations like roll-up, drill-down, slicing and<br>dicing, etc  | Apply Level<br>(Level III)  |
| C330-3.3 | Apply a wide range of classification techniques like Naïve-bayes,<br>decision tree, and KNN for the numerous application including fraud<br>detection, target marketing, medical diagnosis, etc. | Apply Level<br>(Level III)  |
| C330-3.4 | Cluster the similar/dissimilar objects using different methods like partitioning, hierarchical and density based clustering.   | Create Level<br>(Level VI)  |
| C330-3.5 | Analyze the transactional data for finding frequent and interesting<br>patterns using association rule mining techniques like Apriori and<br>FP-Growth.  | Analyse Level<br>(Level IV) |
| C330-3.6 | Analyze the link structure of web using page rank and HITS algorithms.   | Analyse Level<br>(Level IV) |

| Module<br>No. | Subtitle of the<br>Module | Topics in the module   | No. of<br>Lectures<br>for the<br>module |
|---------------|---------------------------|--|---|
| 1.            | Introduction              | What Motivated Data Mining? Why Is It Important?<br>What Is Data Mining? Data Mining—On What Kind of<br>Data? Data Mining Functionalities—What Kinds of<br>Patterns Can Be Mined? Are All of the Patterns<br>Interesting? Classification of Data Mining Systems,<br>Data Mining Task Primitives, Integration of a Data | 3                                       |

|    |   | Mining System with a Database or Data Warehouse<br>System, Major Issues in Data Mining.  |    |  |
|----|---|--|----|--|
|    | Data Warehouse                                    |  |    |  |
| 2. | Data Warehouse<br>Concepts                        | Data Warehouse, Multidimensional Data Model, Data<br>Warehouse Architecture, Data Warehouse<br>Implementation, From Data Warehousing to Data<br>Mining   | 1  |  |
| 3. | Data Pre-processing                               | Data extraction, Data Cleaning, Data Integration and<br>Transformation, Data Reduction, Loading into Staging<br>area, Post Load Processing   | 1  |  |
| 4. | Dimensional<br>modeling and OLAP<br>Technology    | Defining Dimensional model, Granularity of Facts,<br>Additivity of facts, Helper tables, Implementing Many–<br>to-Many Relationship between fact and dimension<br>tables, Implementing changing dimensions, Efficient<br>Methods for Data Cube Computation, Further<br>Development of Data Cube and OLAP Technology,<br>Attribute-Oriented Induction           | 2  |  |
|    | Data Mining                                       |  |    |  |
| 5. | Classification<br>Algorithms                      | Issues Regarding Classification and Prediction,<br>Bayesian Classification, Usability and Complexity<br>Analysis of Bayesian algorithm, Nearest Neighbour<br>algorithm, Decision Tree based algorithm, Rule based<br>Algorithm, Performance evaluation of classifiers:<br>Precision recall, F Measure, Sensitivity, Sensibility,;<br>Ensemble based techniques | 9  |  |
| 6. | Clustering<br>Algorithms                          | Types of Data in Cluster Analysis, A Categorization of<br>Major Clustering Methods, Partitioning Methods,<br>Hierarchical Methods, Usability and Complexity<br>Analysis of Agglomerative Hierarchical Algorithm,<br>k-means Partitioning Algorithm, Density based<br>clustering,: DBSCAN, BIRCH  | 6  |  |
| 7. | Association<br>Algorithms                         | Usability and Complexity Analysis of Apriori<br>Algorithm, Sampling Algorithm, Partitioning, Using<br>multiple minimum supports, Rough set approach  | 6  |  |
|    | Web Mining  |  |    |  |
| 8  | Searching, crawling<br>and indexing<br>Algorithms | Link Based Search Algorithm, Web Crawling, Indexing,<br>Searching, Zone Indexing, Term-Frequency, Link<br>Analysis Algorithm.  | 4  |  |
| 9  | Ranking Algorithms                                | Page rank, Hits ranking algorithms   | 3  |  |
| 10 | Web caching<br>Algorithm                          | LRV, FIFO, LRU, Random, OPT  | 3  |  |
| 11 | Recommendation<br>Algorithms                      | Collaborative Filtering, Item-to-Item recommendation,<br>Memory Based Recommendation,  | 3  |  |
|    |   | Total number of Lectures   | 41 |  |

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

| 15. | Jiawei Han, Micheline Kamber, Data Mining, Morgan Kaufmann<br>Publishers,Elsevier,2005                       |
|-----|--|
| 16. | Kimball R. and Ross M ,The Data Warehouse Toolkit", Wiley  |
| 17. | Pujari, Arun K, Data mining and statistical analysis using SQL, Universities press                           |
| 18. | Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining                                   |
| 19. | Soumen Chakrabarti, Mining the Web: Discovering knowledge from hypertext data",<br>Morgan Kaufmann, Elsevier |
| 20. | Alex, Berson, Stephen J. Smith, Data Warehousing, data mining and OLAP, McGraw-<br>Hill, 2004                |
| 21. | Inmon W.H.,Building the Data Warehouse,4 <sup>th</sup> Edition, Wiley  |
| 22. | Anahory S. and Murray D, Data Warehousing in the Real World, Addison-Wesley                                  |
| 23. | Margaret H. Dunham, Data Mining: Introductory and Advanced Topics, Prentice<br>Hall,2003                     |
| 24. | Mattison R., Web Warehousing and Knowledge Management", Tata McGraw-Hill.                                    |
| 25. | David Hand, Heikki Mannila and Padhraic Smyth ,Principles of Data Mining,PHI                                 |
| 26. | Transactions on Database Systems (ACM)   |
| 27. | IEEE Transactions on Knowledge & Data Engineering  |
| 28. | The VLDB Journal The International Journal on Very Large Data Bases  |

| Course Code   |  | 19B12CS311  | Semester Eve<br>(specify Odd/ | Semester Even<br>(specify Odd/Even)                 |                               | Semester VI Session 2018 -2019<br>Month from January-June |                             |  |
|---|--|---|-------------------------------|---|-------------------------------|---|-----------------------------|--|
| Course Name   |  | IoT and IoT Secur   | rity                          |   |                               |   |                             |  |
| Credits   |  | 04  |                               | Contact Hours                                       |                               |   | B Lectures +1 Tutorial      |  |
| Faculty (Names)   |  | Coordinator(s)  | Vikas Hassiza                 | Vikas Hassiza                                       |                               |   |                             |  |
|   |  | Teacher(s)<br>(Alphabetically)                              | Vivek Kumar                   | Vivek Kumar Singh                                   |                               |   |                             |  |
| COURSE  | COURSE OUTCOMES COGNITIVE LEVELS   |   |                               |   |                               |   | COGNITIVE LEVELS            |  |
| C330-4.1  | Define   | Define basic terminologies related to IoT and IoT security. |                               |   |                               | Remember Level<br>(Level 1)                               |                             |  |
| C330-4.2  | Explain IoT reference model, different architectural views and security aspects moving from machine to machine (M2M) technology to Internet of Things. |   |                               | urity   | Understand Level<br>(Level 2) |   |                             |  |
| C330-4.3  | <b>14.3</b> Identify infeasibility of hardware and software design constraints due Apply Level (Level 3)   |   |                               | Apply Level<br>(Level 3)                            |                               |   |                             |  |
| C330-4.4 Analyze the security related challenges at various layers and security mechanisms adapted to address them. |  |   | ity                           | Analyze Level<br>(Level 4)                          |                               |   |                             |  |
| C330-4.5  | Evalua<br>implen   | te the performance<br>nented at different l                 | of various IoT secu<br>ayers. | f various IoT security protocols<br>vers. (Level 5) |                               |   | Evaluate Level<br>(Level 5) |  |
|   |  |   |                               |   |                               |   |                             |  |

| Module<br>No. | Title of the<br>Module                           | Topics in the Module  | No. of<br>Lectures for<br>the module |
|---------------|--|---|--------------------------------------|
| 1.            | INTRODUCTION<br>& BASIC<br>CONCEPTS              | IoT-An Architectural Overview– Building an architecture,<br>Main design principles and needed capabilities, An IoT<br>architecture outline, standards considerations. M2M and<br>IoT Technology Fundamentals- Devices and gateways,<br>Local and wide area networking, Data management,<br>Business processes in IoT, Everything as a Service(XaaS),<br>M2M and IoT Analytics, Knowledge Management   | 06                                   |
| 2.            | REFERENCE<br>ARCHITECTUR<br>E                    | IoT Architecture-State of the Art – Introduction, State of<br>the art, Reference Model and architecture, IoT reference<br>Model - IoT Reference Architecture- Introduction,<br>Functional View, Information View, Deployment and<br>Operational View, Other Relevant architectural views.<br>Real-World Design Constraints- Introduction, Technical<br>Design constraints-hardware is popular again, Data<br>representation and visualization, Interaction and remote<br>control. | 12                                   |
| 3.            | ANALYSIS OF<br>VARIOUS<br>SECURITY<br>THREATS AT | PHY/MAC layer-Physical capture, Cloning, Impersonation,<br>Denial of service (DoS), Network Layer-Routing,<br>Encryption, Node subversion, Traffic analysis etc,<br>Middleware- Session attack, and data attacks.   | 02                                   |

|   | EA<br>AN<br>CC<br>NC<br>PR  | ACH LAYER<br>ND<br>ORRESPONDI<br>G SECURITY<br>ROBLEMS                                   |   |               |  |  |  |
|---|---|--|---|---------------|--|--|--|
| 4. IOT DATA LINK<br>LAYER &<br>NETWORK<br>LAYER<br>PROTOCOLS<br>AND THEIR<br>SECURITY<br>MECHANISMS |   | DT DATA LINK<br>AYER &<br>ETWORK<br>AYER<br>ROTOCOLS<br>ND THEIR<br>ECURITY<br>ECHANISMS | PHY/MAC Layer (IEEE 802.15), WirelessHART, Z-Wave,<br>Bluetooth Low Energy, Zigbee Smart Energy, DASH7 -<br>Network Layer-IPv4, IPv6, 6LoWPAN, 6TiSCH,ND,<br>DHCP, ICMP, RPL, CORPL, CARP | 10            |  |  |  |
| 5.  | TF<br>SE<br>PF<br>AN<br>SE<br>MI  | RANSPORT &<br>ESSION LAYER<br>ROTOCOLS<br>ND THEIR<br>ECURITY<br>ECHANISMS               | Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-<br>(TLS, DTLS) –<br>Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT   | 06            |  |  |  |
| 6.  | SE<br>LA<br>PR<br>AN<br>SE<br>MI  | ERVICE<br>AYER<br>ROTOCOLS<br>ND THEIR<br>ECURITY<br>ECHANISMS                           | Service Layer -oneM2M, ETSI M2M, OMA, BBF<br>– Security in IoT Protocols – MAC 802.15.4, 6LoWPAN,<br>RPL,   | 04            |  |  |  |
|   |   |  |   |               |  |  |  |
|   |   |  | Total number of Lectures  | 42            |  |  |  |
| Eval<br>Com<br>T1<br>T2<br>End S<br>TA<br>TA<br>Tota  | uation Cr<br>ponents<br>Semester F<br>I   | <b>·iteria</b><br>Examination  | Maximum Marks<br>20<br>20<br>35<br>25 ()<br>100   |               |  |  |  |
| Reco<br>Refer   | mmended<br>rence Bool   | <b>d Reading materia</b><br>ks, Journals, Repor  | <b>l:</b> Author(s), Title, Edition, Publisher, Year of Publication etc.<br>ts, Websites etc. in the IEEE format)   | ( Text books, |  |  |  |
| 1.  | 1. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-<br>5 e-ISBN 978-3-642-19157-2, Springer   |  |   |               |  |  |  |
| 2.  | <ol> <li>Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle,<br/>"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st<br/>Edition, Academic Press, 2014</li> </ol> |  |   |               |  |  |  |
| 3.  | Daniel M<br>Commun  | Inoli, "Building th  | e Internet of Things with IPv6 and MIPv6: The Evolving World<br>78-1-118-47347-4, Willy Publications  | d of M2M      |  |  |  |
| 4.  | Peter Wa  | aher, "Learning Inte   | ernet of Things", PACKT publishing, BIRMINGHAM – MUM  | BAI           |  |  |  |
| 5.  | tp://www.cse.wustl.edu/~jain/cse570-15/ftp/iot_prot/index.html  |  |   |               |  |  |  |

1.Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-<br/>5 e-ISBN 978-3-642-19157-2, Springer

| Course Code                |  | 19B12CS312Semester Events(specify Odd/  |                           | en Semester VI Se<br>Even) Month: from Jan             |   | Session 2<br>January 2(               | Session 2018 -2019<br>anuary 2019 |                     |                          |
|----------------------------|--|---|---------------------------|--|---|---------------------------------------|-----------------------------------|---------------------|--------------------------|
| Course Name                |  | Blockchain T  | Blockchain Technology     |  |   |                                       |                                   |                     |                          |
| Credits 3 Contact Hours 42 |  |   |                           | 2  |   |                                       |                                   |                     |                          |
| Faculty (N                 | ames)  | Coordinato  | r(s)                      | Vikas Hassija  |   |                                       |                                   |                     |                          |
|                            | Teacher(s)<br>(Alphabetica   | ally)   | Vikas Hassija             |  |   |                                       |                                   |                     |                          |
| COURSE                     | ουτο   | OMES  |                           |  |   |                                       |                                   | COGNIT              | IVE LEVELS               |
| C330-5.1                   | Define<br>decent   | all the basic terralized applica  | erminolo<br>tions an      | ogies related to b<br>d smart contracts                | lockchain, 1<br>s.                          | bitcoin,                              |                                   | Reme                | ember Level<br>Level 1)  |
| C330-5.2                   | Unders<br>cryptog<br>algorit   | stand the pillar<br>graphy, digital<br>hms.                                     | security<br>signatur      | res, proof of wor                                      | entralized n                                | etworks l<br>ensus                    | ike                               | Unde<br>(I          | rstand Level<br>Level 2) |
| C330-5.3                   | Identif<br>world   | y the feasibility scenarios using   | y of app<br>g differe     | lying blockchair<br>nt consensus alg                   | n security fe<br>orithms.                   | atures in                             | real                              | Ap<br>(1            | ply Level<br>Level 3)    |
| C330-5.4                   | Analyz<br>consen   | ze various cons<br>Isus, Paxos con  | sensus al<br>sensus,      | gorithms like Po<br>BFT etc.                           | oW, PoS, Po                                 | oB, Raft                              |                                   | Ana<br>(]           | lyze Level<br>Level 4)   |
| C330-5.5                   | Evalua<br>Byzant   | tion of blockel   | hain bas                  | ed consensus alg<br>oof of work etc.                   | gorithms na                                 | mely                                  |                                   | Eval<br>(1          | luate Level<br>Level 5)  |
| Module<br>No.              | Title o<br>Modul   | Title of the<br>Module     Topics in the Module     N       Lecture     Lecture |                           |  |   | No. of<br>Lectures for<br>the module  |                                   |                     |                          |
| 1.                         | Blockc   | chain defined   | We wi<br>struct<br>and co | ll introduce and<br>ure and operati<br>ompare differen | d define blo<br>onal aspect<br>t types of h | ockchain,<br>ts of Bitco<br>olockchai | expla<br>oin blo<br>ns.           | in the<br>ockchain, | 8                        |
| 2.                         | Etherer<br>Blockc  | um<br>chain   | We wi<br>review<br>code e | Il discuss the inr<br>its protocol, and<br>xecution.   | novation of<br>d explore th                 | the Ethere<br>e paymen                | eum bl<br>t mode                  | ockchain,<br>el for | 6                        |
| 3.                         | Algorithms &<br>TechniquesWe will discuss the concept of asymmetric key encryption,<br>define the concept of hashing, and explain techniques that<br>use algorithms to manage the integrity of transactions and<br>blocks in blockchain6   |   |                           |  |   | 6                                     |                                   |                     |                          |
| 4.                         | Trust EssentialsThe purpose of this module is to introduce the reasons for a<br>smart contract and its critical role in transforming<br>blockchain technology from enabling decentralized<br>systems. We will explore the structure and basic concepts<br>of a smart contract through examples, and illustrate Remix<br>(remix.ethereum.org) web IDE for deploying and<br>interacting with a smart contract.7  |   |                           |  |   | 7                                     |                                   |                     |                          |
| 5.                         | interacting with a smart contract.         Smart Contract         Basics         interacting with a smart contract.         Description         Smart Contract         Basics         interacting with a smart contract.         The purpose of this module is to introduce the reasons for a smart contract and its critical role in transforming blockchain technology from enabling decentralized systems. We will explore the structure and basic concepts of a smart contract through examples, and illustrate Remix (remix.ethereum.org) web IDE for deploying and interacting with a smart contract |   |                           |  |   | 7                                     |                                   |                     |                          |

| 6.           | Decentralized   | We will explore the notion of the blockchain server as the   | 4                                    |  |  |  |  |
|--------------|---|--|--------------------------------------|--|--|--|--|
| ••           | Applications  | foundation for a Decentralized Application. We will  |                                      |  |  |  |  |
|              | (Dapps)   | demonstrate how to install the blockchain server and   |                                      |  |  |  |  |
|              |   | establish a peer-to-peer network of nodes. It is a common  |                                      |  |  |  |  |
|              |   | practice to develop and test a Dapp on a local test network  |                                      |  |  |  |  |
|              |   | before deploying it on a public network.   |                                      |  |  |  |  |
| -            | Current challenges  | We will explore just a few of the important challenges and   | 4                                    |  |  |  |  |
| 7.           | and solutions   | solutions that are continuously innovating Blockchain  |                                      |  |  |  |  |
|              | und solutions   |  | 40                                   |  |  |  |  |
|              |   | Total number of Lectures   | 42                                   |  |  |  |  |
| Eval         | uation Criteria   |  |                                      |  |  |  |  |
| Com          | ponents   | Maximum Marks  |                                      |  |  |  |  |
| T1           | •   | 20   |                                      |  |  |  |  |
| T2           |   | 20   |                                      |  |  |  |  |
| End          | Semester Examination  | 35   |                                      |  |  |  |  |
| ТА           |   | 25 (Attendance, Assignment and Ouiz)   | 25 (Attendance, Assignment and Quiz) |  |  |  |  |
| Tota         | 1   | 100  |                                      |  |  |  |  |
|              |   |  |                                      |  |  |  |  |
| Reco<br>Refe | mmended Reading materia<br>rence Books, Journals, Repo  | <b>al:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. rts, Websites etc. in the IEEE format) | ( Text books,                        |  |  |  |  |
| 1.           | Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World |  |                                      |  |  |  |  |
| 2.           | Blockchain: Blueprint for a New Economy   |  |                                      |  |  |  |  |
| 3.           | The Truth Machine: The Blockchain and the Future of Everything                                      |  |                                      |  |  |  |  |
| 4.           | IEEE Transactions on vehi   | icular technology  |                                      |  |  |  |  |
| 5            | ACM Transactions on Bloc  | kchain   |                                      |  |  |  |  |

| Subject Code | 16B1NCI642          | Semester<br>(Even)   | Semester VI Session 2018 - 19<br>Month from January to May |  |  |  |
|--------------|---------------------|----------------------|--|--|--|--|
| Subject Name | e Wireless Networks |                      |  |  |  |  |
| Credits      | 3+1                 | <b>Contact Hours</b> | 3 Lectures +1 Tutorial                                     |  |  |  |

| Faculty                      | Coordinator(s)  | Dr. Gagandeep Kaur                 |                             |  |  |  |
|------------------------------|---|------------------------------------|-----------------------------|--|--|--|
| (Names)                      | Teacher(s)<br>(Alphabetically<br>)                            | 1. Dr. Gagandeep Kaur              |                             |  |  |  |
| COURSE OUTCOMES COGNITIVE LE |   |                                    |                             |  |  |  |
| C330-6.1                     | Define basic concepts & networks                              | Remember Level<br>(Level 1)        |                             |  |  |  |
| C330-6.2                     | Explain cellular concep<br>networks, IEEE 802.11<br>protocols | Understand Level<br>(Level 2)      |                             |  |  |  |
| C330-6.3                     | Identify different categ<br>protocol                          | Apply Level<br>(Level 3)           |                             |  |  |  |
| C330-6.4                     | Analyze metrics of MA simulators                              | Analyze Level<br>(Level 4)         |                             |  |  |  |
| C330-6.5                     | Evaluate various securi                                       | ty parameters in wireless networks | Evaluate Level<br>(Level 5) |  |  |  |

| Module No. | Subtitle of the Module                               | Topics in the module   | No. of<br>Lectures<br>for the<br>module |
|------------|--|--|---|
| 1.         | Overview of Wireless<br>Communications &<br>Networks | Introduction to wireless communication & wireless<br>networks, principles and challenges of various<br>wireless communication generations; GSM, GPRS,<br>3G, 4G, and 5G  | 4                                       |
| 2.         | Data Link Layer                                      | Path Loss and Shadowing, The 802.11 MAC,<br>MAC Access Modes and Timing Section,<br>Contention-Based Access Using the DCF Section,<br>Fragmentation and Reassembly Frame Format.<br>Data Frames, Control Frames, Management<br>Frames, Contention-Based Data Service, Multi-<br>acces communication, Aloha and CSMA Protocols,<br>Other MAC Protocols, Multiple access<br>Interference, IEEE 802.11 wireless LAN, Medium<br>Access control, Interframe spaces, Virtual Carrier<br>Sensing and Network Allocation Vector, ARQ and<br>Atomic Operations, Backoff Procedure with the<br>DCF, Hidden and Exposed Stations, | 10                                      |
| 3.         | Network Layer  | Mobile IP, Network layer routing protocols, key<br>component mechanisms, link metric estimation and<br>neighborhood table management for proactive and<br>reactive routing protocols, opportunistic routing,<br>End-to-End Path Capacity, Mobility, Capacity of  | 8                                       |

|   |  | Mobile Ad Hoc Networks  |              |  |  |  |
|---|--|---|--------------|--|--|--|
| 4.  | Transport Layer  | Transport layer protocols, with an emphasis on<br>congestion control, including TCP over wireless,<br>Feedback TCP, Adhoc TCP, Split TCP, congestion<br>sharing mechanisms, Explicit and precise rate<br>control, | 8            |  |  |  |
| 5.  | Security in Wireless<br>Networks   | Wireless security techniques, WEP, The Extensible<br>Authentication Protocol, Application based attacks,<br>Network Security Attacks, Transport Layer<br>Attacks, DLL Attacks, Cryptographic solutions            | 8            |  |  |  |
| 6.  | Introduction to<br>Simulation Tools &<br>PerformanceNetwork simulation software tools, MAC Protocol<br>Performance Measures, Wireless networks security<br>performance measurement4Measurement   |   |              |  |  |  |
|   |  |   | 42           |  |  |  |
| Evaluation Cri  | teria  |   |              |  |  |  |
| Components<br>T1<br>T2<br>End Semester E<br>TA<br>Total | Maximum           20 | Marks<br>nments+Attendance)   |              |  |  |  |
| <b>Recommended</b><br>Reference Book                    | <b>Reading material:</b> Author(s s, Journals, Reports, Website  | s), Title, Edition, Publisher, Year of Publication etc. (7) as etc. in the IEEE format)   | ſext books,  |  |  |  |
| 1.  | Matthew Gast, 802.11Wire   | less Networks: The Definitive Guide , O'Reilly .  |              |  |  |  |
| 2   | C. Siva Ram Murthy, B. S.<br>Prentice Hall Communicati   | Manoj, "Ad Hoc Wireless Networks Architectures and ons Engineering and Emerging Technologies Series   | d Protocols, |  |  |  |
| 3.  | James F. Kurose, Keith W. Ross, 'Computer Networking : A Top-Down Approach, 6 <sup>th</sup> Edition, Pearson   |   |              |  |  |  |
| 4.  | Ivan Marsic, Wireless Networks: Local and Ad Hoc Networks, 1 <sup>st</sup> Ed., Prentice-Hall, Englewood Cliffs, NJ, 1995.   |   |              |  |  |  |
| 5.  | Nupur Prasad Giri, Wireles   | s Technology, Dreamtech Engineering Textbooks   |              |  |  |  |
| 6.  | Sunilkumar S. Manvi, Mah<br>Concepts and Protocols, 1 <sup>st</sup>  | abaleshwar S. Kakkasageri, 'Wireless and Mobile Net<br>Edition, Wiley   | works:       |  |  |  |
| 7.  | IEEE, ACM Transactions, .<br>Networking."  | Journals and Conference papers on "Wireless Commu   | nications &  |  |  |  |
| 8.  | NS2 Simulator, https://www   | v.isi.edu/nsnam/ns/   |              |  |  |  |

| Course Co              | de  | 16B1NCI634  | -                                     | Semester Eve<br>(specify Odd/l  | n<br>Even)                                   | Semeste<br>Month f                    | er: VI <sup>th</sup> Session 2018 -2019<br>from January to May |                                | 2018 -2019<br>May |  |  |
|------------------------|---|---|---------------------------------------|---|--|---------------------------------------|--|--------------------------------|-------------------|--|--|
| Course Na              | me  | Agile Softwa  | re Development                        |   |  |                                       |  |                                |                   |  |  |
| Credits                |   |   | 4                                     |   | Contact H                                    | Iours                                 |  | 4                              |                   |  |  |
| Faculty (N             | ames)   | Coordinato  | r(s)                                  | Indu Chawla   |  |                                       |  |                                |                   |  |  |
|                        |   | Teacher(s)<br>(Alphabetica  | ally)                                 | Indu Chawla   |  |                                       |  |                                |                   |  |  |
| COURSE OUTCOMES COGNIT |   |   |                                       |   |  | IVE LEVELS                            |  |                                |                   |  |  |
| C330-7.1               | Interpr<br>method<br>project                    | et the trade-off<br>ds and agile so<br>t effectively.   | fs betwe<br>ftware d                  | en traditional so<br>evelopment met                                       | ftware deve<br>hods for a s                  | elopment<br>oftware                   |  | Understar<br>(Level 2)         | nd level          |  |  |
| C330-7.2               | Identif<br>approa<br>part of                    | y and make use<br>ch viz. extreme<br>software deve  | e of an a<br>e progra<br>lopment      | ppropriate agile<br>mming, Scrum,   | software er<br>Crystal tech                  | ngineering<br>nniques as              | g<br>s a   | Apply Le<br>(Level3)           | evel              |  |  |
| C330-7.3               | Apply   | Refactoring te  | chnique                               | s on source code  | for improv                                   | ed design                             | l  | Apply Let<br>(Level3)          | vel               |  |  |
| C330-7.4               | Choose<br>various                               | e tools and con<br>s testing strates  | struct th                             | e methods for te  | sting Agile                                  | projects                              | using  | Apply lev<br>(Level3)          | el                |  |  |
| C330-7.5               | List the<br>with te<br>boards                   | e Planning, trae<br>echniques like<br>etc.  | cking, es<br>burn do                  | stimation and mo<br>wn charts, veloc                                      | onitoring of<br>ity calculati                | agile pro<br>ion and ta               | jects<br>sk  | Analyze l<br>(level4)          | evel              |  |  |
| Module<br>No.          | Title of the<br>Module     Topics in the Module |   |                                       |   |  | No. of<br>Lectures for<br>the module  |  |                                |                   |  |  |
| 1.                     | Introdu   | action  | Traditi<br>Agile s<br>develo          | onal software de<br>software develop<br>pment methods                     | evelopment                                   | methods,<br>ods and le                | an sof   | tware                          | 3                 |  |  |
| 2.                     | Agile<br>Fundaı                                 | mentals   | Agile 1<br>proces<br>of incr          | nanifesto, Agile<br>ses, an iterative<br>emental develop                  | principles,<br>developmer<br>ment and so     | Character<br>nt process<br>oftware pr | ristics<br>, Pros<br>rototyp                                   | of Agile<br>and cons<br>bing.  | 3                 |  |  |
| 3.                     | Requir<br>Plannii                               | rements and ng  | User s<br>Prioriti<br>desirat         | tories, agile esti-<br>izing Themes, Fi<br>bility                         | mation, pla                                  | nning tec<br>oritizatior              | hnique<br>1, prior   | es-<br>itizing                 | 4                 |  |  |
| 4.                     | Scrum   | Scrum Introduction, Scrum - Prioritizing, Estimating, and 5<br>Planning. The Scrum Experience (hands-on exercise) |                                       |   |  |                                       |  | 5                              |                   |  |  |
| 5.                     | Extrem<br>Progra                                | ne<br>mming (XP)  | Extrer<br>Pair pr                     | ne Programming<br>ogramming, Em   | g Values, Pr<br>bracing cha                  | rinciples a<br>inge, incre            | ind Pi<br>ementa   | ractices,<br>Il change         | 5                 |  |  |
| 6.                     | Crysta  | 1   | Crysta<br>family<br>develo<br>and cry | Il methodologies<br>members, Cryst<br>pment process c<br>/stal orange web | : project ca<br>al's seven p<br>ycle, Crysta | tegories,<br>properties<br>al yellow, | comple<br>, Cryst<br>crysta                                    | exity,<br>al clear<br>l orange | 4                 |  |  |
| 7.                     | Kanba   | n   | The pr<br>Measu                       | inciples of kanbarre and manage f   | an, Improvi<br>low, Emerg                    | ng proces<br>ent behav                | s with<br>rior   | kanban,                        | 4                 |  |  |

| 8.         | Feature-Driven<br>Development  | Processes of feature driven development, practices and progress in FDD   | 2  |
|------------|--|--|----|
| 9.         | Agile testing strategy, automated unit test, test plan, test<br>driven development, alpha, beta and acceptance testing | 5  |    |
| 10.        | Refactoring  | Bad smells in code, properties of refactoring, refactoring<br>examples, benefits, cost and risk of reafctoring | 7  |
|            |  | Total number of Lectures   | 42 |
| Evaluation | n Criteria   |  |    |
| Componer   | nts  | Maximum Marks  |    |
| T1         |  | 20   |    |
| T2         |  | 20   |    |
| End Semes  | ster Examination   | 35   |    |
| ТА         |  | 25   |    |
| Total      |  | 100  |    |
|            |  |  |    |

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

| 1. | Cohn, Mike. Agile estimating and planning. Pearson Education   |
|----|--|
| 2. | Beck, Kent. Extreme programming explained: embrace change. Addison-wesley professional                                       |
| 3. | Martin, Robert C. Agile software development: principles, patterns, and practices. Prentice Hall.                            |
| 4. | Shore, James. The Art of Agile Development: Pragmatic guide to agile software development. " O'Reilly Media, Inc.".          |
| 5. | Schwaber, Ken. Agile project management with Scrum. Microsoft press  |
| 6. | Stellman, Andrew, and Jennifer Greene. Learning agile: Understanding scrum, XP, lean, and kanban. "<br>O'Reilly Media, Inc." |
| 7. | Cohn, Mike. User stories applied: For agile software development. Addison-Wesley Professional                                |

| Course Code                     |   | 16B1NCI633   | 33 Semester Even<br>(specify Odd/Eve |   | n<br>E <b>ven</b> )                        | Semester VI Session<br>Month from January-Jur |                 |                       | 2018 -2019<br>e |
|---------------------------------|---|--|--------------------------------------|---|--|---|-----------------|-----------------------|-----------------|
| Course Na                       | me  | Introduction   | to Mobi                              | le Application D  | evelopmen                                  | t   |                 |                       |                 |
| Credits                         |   |  | 3                                    |   | Contact Hours                              |   |                 | 3(Lectures) + 1 (Tut) |                 |
| Faculty (N                      | ames)   | Coordinato   | r(s)                                 | Arpita Jadhav   | Bhatt                                      |   |                 |                       |                 |
| T<br>(A                         |   | Teacher(s)<br>(Alphabetica   | ally)                                | Arpita Jadhav Bhatt, Mradula Sharma                         |  |   |                 |                       |                 |
| COURSE OUTCOMES COGNITIVE LEVEL |   |  |                                      |   |  |   | VE LEVELS       |                       |                 |
| C330-8.1                        | Analyze functional aspects of Android mobile operating system for Analyze Level (Le developing Android applications   |  |                                      |   |  | vel (Level 4)                                 |                 |                       |                 |
| C330-8.2                        | Explain<br>Intents  | lain how Android applications work, their life cycle, manifest,<br>ts. event handling and using external resources |                                      |   |  |   | Level (Level 2) |                       |                 |
| C330-8.3                        | Design<br>interfac<br>differe<br>SMS a  | and develop u<br>ces by using, e<br>nt adapters and<br>nd email  | iseful A<br>xtending<br>l picker     | ndroid applications<br>g, and creating o<br>views, fragment | ons with con<br>wn layouts<br>s, sending a | mpelling u<br>using<br>and receiv             | iser<br>ing     | Create Leve           | el (Level 6)    |
| C330-8.4                        | Make u<br>through   | use of Google I<br>h Internet for n  | Map AP<br>nobile e                   | PI to develop loca<br>nvironments                           | ation aware                                | services                                      |                 | Apply Leve            | el (Level 3)    |
| C330-8.5                        | Apply<br>applica  | functional aspe<br>ations using SQ   | ects of c<br>Lite da                 | latabase handling<br>tabase                                 | g to develop                               | o Android                                     |                 | Apply Leve            | l (Level 3)     |
| Module<br>No.                   | Title o<br>Modul  | Title of the     Topics in the Module       Module     Violation   |                                      |   |  | No. of<br>Lectures for<br>the module          |                 |                       |                 |
| 1.                              | Introduction to App<br>developmentIntroduction to app development process and its platforms<br>and development tools, Android Architecture, Setting up<br>the environment, SDK, Architectural components, Creating<br>simple Android applications, Activities, Intents and<br>manifest files, Life cycles of an activity, working with<br>intents, using intent object to link activities and types of<br>intent passing data using intents |  |                                      |   |  | 8   |                 |                       |                 |

|    |   | manifest files, Life cycles of an activity, working with<br>intents, using intent object to link activities and types of<br>intent, passing data using intents,   |    |
|----|---|---|----|
| 2. | Event Handling  | Handling buttons and action listener methods and events, performing simple operations with button   | 6  |
| 3. | Designing and<br>handling Graphical<br>User Interface –I  | Views and View Groups, Types of Layouts, Textview,<br>EditText, XML layouts, Image View, List View, Grid<br>View, Spinners Navigation bar, tab bar, user inputs like<br>swipes, pinch, zoom etc. Adapter classes, model classes                                     | 10 |
| 4. | Designing and<br>handling Graphical<br>User Interface –II | <b>Part 1:</b> Handling different types of buttons: Radio button,<br>Check box button, toggle, progress bar view, displaying<br>pictures and menus with views, using menus with views<br>Designing interfaces with Views: Basic views, Picker views<br>: Date/Time, | 8  |
| 5. | Designing and<br>handling Graphical<br>User Interface –II | <b>Part 2:</b> Customizing List view, Enabling Filtering and<br>Multi-Item Support in the List View, Creating and Using a<br>List Fragment, customizing Grid and Spinner views by<br>defining row layouts, using GridView view, Sending and                         | 7  |

|                          | receiving SMS programmatically, sending Email and<br>implementing location based services using map APIs |  |    |  |  |
|--------------------------|--|--|----|--|--|
| 6.                       | Mobile Databases   | Sqlite introduction, database Create, Retrive, Update, delete operations, backup of DB's | 7  |  |  |
|                          |  | Total number of Lectures   | 46 |  |  |
| Evaluation               | n Criteria   |  |    |  |  |
| Componen                 | nts  | Maximum Marks  |    |  |  |
| T1                       |  | 20   |    |  |  |
| T2                       |  | 20   |    |  |  |
| End Semester Examination |  | 35   |    |  |  |
| ТА                       |  | 25 (Project: 15, Class Test: 5, Attendance: 5)   |    |  |  |
| Total                    |  | 100  |    |  |  |

| <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.   | Griffiths D, Griffiths D. Head First Android Development: a brain-friendly guide. " O' Reilly Media, Inc."; 2017 Aug 9.                            |  |
| 2.   | Burd BA. Android application development all-in-one for dummies. John Wiley & Sons; 2015 Jul 9.  |  |
| 3.   | Annuzzi Jr J, Darcey L, Conder S. Introduction to Android application development: Android essentials. Pearson Education; 2014.                    |  |
| 4.   | Meier R. Professional Android 4 application development. John Wiley & Sons; 2012.  |  |
| 5.   | Lee WM. Beginning android 4 application Development. John Wiley & Sons; 2012 Feb 3.  |  |
| 6.   | Darcey L, Conder S. Sams Teach Yourself Android Application Development in 24 Hours: Sams Teac Your Andr Appl D_2. Pearson Education; 2011 Jul 25. |  |
| 7.   | Felker D. Android application development for dummies. John Wiley & Sons; 2010 Nov 17.   |  |
| 8.   | Murphy, M. L. "The Busy Coder's Guide to Advanced Android Development: CommonsWare." (2009).   |  |
| 9.   | Hashimi SY, Komatineni S. Pro Android. Apress; 2009 Jun 22.  |  |
| 10.  | Rogers R, Lombardo J, Mednieks Z, Meike B. Android application development: Programming with the Google SDK. O'Reilly Media, Inc.; 2009 May 26.    |  |
| 11.  | https://developer.android.com  |  |

| Subject Code | 16B1NCI644           | Semester Even<br>(specify Odd/Even) | Semester Even Session 2018 - 19<br>Month from January to May |
|--------------|----------------------|-------------------------------------|--|
| Subject Name | Cloud based Enterpri | ise Applications                    |  |
| Credits      | 4                    | Contact Hours                       | 4  |

| Faculty | Coordinator(s) | Bharat Gupta |
|---------|----------------|--------------|
| (Names) | Teacher(s)     | Bharat Gupta |
|         |                |              |

| COURSE OU | COGNITIVE<br>LEVELS  |                            |
|-----------|--|----------------------------|
| C330-9.1  | Differentiate between Public, Private, and Hybrid Clouds   | Understand Level (Level 2) |
| C330-9.2  | Develop Enterprise applications based on XML, JavaScript, Java<br>Servlets, Java Server Pages, etc.                      | Apply Level (Level 3)      |
| C330-9.3  | Develop web service based solutions by using REST, JSON, SOAP, etc.  | Apply Level (Level 3)      |
| C330-9.4  | Examine emerging technologies in cloud environment.  | Analyse Level (Level 4)    |
| C330-9.5  | Evaluate the performance of different Public Cloud Platforms e.g., GAE, AWS and Azure.                                   | Evaluate Level (Level 5)   |
| C330-9.6  | Design and deploy Enterprise applications on one of the Cloud Service<br>Providers, i.e., Amazon AWS or Microsoft Azure. | Create Level (Level 6)     |

| Module<br>No. | Subtitle of the Module             | Topics in the module  | No. of Lectures for the module |
|---------------|------------------------------------|---|--------------------------------|
| 1             | XML Programming                    | XML, DTD, XML schema, XPath, XQuery   | 6                              |
| 2             | Web services                       | REST, JSON,SOAP   | 6                              |
| 3             | JavaScript                         | Basic constructs, Conditional statements, Loop,<br>External linking with .js, Browser related events  | 6                              |
| 4.            | Server Side programming            | Java servlet, Java server pages   | 8                              |
| 5.            | Introduction to Cloud<br>Computing | Public, private, and Hybrid clouds; Features of cloud platforms,  | 4                              |
| 6.            | Public Cloud Platforms             | Introduction to GAE, AWS and Azure;<br>Programming support of Google App Engines,<br>Amazon AWS, and Microsoft Azure;<br>Emerging cloud software environments | 7                              |
| 7.            | Apache Hadoop                      | Introduction to distributed computing, Map Reduce   | 3                              |
| 8.            | Virtualization                     | Virtualization structures/tools and mechanism,<br>Virtualization of CPU, Memory and I/O devices   | 2                              |

| Total number   | Total number of Lectures   42   |                    |  |  |
|----------------|---|--------------------|--|--|
|                |   |                    |  |  |
| Evaluation Cri | teria   |                    |  |  |
| Components     | Maximum Marks   |                    |  |  |
| T1             | 20  |                    |  |  |
| T2             | 20  |                    |  |  |
| End Semester   | Examination 35  |                    |  |  |
| ТА             | 25 (Attendance (5); Tutorial performance and Quiz (10);                                 | Mini-project (10)) |  |  |
| Total          | 100   |                    |  |  |
|                |   |                    |  |  |
| Recommended    | <b>Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. | ( Text books,      |  |  |
| Reference Book | ts, Journals, Reports, Websites etc. )  |                    |  |  |
| 1.             | https://www.w3.org/XML/   |                    |  |  |
| 2.             | https://aws.amazon.com/   |                    |  |  |
| 3.             | https://azure.microsoft.com/en-in/  |                    |  |  |
| 4.             | https://cloud.google.com/appengine/docs/  |                    |  |  |

Elliotte Harold, W. Means, XML in a Nutshell, 3rd Edition, O'Reilly Media, 2009

https://docs.oracle.com/javaee/6/tutorial/doc/bnafd.html (Java Servlet Technology)

http://www.oracle.com/technetwork/java/javaee/jsp/index.html (JSP)

John Pollock, JavaScript, 3rd Edition, Mc Graw Hill, 2011

https://docs.oracle.com/javase/tutorial/jaxp/

5.

6.

7.

8.

9.
| Course Co   | ode              | 19B13CS311  | Semester Eve   | en  | Semeste<br>Month            | er 6 <sup>th</sup><br>from . | Session 2018 -2019<br>Jan to Jul |  |
|---|------------------|---|--|---|-----------------------------|------------------------------|----------------------------------|--|
| Course Na   | ime              | Blockchain& Cyber   | Security   |   | -                           |                              |                                  |  |
| Credits   |                  |   |  | Contact I   | Hours                       | 4hrs                         |                                  |  |
| Faculty (N  | ames)            | Coordinator(s)  | Dr. Gagandeep  | o Kaur  |                             |                              |                                  |  |
|   |                  | Teacher(s)<br>(Alphabetically)  | Dr. Gagandeep  | o Kaur  |                             |                              |                                  |  |
| COURSE  | OUTCO            | OMES  |  |   |                             |                              | COGNITIVE LEVELS                 |  |
| C305-7.1  | Define<br>Crypto | all the basic terminolocurrencies and Smart   | ogies related to blockchain,<br>contract mechanism   |   | Remember Level<br>(Level 1) |                              |                                  |  |
| C305-7.2  | Unders<br>concep | stand blockchain mech<br>ots, and Block Certs.  | anisms, Proof-o                                      | f-Work, Pro   | oof-of-Sta                  | ke                           | Understand Level<br>(Level 2)    |  |
| C305-7.3 Implem<br>Identiti   |                  | nent smart contracts based decentralized network processes;<br>y and implement Cryptographic concepts of Blockchain |  |   | ,                           | Apply Level<br>(Level 3)     |                                  |  |
| C305-7.4 Analyze blockchain technology for<br>information, Test for the issues in<br>blockchain and consensus algorithm |                  |   | gy for integrity a<br>es in the existing<br>gorithms | gy for integrity and availability of the<br>es in the existing implementations of<br>porithms |                             |                              | Analyze Level<br>(Level 4)       |  |
| C305-7.5  | Evalua           | te Blockchain based n   | etwork protectio                                     | 'n  |                             |                              | Evaluate Level<br>(Level 5)      |  |

|               | 0.0000000000000000000000000000000000000                |   |   |             |
|---------------|--|---|---|-------------|
| C305-7.5      | Evaluate Block   | chain based network protection  | Evaluate Level (Level 5)  |             |
| Module<br>No. | Title of the<br>Module                                 | List of Experiments   |   | СО          |
| 1.            | Introduction to<br>Blockchain&<br>Cyber Security       | <ol> <li>Read and understand papers:</li> <li>Satoshi Nakamoto, Bitcoin, "A Peer-to-Peer Electronic<br/>Michael Crosby, Nachiappan, Pradhan Pattanayak, Sanj<br/>VigneshKalyanaraman, "BlockChain Technology Beyon<br/>Install node js</li> <li>Study and implement Constructor function in java script</li> </ol>  | Cash System"<br>eev Verma,<br>nd Bitcoin"   | CO1         |
| 2.            | Basics of<br>Blockchain<br>and<br>Cryptocurrenci<br>es | Create the blockchain using the constructor functions an<br>install Postman<br>Create an API using express framework of node js to int<br>blockchain data structure, create three API methods for<br>blockchain, posting transactions and mining a block<br>Install body parser. Requests that we send using postmat<br>this body parser, and wecan use that data in the requests<br>Test post request using postman. Apply POST, SEND to<br>postman. Write code for allowing transactions through p<br>Write a new method to create new transactions. This me<br>threeparameters i:e amount, sender and receiver. All the<br>pending transactionsand are not recorded in any block. T<br>get mined and get added to the next blockin that chain. | d prototype objects<br>eract with<br>getting the current<br>n will go through<br>o check working of<br>oostman method.<br>thod will take<br>se transactions are<br>These transactions | CO2         |
| 3             | Science of<br>Blockchain-I<br>(POW, POS<br>etc.)       | Write a proof of work and proof of stake methods. PoW<br>that whatever transactionswe are adding to the blockcha<br>method will take in the current block data, previous bloc<br>think of a nonce, that should create a specific hash as ou<br>work method, check that the block is valid, by using it in<br>Create a genesis block in blockchain data structure. Gen   | method validates<br>in are valid. This<br>is hash and will<br>tputtest the proof of<br>hashblock method.<br>esis block is the   | CO2,<br>CO3 |

| Image: Construct solution is of main and the construction of th        |           |   | firstblock. It has no previous block hash. It doesn't include any transactions   |             |
|--|-----------|---|--|-------------|
| 4       Science of<br>Blockchain-II<br>(Decentralizati<br>on)       Create a decentralized network to host blockchain to have a look that how<br>blockchain works in real world. Create a decentralized network by creating<br>multiple instances of API. Eachinstance will represent a node in the<br>blockchain.<br>Register the nodes to a network. For this we need to createthree new end<br>point in networkNodes.js.<br>Synchronize the network and we need to broadcast the mining<br>reward transaction to all nodes.       CO3         5       Smart<br>Contracts<br>(Solidity)       Build smart contract on Ethereum command line.<br>Construct smart contract in javascript to connect front-end.       CO3         6       HyperLedger       Build your application with hyperledger technologies       CO4         7       Blockchain<br>Security       Create a hash block method, that will take the block data as parameter and<br>will hashthe complete data into a 256 bit string. import it in blockchain<br>Use library packages to generate private keys, Public Keys<br>Generate Private Key WIF "wallet import format" Bitcoin wallet that to<br>make transactions. Check address in blockchain.<br>Use library packages to generate private keys, Public Keys<br>Generate Private Key WIF "wallet import format" Bitcoin wallet that to<br>make transactions. Check address in blockchain.<br>Read paper Decentralizing Privacy: Using Blockchain to Protect Personal<br>Data (ZNP15) in the same folder         Evaluation Criteria<br>Components         Maximum Marks<br>Lab Test 1       20<br>Lab Test 2         20<br>Lab Test 1       20<br>Lab Test 2         20<br>Lab Test 2       20<br>Lab Test 2         20<br>Lab Test 2       20<br>Lab Test 2         20   |           |   | work for this, so nonce is also not required   |             |
| Image: construct and transaction to all nodes.Image: construct and transaction to all nodes.Construct and transaction to all nodes.5SmartBuild smart contract on Ethereum command line.CO3ContractsConstruct smart contract in javascript to connect front-end.CO36HyperLedgerBuild your application with hyperledger technologiesCO47BlockchainCreate a hash block method, that will take the block data as parameter and<br>Use library packages to generate private keys, Public KeysCO3,<br>CO4,<br>CO4,<br>Use library packages to generate private keys, Public KeysCO56Generate Private Key WIF "wallet import format" Bitcoin wallet that to<br>make transactions. Check address in blockchain.info to see balance. Use it to<br>infer public key hash from node address<br>Apply homomorphic encryption in python<br>Apply homomorphic encryption in blockchain<br>Read paper Decentralizing Privacy: Using Blockchain to Protect Personal<br>Data (ZNP15) in the same folderImage: construct of the same folderEvaluation CriteriaCongutation MarksLab Test 1<br>20202020Evaluation 11520Evaluation 23030  | 4         | Science of<br>Blockchain-II<br>(Decentralizati<br>on) | Create a decentralized network to host blockchain to have a look that how<br>blockchain works in real world. Create a decentralized network by creating<br>multiple instances of API. Eachinstance will represent a node in the<br>blockchain network. These all nodes will work together to host our<br>blockchain.<br>Register the nodes to a network. For this we need to createthree new end<br>point in networkNodes.js.<br>Synchronize the network , so that the copy of blockchain is same at all the<br>nodes<br>Update the mine end point, so that it broadcasts the newly created block to<br>all the other nodes in the network and we need to broadcast the mining | CO3,<br>CO4 |
| 5SmartBuild smart contract on Ethereum command line.CO3Contracts<br>(Solidity)Construct smart contract in javascript to connect front-end.CO36HyperLedgerBuild your application with hyperledger technologiesCO47BlockchainCreate a hash block method, that will take the block data as parameter and<br>SecurityCO2,<br>Use library packages to generate private keys, Public KeysCO4,<br>CO4,<br>CO56HyperLedgerGenerate Private Key WIF "wallet import format" Bitcoin wallet that to<br>make transactions. Check address in blockchain.<br>infer public key hash from node address<br>Apply homomorphic encryption in python<br>Apply homomorphic encryption in blockchain<br>Data (ZNP15) in the same folderCO5Evaluation CriteriaComponentsMaximum MarksLab Test 120Lab Test 22020Evaluation 115Evaluation 230   |           | ~   | reward transaction to all nodes.   |             |
| Contracts<br>(Solidity)Construct small contract in javascript to connect non-end.6HyperLedgerBuild your application with hyperledger technologiesCO47BlockchainCreate a hash block method, that will take the block data as parameter and<br>will hashthe complete data into a 256 bit string. import it in blockchain<br>Use library packages to generate private keys, Public KeysCO4,<br>CO4,<br>CO56HyperLedgerCreate a hash block method, that will take the block data as parameter and<br>will hashthe complete data into a 256 bit string. import it in blockchain<br>Use library packages to generate private keys, Public KeysCO5,<br>CO56Generate Private Key WIF "wallet import format" Bitcoin wallet that to<br>make transactions. Check address in blockchain.info to see balance. Use it to<br>infer public key hash from node address<br>Apply homomorphic encryption in blockchain<br>Read paper Decentralizing Privacy: Using Blockchain to Protect Personal<br>Data (ZNP15) in the same folderCO4Evaluation CriteriaComponentsMaximum Marks<br>Lab Test 120Lab Test 22020Evaluation 115Evaluation 230  | 5         | Smart   | Build smart contract on Ethereum command line.   | CO3         |
| 6HyperLedgerBuild your application with hyperledger technologiesCO47BlockchainCreate a hash block method, that will take the block data as parameter and<br>will hashthe complete data into a 256 bit string. import it in blockchain<br>Use library packages to generate private keys, Public Keys<br>Generate Private Key WIF "wallet import format" Bitcoin wallet that to<br>make transactions. Check address in blockchain.info to see balance. Use it to<br>infer public key hash from node address<br>Apply homomorphic encryption in blockchain<br>Read paper Decentralizing Privacy: Using Blockchain to Protect Personal<br>Data (ZNP15) in the same folderCO4Evaluation Criteria<br>20<br>Lab Test 1Maximum Marks<br>20<br>20<br>20<br>20<br>20Zo4<br>20<br>20<br>20Evaluation 115<br>20<br>303030  |           | (Solidity)  | Construct smart contract in javascript to connect nont-end.  |             |
| 7Blockchain<br>SecurityCreate a hash block method, that will take the block data as parameter and<br>will hashthe complete data into a 256 bit string. import it in blockchain<br>Use library packages to generate private keys, Public Keys<br>Generate Private Key WIF "wallet import format" Bitcoin wallet that to<br>make transactions. Check address in blockchain.info to see balance. Use it to<br>infer public key hash from node address<br>Apply homomorphic encryption in python<br>Apply homomorphic encryption in blockchain<br>Read paper Decentralizing Privacy: Using Blockchain to Protect Personal<br>Data (ZNP15) in the same folderCO2,<br>CO4,<br>CO5Evaluation CriteriaComponentsMaximum MarksLab Test 120Lab Test 220Evaluation 115Evaluation 230  | 6         | HyperLedger   | Build your application with hyperledger technologies   | CO4         |
| Securitywill hashthe complete data into a 256 bit string. import it in blockchain<br>Use library packages to generate private keys, Public Keys<br>Generate Private Key WIF "wallet import format" Bitcoin wallet that to<br>make transactions. Check address in blockchain.info to see balance. Use it to<br>infer public key hash from node address<br>Apply homomorphic encryption in python<br>Apply homomorphic encryption in blockchain<br>Read paper Decentralizing Privacy: Using Blockchain to Protect Personal<br>Data (ZNP15) in the same folderCO4,<br>CO5Evaluation Criteria<br>Lab Test 1Maximum Marks<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20<br>20Maximum Marks<br>20<br>20<br>20<br>20<br>20Maximum Marks<br>20<br>20<br>20<br>20<br>20   | 7         | Blockchain  | Create a hash block method, that will take the block data as parameter and   | CO2,        |
| Evaluation CriteriaCoseHome Maximum MarksLab Test 120Lab Test 220Evaluation 115Evaluation 230  |           | Security  | will hashthe complete data into a 256 bit string. import it in blockchain  | CO4,        |
| Evaluation CriteriaMaximum MarksLab Test 120Lab Test 220Evaluation 115Evaluation 230   |           |   | Use library packages to generate private keys, Public Keys<br>Generate Private Key WIE "wallet import format" Bitcoin wallet that to   | COS         |
| International content action |           |   | make transactions. Check address in blockchain info to see balance. Use it to  |             |
| Apply homomorphic encryption in python<br>Apply homomorphic encryption in blockchain<br>Read paper Decentralizing Privacy: Using Blockchain to Protect Personal<br>Data (ZNP15) in the same folderEvaluation CriteriaMaximum MarksLab Test 120Lab Test 220Evaluation 115Evaluation 230   |           |   | infer public key hash from node address  |             |
| Apply homomorphic encryption in blockchain<br>Read paper Decentralizing Privacy: Using Blockchain to Protect Personal<br>Data (ZNP15) in the same folderEvaluation CriteriaMaximum MarksLab Test 120Lab Test 220Evaluation 115Evaluation 230   |           |   | Apply homomorphic encryption in python   |             |
| Read paper Decentralizing Privacy: Using Blockchain to Protect Personal<br>Data (ZNP15) in the same folderEvaluation CriteriaMaximum MarksLab Test 120Lab Test 220Evaluation 115Evaluation 230   |           |   | Apply homomorphic encryption in blockchain   |             |
| Data (ZNP15) in the same folderEvaluation CriteriaComponentsMaximum MarksLab Test 120Lab Test 220Evaluation 115Evaluation 230  |           |   | Read paper Decentralizing Privacy: Using Blockchain to Protect Personal  |             |
| Evaluation CriteriaComponentsMaximum MarksLab Test 120Lab Test 220Evaluation 115Evaluation 230   |           |   | Data (ZNP15) in the same folder  |             |
| ComponentsMaximum MarksLab Test 120Lab Test 220Evaluation 115Evaluation 230  | Evaluatio | on Criteria   |  |             |
| Lab Test 120Lab Test 220Evaluation 115Evaluation 230   | Compone   | ents  | Maximum Marks  |             |
| Lab Test 220Evaluation 115Evaluation 230   | Lab Test  | 1   | 20   |             |
| Evaluation 2 30  | Lab Test  | 2<br>n 1  | 20<br>15   |             |
| Evaluation 2 50  | Evaluatio | 11 I<br>n 2   | 15 20  |             |
| Attendance 15  | Attendary | II ∠<br>20  | 50<br>15   |             |
| Total 100  | Total     |   | 100  |             |

| Reco<br>Refe | <b>ommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence Books, Journals, Reports, Websites etc. in the IEEE format) |
|--------------|---|
| 1.           | Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, Princeton  |
| 2.           | Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, Imran Bashir, Packt Publishing                           |
| 3.           | Bitcoin: A Peer-to-Peer Electronic Cash System, Satoshi Nakamoto  |
| 4.           | Michael Crosby, Nachiappan, Pradhan Pattanayak, Sanjeev Verma, Vignesh Kalyanaraman, "BlockChain Technology Beyond Bitcoin  |
| 5.           | Using Blockchain to Protect Personal Data, Guy Zyskind, et. al.   |
| 6.           | IEEE Blockchain Initiative at https://blockchain.ieee.org/  |

# **Detailed Syllabus**

| Subject Code | 19B16CS311           | Semester odd         | Semester Sixth Session 2018-2019<br>Month from Jan to June |
|--------------|----------------------|----------------------|--|
| Subject Name | Neural network Works | hop                  |  |
| Credits      | 0-0-4                | <b>Contact Hours</b> | 4 lab hours  |

| Faculty | Coordinator(s)                 | Anuja Arora  |  |
|---------|--------------------------------|--|--|
| (Names) | Teacher(s)<br>(Alphabetically) | Anuja Arora Archana Purwar Pawan Upadhay Ankit<br>Vidhyarthi |  |
|         |                                |  |  |

| SNO     | Description   | Cognitive Level<br>(Bloom Taxonomy) |
|---------|---|-------------------------------------|
| CS311.1 | Understand the fundamentals and concepts of neural network, neural network architectures, and its paradigm. | Understand Level<br>(Level 2)       |
| CS311.2 | Apply the neural network to solve practical problems  | Apply Level (Level 3)               |
| CS311.3 | Examine the engineering applications that can learn using neural networks                                   | Evaluate Level (Level 5)            |
| CS311.4 | Implement Neural network in context of problem solving and modelling in python                              | Analyze Level<br>(Level 4)          |
| CS311.5 | To develop neural network applications on real-world tasks  | Create Level (Level 6)              |

| Module No. | Subtitle of the Module                       | Topics in the module   | No. of Labs for<br>the module |
|------------|--|--|-------------------------------|
| 1.         | Overview of classification<br>and Regression | Linear Regression, Multiple Linear<br>Regression, KNN classifier, SVM<br>Classifier  | 4                             |
| 2.         | Neural Fundamental Concept                   | Neuron models, basic Learning rules,<br>Single Neuron NN, Single layer neural<br>network, Activation Function, Two Layer<br>Neural Network, error function           | 4                             |
| 3          | Basic neural network models                  | Multilayer Perceptron Learning Algorithm,<br>Stochastic gradient descent, Forward<br>Propagation, Backpropagation, Real life<br>case studies                         | 8                             |
| 4          | Other Neural network models                  | Associative memory, Self-organizing<br>feature map, Neural network decision tree,<br>Data visualization with self-organizing<br>feature map                          | 6                             |
| 5          | Convolution Neural Network                   | Fundamentals of convolution Neural<br>network and Object detection, introducing<br>tensor flow and keras libraries for CNN,<br>neural style transfer Case studies of | 6                             |

| Convolution neural network. |    |
|-----------------------------|----|
| Total number of Lectures    | 28 |

| <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.   | S. Haykin, Neural Networks: A Comprehensive Foundation 2nd edition, (Prentice Hall, 1999)   |  |  |  |  |
| 2.   | Rajasekaran, S., & Pai, G. V. (2003). Neural networks, fuzzy logic and genetic algorithm: synthesis and applications (with cd). PHI Learning Pvt. Ltd |  |  |  |  |
| 3.   | C. Looney, Pattern Recognition Using Neural Networks, Oxford University Press, 1997   |  |  |  |  |
| 4.   | Hagan, M. T., Demuth, H. B., Beale, M. H., & De Jesús, O. (1996). Neural network design (Vol. 20). Boston: Pws Pub                                    |  |  |  |  |
| 5.   | Sivanandam, S. N., & Deepa, S. N. (2007). Principles of Soft Computing (With CD). John Wiley & Sons.  |  |  |  |  |

| Course Co  | ode  | 18B16CS312  | Semester Ever<br>(specify Odd/)  | n<br>Even)                                 | Semester VI S<br>Month from Ja                    |             | Session 2018 -2019<br>Jan-Jun   |  |
|--|--|---|--|--|---|-------------|---|--|
| Course Name  |  | R Programming Wor   | kshop  |  |   |             |   |  |
| Credits  |  | 0   |  | Contact I                                  | Hours   |             | 1-0-2 (3 hrs per week)  |  |
| Faculty (N   | ames)  | Coordinator(s)  | Megha Rathi  |  |   |             |   |  |
|  |  | Teacher(s)<br>(Alphabetically)  | Dr. Adwitiya S   | Sinha, Kirti                               | Aggarwal  | , Megl      | ha Rathi  |  |
| COURSE OUTCOMES  |  |   |  |  |   |             |   |  |
| COURSE   | OUTCO  | DMES  |  |  |   |             | COGNITIVE LEVELS  |  |
| COURSE<br>C305-9.1                                     | OUTCO<br>Define<br>Explai  | DMES<br>all tools and technique<br>n the basic & core cond  | es used for Data<br>cept of R  | Mining and                                 | l Analysis  |             | COGNITIVE LEVELS<br>Understand Level<br>(Level 2)   |  |
| COURSE<br>C305-9.1<br>C305-9.2                         | OUTCO<br>Define<br>Explai<br>Develo<br>technio   | DMES<br>all tools and technique<br>n the basic & core con-<br>op code for data extract<br>ques and build predicti   | es used for Data<br>cept of R<br>tion & loading. /<br>ve model   | Mining and                                 | l Analysis  | sing        | COGNITIVE LEVELS<br>Understand Level<br>(Level 2)<br>Apply Level<br>(Level 3)   |  |
| COURSE<br>C305-9.1<br>C305-9.2<br>C305-9.3             | OUTCO<br>Define<br>Explai<br>Develo<br>technic<br>Choos<br>results                     | DMES<br>all tools and technique<br>n the basic & core con-<br>op code for data extract<br>ques and build predicti-<br>e Data Visualization te   | es used for Data<br>cept of R<br>tion & loading. A<br>ve model<br>chniques for gra                                   | Mining and<br>Apply data p<br>phical repro | l Analysis<br>pre-proces<br>esentation            | sing<br>of  | COGNITIVE LEVELS<br>Understand Level<br>(Level 2)<br>Apply Level<br>(Level 3)<br>Apply Level<br>(Level 3)                               |  |
| COURSE<br>C305-9.1<br>C305-9.2<br>C305-9.3<br>C305-9.4 | OUTCO<br>Define<br>Explai<br>Develo<br>technic<br>Choos<br>results<br>Analyz<br>discov | DMES<br>all tools and technique<br>n the basic & core conc<br>op code for data extract<br>ques and build prediction<br>the Data Visualization te<br>ze the results. Compare<br>er new pattern insight | es used for Data<br>cept of R<br>tion & loading. A<br>ve model<br>chniques for gra<br>e and contrast the<br>in data. | Mining and<br>Apply data<br>phical repro   | Analysis<br>pre-proces<br>esentation<br>tained to | ssing<br>of | COGNITIVE LEVELS<br>Understand Level<br>(Level 2)<br>Apply Level<br>(Level 3)<br>Apply Level<br>(Level 3)<br>Analyze Level<br>(Level 4) |  |

| C305-9.5      |  | (Level 6)   |                                      |
|---------------|--|---|--------------------------------------|
| Module<br>No. | Title of the<br>Module                         | Topics in the Module  | No. of<br>Lectures for<br>the module |
| 1.            | Introduction to R                              | Introduction to R, Installation, Getting Started ,Some<br>Information on R Commands, Objects,Functions, Number<br>& Vector, Matrices & Array,Factors, Conditional<br>Statements, Loop, Scripts, R package.  | 1+3                                  |
| 2.            | List , Data Frames<br>& String Handling        | Introduction, Creating a List, List Operation, Recursive<br>List, Introduction to Data Frame, Creating Data Frame,<br>Data Frame Operations, lapply() and sapply() functions.<br>Introduction to String handling, String functions, String<br>Manipulation, Regular Expressions & Pattern Matching,<br>and Introduction to "stringr" package. | 2+3                                  |
| 3.            | Object Oriented<br>Programming                 | Introduction, Object Oriented Programming Concepts, S3 classes, S4 classes, Reference Classes.  | 1+3                                  |
| 4.            | Import & Export                                | Introduction, Saving & Loading R data, Import and Export<br>to different file formats: Excel File, Binary File, XML File,<br>JSON File. Analyzing data & Reshaping the data.  | 1+3                                  |
| 5.            | R-working with<br>database (Mysql +<br>Hadoop) | Introduction to Databases, Introduction to SQL Commands,<br>RMySQL Package, Connecting R to MySQL ,Import Table,<br>Querying Data, Export data to MySQL , Disconnect<br>Function. Introduction to Hadoop, Import and Export data<br>(Hadoop)  | 2+4                                  |
| 6.            | Data Preprocessing<br>using R                  | Data Pre-processing, forms of Data Pre-processing, Data<br>Cleaning Techniques, Data Redundancy- chi square test,<br>correlation analysis, covariance coefficient, Data<br>Transformation, Data Reduction- Principal Component  | 2+4                                  |

|   |   | Analysis, R packages for Data Pre-processing.   |  |
|---|---|---|--|
| 7.  | Data Visualization  | Visual Representation of statistical analysis, High level<br>plotting commands- create plots with axes, titles, labels and<br>others on the graphics device and Low level plotting<br>commands- add new features like extra labels, point or line.<br>Plots, Histogram, Scatter Plots, Pie chart, Box Plot, QQ<br>Plot, customized Plotting. Introduction to data visualization<br>packages: Ggobi & ggplot.  | 2+3  |
| 5   | 3 Classification and<br>Clustering<br>Algorithm   | Classification Techniques: Introduction to Classification,<br>Regression, Naïve Bayes, Decision Tree, KNN, Ensemble<br>Methods.<br>Clustering Techniques: Introduction to Clustering, K-<br>means, Hierarchical Clustering, DB Scan.  | 3+4  |
| ç   | Data Analytics  | Tools for Data Analytics by integrating R with Android or<br>web Interface, Introduction to shiny Package.  | 1+3  |
|   |   | Total number of Lectures  | 45   |
| Eval  | uation Criteria   |   |  |
| Com   | ponents   | Maximum Marks   |  |
| Lab [<br>End ]  | Fest1<br>Semester Examination   | 30<br>40  |  |
| TA<br>Tota  | l   | 30 (Quiz + Evaluative Assignment + Class Test + Attendance<br>100   | 2)   |
|   |   |   |  |
| Reco<br>Refe  | ommended Reading materi<br>rence Books, Journals, Repo  | <b>al:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. rts, Websites etc. in the IEEE format)  | ( Text books,  |
| Reco<br>Refe  | ommended Reading materi<br>rence Books, Journals, Repo<br>Paul Teetor.R Cookbook -  | al: Author(s), Title, Edition, Publisher, Year of Publication etc.<br>arts, Websites etc. in the IEEE format)<br>Proven Recipes for Data Analysis, Statistics, and Graphics. O'H  | ( Text books,<br>Reilly, 2011.   |
| Reco<br>Refe<br>1.<br>2.  | mmended Reading materi<br>rence Books, Journals, Repo<br>Paul Teetor.R Cookbook -<br>Alain F. Zuur, Elena N. Ie<br>978-0- 387-93836-3.  | al: Author(s), Title, Edition, Publisher, Year of Publication etc.<br>orts, Websites etc. in the IEEE format)<br>Proven Recipes for Data Analysis, Statistics, and Graphics. O'H<br>no, and Erik Meesters. A Beginner's Guide to R. Use R. Spring   | ( Text books,<br>Reilly, 2011.<br>er, 2009. ISBN:                                |
| Reco           Refer           1.           2.           3.                                       | mmended Reading materi<br>rence Books, Journals, Repo<br>Paul Teetor.R Cookbook -<br>Alain F. Zuur, Elena N. Ie<br>978-0- 387-93836-3.<br>John Maindonald and John<br>Cambridge, 2nd edition, 20  | al: Author(s), Title, Edition, Publisher, Year of Publication etc.<br>rts, Websites etc. in the IEEE format)<br>Proven Recipes for Data Analysis, Statistics, and Graphics. O'I<br>no, and Erik Meesters. A Beginner's Guide to R. Use R. Spring<br>n Braun. Data Analysis and Graphics Using R. Cambridge Univ<br>007. ISBN 978-0-521-86116-8.   | ( Text books,<br>Reilly, 2011.<br>er, 2009. ISBN:<br>ersity Press,               |
| Reco           Refe           1.           2.           3.           4.                           | mmended Reading materi<br>rence Books, Journals, Repo<br>Paul Teetor.R Cookbook -<br>Alain F. Zuur, Elena N. Ie<br>978-0- 387-93836-3.<br>John Maindonald and John<br>Cambridge, 2nd edition, 20<br>Advanced R, by Hadley W   | al: Author(s), Title, Edition, Publisher, Year of Publication etc.<br>orts, Websites etc. in the IEEE format)<br>Proven Recipes for Data Analysis, Statistics, and Graphics. O'I<br>no, and Erik Meesters. A Beginner's Guide to R. Use R. Spring<br>n Braun. Data Analysis and Graphics Using R. Cambridge Univ<br>207. ISBN 978-0-521-86116-8.<br>Tickham, ISBN 9781466586963.  | ( Text books,<br>Reilly, 2011.<br>er, 2009. ISBN:<br>ersity Press,               |
| Reco           Refe           1.           2.           3.           4.           5.              | mmended Reading materi<br>rence Books, Journals, Repo<br>Paul Teetor.R Cookbook -<br>Alain F. Zuur, Elena N. Ie<br>978-0- 387-93836-3.<br>John Maindonald and John<br>Cambridge, 2nd edition, 20<br>Advanced R, by Hadley W<br>Using R for Introductory S   | al: Author(s), Title, Edition, Publisher, Year of Publication etc.<br>arts, Websites etc. in the IEEE format)<br>Proven Recipes for Data Analysis, Statistics, and Graphics. O'I<br>no, and Erik Meesters. A Beginner's Guide to R. Use R. Spring<br>and Braun. Data Analysis and Graphics Using R. Cambridge Univ<br>207. ISBN 978-0-521-86116-8.<br>Tickham, ISBN 9781466586963.<br>tatistics, by John Verzani, Chapman & Hall/CRC, 2004, ISBN                                | ( Text books,<br>Reilly, 2011.<br>er, 2009. ISBN:<br>ersity Press,<br>1584884509 |
| Reco           Refe           1.           2.           3.           4.           5.           6. | <ul> <li>mmended Reading materi<br/>rence Books, Journals, Report<br/>Paul Teetor.R Cookbook -<br/>Alain F. Zuur, Elena N. Ie<br/>978-0- 387-93836-3.</li> <li>John Maindonald and John<br/>Cambridge, 2nd edition, 20<br/>Advanced R, by Hadley W</li> <li>Using R for Introductory S</li> <li>R Programming for Data S</li> </ul> | al: Author(s), Title, Edition, Publisher, Year of Publication etc.<br>arts, Websites etc. in the IEEE format)<br>Proven Recipes for Data Analysis, Statistics, and Graphics. O'I<br>no, and Erik Meesters. A Beginner's Guide to R. Use R. Spring<br>and Braun. Data Analysis and Graphics Using R. Cambridge Univ<br>207. ISBN 978-0-521-86116-8.<br>Tickham, ISBN 9781466586963.<br>tatistics, by John Verzani, Chapman & Hall/CRC, 2004, ISBN 2<br>cience, by Roger D. Peng, | ( Text books,<br>Reilly, 2011.<br>er, 2009. ISBN:<br>ersity Press,<br>1584884509 |

# **Detailed Syllabus**

| Subject Code | 18B16CS311                    | Semester: Even<br>(specify Odd/Even) | Semester VI Session 2018-2019<br>Month from January'19 to June'19 |  |  |
|--------------|-------------------------------|--------------------------------------|---|--|--|
| Subject Name | Internet Of Things (Workshop) |                                      |   |  |  |
| Credits      | 0-0-4                         | <b>Contact Hours</b>                 | 4   |  |  |

| Faculty | Coordinator(s)                 | Dr K. Rajalakshmi   |
|---------|--------------------------------|---|
| (Names) | Teacher(s)<br>(Alphabetically) | Dr K. Rajalakshmi<br>Dr. Prakash Kumar<br>Ms. Purtee Kholi<br>Mr. Vivek Kumar Singh |

| COURSE OUT | COGNITIVE LEVELS   |                      |
|------------|--|----------------------|
| C305-10.1  | Define exiting IoT frameworks and techniques used for developing applications  | Remember (level 1)   |
| C305-10.2  | Explain the uses of IoT edge devices & basic concept of Node-<br>RED platform.   | Understand (level 2) |
| C305-10.3  | Develop Java Script based IoT applications using functional nodes, flows and dashboard on Node-RED platform                      | Apply (level 3)      |
| C305-10.4  | Evaluate the data gathered using Node-RED functionalities and choose appropriate graphical user interface to output the results. | Evaluate (level 5)   |
| C305-10.5  | Analyze various communication protocols, network connectivity, and cloud services using Node-RED platform.                       | Analyze (level 4)    |

| Module<br>No. | Subtitle of the Module  | Topics in the module  | CO    |
|---------------|---|---|-------|
| 1.            | Java scripts for inbuilt<br>functional nodes and deploy it<br>in Node Red flows, types of | Setup and Install Node.js and Node-RED as IDE platform for IoT application development.                       | C1    |
| 2.            | Message   | I/O nodes, flows, third party palettes,<br>import/export of flows in Node-RED                                 | C1,C2 |
| 3.            | User defined functional nodes into Node-RED flows and                                     | Java scripts for user defined functional nodes and deploy it in Node-Red flows.                               | C2,C3 |
| 4.            | FRED cloud and using various dashboard UI interfaces                                      | User defined functional nodes into Node-RED flows and FRED cloud.   | C2,C3 |
| 5.            |   | UI modules for peripheral sensors and devices that<br>can be controlled through smart phones and web<br>pages | C2,C3 |
| 6.            | MQTT brokers for publishing<br>and subscribing between IoT<br>sensors and devices.        | MQTT brokers for publishing and subscribing between IoT sensors and devices.                                  | C4,C5 |
| 7.            | Using websocket for HTTP,<br>TCP and UDP traffic flow in                                  | HTTP, TCP and UDP traffic flow for IoT applications.  | C4,C5 |
| 8.            | IoT applications.   | Using WebSocket through internet and cloud platforms.   | C4,C5 |
|               | Total nur   | nber of Lab hours   | 56    |

| <b>Evaluation Criteria</b> |  |
|----------------------------|--|
| Components                 | Maximum Marks                              |
| Mid Term Evaluation        | 30   |
| D2D Evaluation             | 30 (Lab Evaluation (20) + Attendance (10)) |
| Final Evaluation           | 40   |
|                            |  |
| Total                      | 100  |

| Reco<br>Refe | <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.           | "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press)  |  |  |  |  |  |  |
| 2.           | "Getting Started with the Internet of Things: Connecting Sensors and Microcontrollers to the Cloud" Cuno<br>Pfister  |  |  |  |  |  |  |
| 3.           | The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press)  |  |  |  |  |  |  |
| 4.           | https://www.raspberrypi.org/documentation/   |  |  |  |  |  |  |
| 2.           | https://www.arduino.cc/en/Tutorial/HomePage  |  |  |  |  |  |  |
| 3.           | https://nodered.org/docs/hardware/raspberrypi  |  |  |  |  |  |  |
| 4.           | https://nodered.org/docs/getting-started/installation  |  |  |  |  |  |  |
| 5.           | https://docs.oasis-open.org/mqtt/mqtt/v5.0/mqtt-v5.0.html  |  |  |  |  |  |  |
| 6.           | https://mosquitto.org/   |  |  |  |  |  |  |

| Course Code         |  | 19B16CS312                          | r<br>r  | Semester Even  |  | Semeste    | r VI                   | Session 2              | 2018 -2019                           |  |
|---------------------|--|-------------------------------------|---|--|--|------------|------------------------|------------------------|--------------------------------------|--|
|                     |  |                                     |   | (specify Odd/Even) Month from J  |  | Jan-Jun    |                        |                        |                                      |  |
| Course Name         |  | Data Analytic                       | Data Analytics Workshop   |  |  |            |                        |                        |                                      |  |
| Credits             |  |                                     | 0   |  | Contact I  | Iours      |                        | 1-0-2 (3 hrs           | s per week)                          |  |
| Faculty (N          | ames)  | Coordinato                          | r(s)  | Dr. Adwitiya S   | inha   |            |                        |                        |                                      |  |
|                     |  | Teacher(s)<br>(Alphabetica          | ally)   | Dr. Adwitiya S   | inha, Meg  | ha Rathi   |                        |                        |                                      |  |
| COURSE              | OUTCO  | OMES                                |   |  |  |            |                        | COGNIT                 | IVE LEVELS                           |  |
| C305-11.1           | Der<br>ana   | monstrate basic<br>lytical tools &  | c & adva<br>IDEs  | ance facets of app   | plication-ba   | ased data  |                        | Understan<br>(Level 2) | nd Level                             |  |
| C305-11.2           | Ap   | ply large scale                     | data spa  | nning over com   | olex structu   | res        |                        | Apply Lev<br>(Level 3) | vel                                  |  |
| C305-11.3           | An<br>clu  | alyze benchma<br>stering and clas   | rk methossification   | ods for pre-proce  | essing, inde   | xing,      |                        | Analyze I<br>(Level 4) | Level                                |  |
| C305-11.4           | Eva<br>spe   | aluate performa<br>cific target dor | ance of innovated algorithms for application-<br>mains (Level   |  |  |            |                        | Evaluation (Level 5)   | luation Level<br>vel 5)              |  |
| C305-11.5           | Des  | sign methods to                     | to yield required information from real-world data (Level   |  |  |            |                        | Create Le<br>(Level 6) | Level                                |  |
| C305-11.6           | Cor<br>dat   | nstruct low-cor<br>asets            | mplexity computation framework for massive Create Le<br>(Level 6)   |  |  |            | Create Le<br>(Level 6) | vel                    |                                      |  |
| Module<br>No.       | Title o<br>Modu  | of the<br>le                        | Topics  | s in the Module  |  |            |                        |                        | No. of<br>Lectures for<br>the module |  |
| 1.                  | Introd<br>Data   | uction to                           | Overvi<br>Visual  | iew to Data & An ization   | nalysis, Ne  | eds for Ar | alytic                 | s, Data                | 1+0                                  |  |
| 2. Analytical Tools |  |                                     | Matlab, Gephi, Netlogo, Python, R, Python, Libraries & 1-<br>Packages like – plotly, Matplotlib, Numpy, Pandas,<br>Seaborn, Scikit-Learn, Scipy, BeautifulSoup, Bokeh, Urllib,<br>PandaSQL, Basemap |  |  |            |                        | 1+6                    |                                      |  |
| 3.                  | Data C<br>Extrac   | Collection & tion                   | Data Crawling, Data Scrapping, Real-time Data Extraction,<br>Streaming Data, Authenticated Data Repositories  |  |  |            | xtraction,             | 1+4                    |                                      |  |
| 4.                  | Data Management         Data Mining & Management, Data Cleaning, Data Pre-<br>processing, Spatial Data Representation, Demographic<br>Analysis |                                     |   |  |  | 1+4        |                        |                        |                                      |  |
| 5.                  | Descri<br>Inferen  | ptive &<br>ntial Statistics         | Descri<br>Distrib<br>Distrib<br>Confid  | ptive Statistics -<br>pution & Dispers<br>pution, Inferentia<br>lence Intervals, F | stics - Central Tendency & Data,<br>ispersion, Random Variables, Probability<br>rential Statistics – Error Analysis,<br>vals, Regression, Logistic |            |                        | 3+4                    |                                      |  |
| 6                   |  |                                     | Rando   | m Graphs, Bollo  | bás Config   | uration M  | odel, I                | solation               | 3+4                                  |  |

Probability, Giant Component, Strategic Networks, Game

2+2

Theory, Big Data Analytics, Social Networks, Web

Linear Discriminant Analysis, Quadratic Discriminant

Analysis, Classification Trees, Support Vector Machines,

Analytics, Google Analytics

Random Forest

6.

7.

**Graph Analytics** 

Supervised

Learning

| 8.         | Unsupervised<br>Learning | 1+2  |    |  |  |
|------------|--------------------------|--|----|--|--|
| 9.         | Deep Learning            | Neural Networks, Feed Forward Neural Networks, Fuzzy<br>Logic, Recurrent Neural Nets, Convolutional Neural Nets,<br>Deep Neural Networks |    |  |  |
|            |                          | Total number of Lectures   | 42 |  |  |
| Evaluation | n Criteria               |  |    |  |  |
| Componen   | nts                      | Maximum Marks  |    |  |  |
| Lab Test1  |                          | 30   |    |  |  |
| End Semes  | ter Examination          | 40   |    |  |  |
| ТА         |                          | 30 (Quiz + Evaluative Assignment + Class Test + Attendance   | 2) |  |  |
| Total      |                          | 100  |    |  |  |

Г

| Reco<br>Refe | <b>ommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence Books, Journals, Reports, Websites etc. in the IEEE format) |
|--------------|---|
| 1.           | Data Analytics by Anil Maheshwar, McGraw Hill Education, 2017   |
| 2.           | Data Smart: Using Data Science to Transform Information into Insight, by J. W. Foreman, Wiley 2013  |
| 3.           | The Elements of Statistical Learning by Hastie, Trevor, Tibshirani, Robert, Friedman, Jerome, Springer, 2009  |
| 4.           | Introduction to Statistical Learning by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Springer, 2017  |
| 5.           | Data Mining: Practical Machine Learning Tools and Techniques by Ian H. Witten, Eibe Frank, Mark A. Hall, The Morgan Kaufmann Series, Elsevier, 2011                             |
| 6.           | Designing Data-Intensive Applications by Martin Kleppmann, O'Reilly, 2017   |
| 7.           | Big Data at Work: Dispelling the Myths, Uncovering the Opportunities by Thomas H. Davenport, Harvard Business School Publishing Corporation, 2014                               |
| 8.           | Machine Learning by Tom Mitchell, McGraw Hill Education, 2017   |
| 9.           | Advanced Analytics with Spark: Patterns for Learning from Data at Scale by Sandy Ryza, Uri Laserson, Sean Owen, Josh Wills, O'Reilly, 2017                                      |
| 10.          | Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, by B. Baesens, Wiley, 2014   |
| 11.          | Business UnIntelligence: Insight and Innovation Beyond Analytics and Big Data, by B. Devlin, Technics Publications, 2013  |

| Course Code  |  | 19B16CS313   | Semester : Even   |                                      | <b>Semester</b> 6 <sup>th</sup> <b>Session</b> 2018 -2019<br><b>Month from Jan 19 to May 19</b> |                          | <b>Session</b> 2018 -2019<br>(an 19 to May 19 |
|--------------|--|--|---|--------------------------------------|---|--------------------------|---|
| Course Name  | •  | Spatial Data Mining  | 5   |                                      |   |                          |   |
| Credits      |  | 0  | Contact Hours 1-(   |                                      | 1-0-2   | 2 (3 hrs per week)       |   |
| Faculty (Nam | ies)   | Coordinator(s)   | Mahendra Kur  | nar Gurve                            |   |                          |   |
|              |  | Teacher(s)<br>(Alphabetically)   | Ankita Wadawa   |                                      |   |                          |   |
| COURSE OU    | JTCO   | DMES   |   |                                      |   |                          | COGNITIVE LEVELS                              |
| C305-12.1    | <b>2.1</b> Illustrate spatial data mining concepts, techniques and real world applications.  |  |   | Understand Level (Level 2)           |   |                          |   |
| C305-12.2    | <ul> <li>2.2 Create maps using the basics of data capture, storage, analysis, and output procedure in open source spatial data mining (OGIS) tool. (Lev</li> </ul> |  |   |                                      | Apply Level<br>(Level 3)  |                          |   |
| C305-12.3    | Apply spatial clustering and classification algorithms to discover Apply Level (Level 3)   |  |   |                                      |   | Apply Level<br>(Level 3) |   |
| C305-12.4    | Iden<br>pree   | ntify and evaluate the b<br>dictive Modeling and s                           | the best spatial data mining technique for<br>and suitability analysis. (Level 4) |                                      |   |                          |   |
| C305-12.5    | Dev<br>real<br>best  | velop a project using sp<br>world problems like f<br>t place/site for ATM/so | oatial data minin<br>inding accident<br>chools/industries                         | g technique<br>prone area,<br>s etc. | to solve<br>recomme   | the<br>nd                | Create Level<br>(Level 6)                     |

| Module<br>No. | Title of the Module            | List of Experiments   | No. of<br>Lectures<br>for the<br>module |
|---------------|--------------------------------|---|---|
| 1.            | Course overview:               | Course overview: What Spatial Motivated Data Mining? Why<br>Is It Important? Spatial Data Mining vs Classical Data Mining<br>? Data Mining Functionalities—What Kinds of Spatial<br>Patterns Can Be Mined? Are All of the Patterns Interesting?<br>Data mining process, Types of datasets and attributes, Major<br>Issues in Spatial Data Mining.       | 06                                      |
| 2.            | Data Preprocessing :           | Data Preprocessing : Getting To know your data, Types of<br>spatial data , Raster data, Vector data, , Spatial Data<br>collection methods , Data extraction, online sources of spatial<br>data  | 03                                      |
| 3.            | QGIS,                          | Installation and Launching QGIS, introduction to QGIS GUI,<br>visualization and export spatial data into QGIS, Load raster<br>and vector layers, Create, edit, manage and export data,<br>Working with Projections, Working with Vector Data,<br>Working with Raster Data, Extension of QGIS functionality<br>through plugins, Python Console for QGIS. | 10                                      |
| 4.            | Classification<br>Algorithms : | Classification Algorithms : Issues Regarding classical<br>Classification methods , Spatial Classification Algorithms like<br>spatial Decision Tree based algorithm, spatial entropy etc.  | 07                                      |
| 5.            | Clustering<br>Algorithms:      | Clustering Algorithms: Types of Data in Cluster Analysis,<br>Similarity Measures, Usability and Complexity Analysis of<br>major Clustering Methods in spatial data mining. k-means,<br>Density-based spatial clustering of applications with noise  | 08                                      |

|            |                      | (DBSCAN), Ordering points to identify the                     |    |
|------------|----------------------|---|----|
|            |                      | clustering structure (OPTICS), SATCAN, Applications of        |    |
|            |                      | clustering in spatial data mining.                            |    |
| 6          | Spatial Rule mining: | Spatial Rule mining: Usability and Complexity Analysis of     | 04 |
|            |                      | Apriori Algorithm using multiple minimum supports for         |    |
|            |                      | spatial rule mining.  |    |
| 7          | Suitability analysis | Case studies and application of spatial data mining technique | 06 |
|            |                      | to solve the real world problems like prediction of accident  |    |
|            |                      | prone area, crime hotspot analysis, recommend best place/site |    |
|            |                      | for ATM/schools/industries etc                                |    |
|            |                      |   | 42 |
| Evaluation | n Criteria           |   |    |
| Compone    | nts                  | Maximum Marks   |    |
| Lab Test1  |                      | 30  |    |
| End Semes  | ster Examination     | 40  |    |
| ТА         |                      | 30 (Quiz + Evaluative Assignment + Class Test + Attendance)   |    |
| Total      |                      | 100   |    |

| Course Code  |   | 15B19CI691  | Semester : Even Semes                               |  | Semeste                             | r: VI                     | Session 2018 - 2019  |
|--|---|---|---|--|-------------------------------------|---------------------------|--|
|  |   |   | (specify Odd/Even) Month: Jan-Ma                    |  | ay                                  |                           |  |
| Course Na  | me  | Minor Project-CSE   |   |  |                                     |                           |  |
| Credits  |   | 5   |   | Contact <b>F</b>                       | Iours                               |                           |  |
| Faculty (N   | ames)   | Coordinator(s)  | Dr. Adwitiya Sir                                    | nha, Megh                              | a Rathi, S                          | onal                      |  |
|  |   | Teacher(s)<br>(Alphabetically)  | Dr. Anuja Arora<br>Gagandeep Kau<br>Megha Rathi, Dr | , Dr. Adw<br>r, Dr. K.Ra<br>r. Potukuc | itiya Sinh<br>ajalakshm<br>hi Raghu | a, Dr.<br>i, Mał<br>Vamsi | Dhanalakshmi G, Dr.<br>Iendra Kumar Gurve,<br>I, Dr. Sangeeta Mittal |
| COURSE   | OUTCO   | OMES  |   |  |                                     |                           | COGNITIVE LEVELS   |
| C351.1   | Compa<br>meet sp  | re and Contrast all too<br>pecific need to solve co   | ls and techniques omplex problems.                  | to generat                             | e solution                          | that                      | Understand Level<br>(Level 2)  |
| C351.2   | Identif<br>with a   | y, discuss and justify the comprehensive and system is a set of the comprehensive and set of the | he technical aspec<br>stematic approach             | ets of the c                           | hosen pro                           | ject                      | Apply Level<br>(Level 3)   |
| C351.3   | Develo<br>require<br>social-  | Develop software systems that meet specified design and performance<br>equirements that contributes to global, economic, environmental and<br>cocial-context Apply Level (Level 3)  |   |  |                                     |                           | Apply Level<br>(Level 3)   |
| C351.4   | Evalua<br>strateg   | te & justify the propos<br>ies  | ed solution using                                   | appropria                              | te learning                         | 5                         | Evaluate Level<br>(Level 5)  |
| C351.5   | Design & develop integrated software models and techniques towards research initiatives |   |   |  | rds                                 | Create Level<br>(Level 6) |  |
| Evaluation   | Criteri   | a   |   |  |                                     |                           |  |
| ComponentsMaximSynopsisMid-Term evaluationFinal evaluation |   |   | <b>um Marks</b><br>10<br>40<br>50                   |  |                                     |                           |  |
| Total  |   | 1   | 00  |  |                                     |                           |  |

| Course Code     | 16B1NCI637                     | Semester Eve | en                   | Semeste<br>Month f | er VI <sup>th</sup> <b>Session</b> 2018-2019<br>from Jan-May |  |
|-----------------|--------------------------------|--------------|----------------------|--------------------|--|--|
| Course Name     | Meta-heuristic Algor           | rithms       |                      |                    |  |  |
| Credits         | 4                              |              | <b>Contact Hours</b> |                    | 3 – 1 0  |  |
| Faculty (Names) | Coordinator(s)                 | Mr. Raju Pal |                      |                    |  |  |
|                 | Teacher(s)<br>(Alphabetically) |              |                      |                    |  |  |
| P               |                                |              |                      |                    |  |  |

| COURSE O  | UTCOMES   | <b>COGNITIVE LEVELS</b> |
|-----------|---|-------------------------|
| C330-11.1 | Explain the concepts of optimization including single-objective,<br>multi-objective, exploration, exploitation, unimodal, multimodal,<br>evolutionary, and swarm based methods. | II.<br>Understanding    |
| C330-11.2 | Apply the knowledge of meta-heuristic fundamentals to solve various complex combinatorial optimization problems   | III.<br>Applying        |
| C330-11.3 | List and analyze various real world problems as an optimization<br>problem and examine various hybrid meta-heuristic algorithms to<br>solve it.                                 | IV. Analyzing           |
| C330-11.4 | Solve the designed algorithms in a python programming language.   | III.<br>Applying        |
| C330-11.5 | Examine empirical studies of the applied methods and draw sound conclusions on qualitative and quantitative aspects of these methods.   | IV. Analyzing           |

| Module<br>No. | Title of the<br>Module                                 | Topics in the Module  | No. of<br>Lectures for<br>the module |
|---------------|--|---|--------------------------------------|
| 1.            | Classification of<br>optimization<br>problems          | Basics of optimization problems: mathematical formulation, constrained and unconstrained problems optimization, various case studies.   | 3                                    |
| 2.            | A brief review of<br>conventional<br>search algorithms | Introduction to randomized search heuristics including<br>randomized local search; Local search Vs global search,<br>Iterated local search and guided local search; single<br>solutions Vs population based algorithms, Tabu Search<br>and Simulated annealing. | 4                                    |
| 3.            | Standard<br>Benchmark<br>Problems                      | Overview of standard benchmark functions with their<br>parameters, multi-modal and unimodal functions,<br>IEEE congress on Evolutionary Computation<br>(CEC) benchmark problems, CEC2005, CEC2013,<br>CEC2017, CEC2018 benchmark problems.                      | 3                                    |
| 4.            | Evolutionary<br>Algorithms (EA)                        | Basic concepts, evolutionary algorithms in discrete<br>Evolutionary and continuous domains, Genetic<br>Alogrithm (GA): selection, crossover and mutation<br>schemes, Binary GA, Real-coded GA, Constraint-handling<br>in GA.                                    | 6                                    |
| 5.            | Other Evolutionary                                     | Evolution Stategies (ES): non-recombinative,  | 7                                    |

|   |   | Algorithms             | recombinative, self-adaptive; Evolutionary Programming<br>(EP), Genetic Programming (GP), Differential Evolution<br>(DE), Biogeography-based Optimization (BBO): Main  |                 |  |  |
|---|---|------------------------|--|-----------------|--|--|
|   |   |                        | algorithm, basic components, issues and variations.  |                 |  |  |
| e   |   | Multi-objective<br>EAs | Multi-objective genetic algorithm (MOGA): Non-<br>dominated sorting, crowding distance, elitist model, NSGA-<br>II.  | 8               |  |  |
| 7   | 7. Swarm based approach   |                        | Swarm intelligence, Ant colony optimization (ACO): Main<br>algorithm, basic components, issues and variations,<br>Gravitational search optimization (GSA): Main algorithm,<br>basic components, issues and variations, Particle swarm<br>optimization (PSO): Main algorithm, basic components,<br>issues and variations. | 8               |  |  |
| 8   | 8. Applications and implementation  |                        | Various case studies and literature available of selected<br>methods covered in the module. Implementation of those<br>methods to solve real world problems in python.   | 4               |  |  |
|   |   |                        | Total number of Lectures   | 45              |  |  |
| Eval  | uation  | Criteria               |  |                 |  |  |
| Com<br>T1<br>T2<br>End<br>TA<br>Tota  | ComponentsMaximum MarksT120T220End Semester Examination35TA25 (D2D experiments in LABs)Total100                                     |                        |  |                 |  |  |
| <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.  | Nunes de Castro, Leandro, "Nature-Inspired Computing Design, Development, and Applications"<br>IGI Global, 31-May-2012 - 435 pages  |                        |  |                 |  |  |
| <ul> <li>Nelishia Pillay, Andries P. Engelbrecht, Ajith Abraham, Mathys C. du Plessis, Václav Snášel, Azah</li> <li>Kamilah Muda, "Advances in Nature and Biologically Inspired Computing", Springer, 01-Dec-2015, 452 pages</li> </ul> |   |                        |  |                 |  |  |
| 3.  | 3. Mandal, Jyotsna Kumar, "Handbook of Research on Natural Computing for Optimization Problems", IGI Global, 25-May-2016-1015 pages |                        |  |                 |  |  |
| 4.  | Xin-Sl<br>pages   | he Yang, "Nature-Ins   | pired Computation in Engineering", Springer, 19-Mar-2016 - (   | Computers - 276 |  |  |
| 5.  | pages<br>Xin-She Yang, "Nature-Inspired Optimization Algorithms", Elsevier, 17-Feb-2014 - Computers - 300                           |                        |  |                 |  |  |

| Course Code 16B1NCI64    |  |   | 5   | Semester Eve  | en  | Semeste<br>Month f  | er VI <sup>th</sup><br>from             | <b>Session</b><br>Jan - May                   | 2018 -2019                           |
|--------------------------|--|---|---|---|---|---|---|---|--------------------------------------|
| Course Name Introduction |  |   | o Cloud Computing   |   |   |   |   |   |                                      |
| Credits                  |  |   | 4   |   | Contact H   | lours   |   | 3 – 1   | 0                                    |
| Faculty (N               | ames)  | Coordinato  | r(s)  | Sudhanshu Ku  | lshrestha   |   |   |   |                                      |
|                          |  | Teacher(s)<br>(Alphabetica  | ally)   | Sudhanshu Ku  | lshrestha   |   |   |   |                                      |
| COURSE                   | OUTCO  | OMES  |   |   |   |   |   | COGNIT  | IVE LEVELS                           |
| C330-10.1                | Defin<br>techr<br>parac  | ning the basic on the basic of | concepts  | s of cloud compu<br>s, deployment m   | iting, enabli<br>odels, and s                                 | ng<br>service   |   | Ren   | I.<br>nembering                      |
| C330-10.2                | Illust<br>cente  | ration of Servi<br>er, energy mana  | ce Orier<br>agement   | nted Architecture<br>, disaster recove  | e (SOA), ele<br>ry, and virt                                  | ements of<br>ualization   | data                                    | Und   | II.<br>erstanding                    |
| C330-10.3                | Build  | l Virtual Mach  | ines (VI  | M) using IaaS pr  | ovided by A   | AWS.  |   | III.  | Applying                             |
| C330-10.4                | Categ<br>alloc<br>vario  | gorization of vi<br>ation technique<br>ous metrics.   | irtualiza<br>es and ev  | tion, tools, hype<br>valuating the per  | rvisors, reso<br>formance o                                   | ource<br>f servers  | on                                      | A   | IV.<br>nalyzing                      |
| Module<br>No.            | Title o<br>Modu  | f the<br>le   | Topics  | s in the Module   |   |   |   |   | No. of<br>Lectures for<br>the module |
| 1.                       | Overview of<br>Distributed<br>Computing  |   | Trends of computing, Introduction to distributed<br>computing, Next big thing: cloud computing. System<br>models for Distributed and Cloud Computing, Enabling<br>Technologies. <b>Demo</b> – AWS Instance provisioning |   |   | 4   |   |   |                                      |
| 2.                       | Introduction to<br>Cloud Computing ,<br>Issues and<br>ChallengesWhat's cloud computing, History of cloud<br>Properties & Characteristics, Benefits of c<br>Service models, Deployment models. Cur<br>challenges of cloud computing, Infrastruc<br>(IaaS), Platform as a Service (PaaS), Soft<br>(SaaS). Demo – AWS Instance provisioni<br>the compute and storage capacity |   |   | of cloud c<br>efits of clc<br>els. Curre<br>frastructu<br>S), Softwa<br>ovisioning  | omput<br>oud con<br>nt issu<br>re as a<br>are as a<br>g, auto | ting,<br>mputing,<br>es and<br>Service<br>a Service<br>-scaling | 6                                       |   |                                      |
| 3.                       | Cloud Architecture Traditional computing architecture, cloud computing architecture, network components, processing element Storage, - RAID, FC-SAN, and others. Energy Managor of data centers.   |   |   | ing<br>nents,<br>magement   | 6   |   |   |   |                                      |
| 4.                       | Virtualization Comput<br>Virtualization Virtuali<br>Techniques Technol<br>Hypervi  |   |   | uter Clusters and Technologies used in Clustering.<br>Ilization in Cloud Computing, Virtualization<br>ologies, Types, Virtual Machines Monitors (VMM) -<br>rvisors, Virtualization of resources and related issues. |   |   | tering.<br>(VMM) -<br>ed issues.        | 11  |                                      |
| 5.                       | Cloud<br>Manag   | Resource  | Resourcenter<br>- VM<br>in VM   | rce Allocation ta<br>level (network),<br>consolidation an<br>s. Performance 6   | resource al<br>d VM Migrevaluation n                          | oad baland<br>location a<br>ration, Sch<br>netrics for          | cing at<br>t the h<br>redulin<br>data o | t data<br>lost level<br>ng of tasks<br>center | 6                                    |

|  |  |  | hosts.   |                 |  |
|--|--|--|--|-----------------|--|
| 6. Cloud computing :<br>case studies   |  | Cloud computing :<br>case studies                    | Case Studies of different Cloud Computing platforms and<br>related tools - Amazon Web Services Elastic Cloud<br>Compute, Google Application Engine, windows Azure.,<br>KVM, Kubernetes, Docker containers, VMWare,<br>OpenStack etc. | 10              |  |
|  | Total number of Lectures   |  |  |                 |  |
| Eval                                   | uation   | n Criteria   |  |                 |  |
| Com<br>T1<br>T2<br>End 2<br>TA<br>Tota | poner<br>Semes<br>I  | nts<br>ter Examination                               | Maximum Marks<br>20<br>20<br>35<br>25 (10 Attd, 10 Assignment, 5 Class Performance)<br>100   |                 |  |
| Reco<br>Refe                           | mmen<br>rence  | n <b>ded Reading materi</b><br>Books, Journals, Repo | <b>al:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. rts, Websites etc. in the IEEE format)   | ( Text books,   |  |
| 1.                                     | K. H<br>Proce  | Iwang, Geoffrey C.                                   | Fox, Jack J. Dongarra, "Distributed and Cloud Computing f Things", Morgan Kauffman Publishers, Elsevier.   | - From Parallel |  |
| 2.                                     | Behr   | ouz Forouzan, "Data C                                | Communication and Networking, 4 <sup>th</sup> Edition", McGraw-Hill Pul  | olication       |  |
| 3.                                     | Abra<br>Publi  | han Silberschatz, Pete                               | er B Galvin, Greg Gagne, "Operating System Concepts", 9 <sup>th</sup>  | Edition, Wiley  |  |
| 4.                                     | <ul> <li>Journal articles from <ul> <li>IEEE Transactions on Cloud Computing,</li> </ul> </li> <li>IEEE Transactions on Network and Service Management <ul> <li>IEEE Transactions on Parallel and Distributed Systems</li> </ul> </li> <li>Other Journals and Conference papers on "Distributed and Cloud Computing."</li> </ul> |  |  |                 |  |
| 5.                                     | "Virt  | ualization Overview",                                | White paper, VM Ware.  |                 |  |
| 6.                                     | AWS  | S Educate Platform for                               | Educators - https://www.awseducate.com/  |                 |  |
| 7.                                     | AWS  | S Cloud Services – Clo                               | oud Service Provider - Demonstration - https://aws.amazon.com  | /               |  |
| 8.                                     | Goog   | gle Cloud Platform - C                               | Cloud Service Provider - Demonstration - https://cloud.google.cd   | om/             |  |

| Subject Code    | 16B1NCI648                             | Semester Even<br>(specify Odd/Even) |                  | Semester VI Session 2018_2019<br>Month from Jan to Jun |
|-----------------|--|-------------------------------------|------------------|--|
| Subject Name    | Information Retrieval and Semantic Web |                                     |                  |  |
| Credits         | 4                                      |                                     | Contact Hours    | 3-1-0  |
| Faculty (Names) | Coordinator(s)                         |                                     | Dr Devpriya Soni |  |
|                 | Teacher(s)<br>(Alphabetically)         |                                     | Dr Devpriya Soni |  |

| COURSE ( | DUTCOMES   | COGNI<br>LEVE            | FIVE<br>LS    |
|----------|--|--------------------------|---------------|
| C648.1   | Analyze the capabilities and limitations of information retrieval systems.   | Analyze<br>(Level 4)     | Level         |
| C648.2   | Apply techniques for design and implementation of retrieval systems for text and other media.  | Apply<br>(Level 3)       | Level         |
| C648.3   | Analyze the results of retrieval from large quantities of data by<br>using various algorithms of information retrieval and Optimization<br>of the results. | Create<br>(Level 6)      | Level         |
| C648.4   | Analyze the different retrieval metrics for retrieval evaluation.  | Analyze<br>(Level 4)     | Level         |
| C648.5   | Understand the concepts of web crawling and web retrieval and its optimization.  | Understand<br>Level (Lev | ling<br>el 2) |
| C648.6   | Apply the taxonomy and ontology concepts, Resource Description<br>Framework (RDF) and web ontology language (OWL) on semantic<br>web applications          | Apply<br>(Level 3)       | Level         |

| Module | Title of the   | Topics in the Module   | No. of Lectures |
|--------|--|--|-----------------|
| No.    | Module   |  | for the Module  |
| 1.     | Introduction to<br>Information<br>Retrieval                | Theory of information retrieval, Information<br>retrieval on data and information retrieval on the<br>web Information retrieval tools and their<br>architecture.   | 4               |
| 2.     | Boolean<br>Retrieval &<br>Index<br>Construction            | An example information retrieval problem,<br>Processing Boolean queries, The extended<br>Boolean model versus ranked retrieval, Blocked<br>sort based, single pass in Memory, Distributed<br>and dynamic Indexing. | 6               |
| 3.     | Dictionary and tolerant retrieval                          | Wild card queries, Spelling correction,<br>Phonetic correction   | 4               |
| 4.     | Scoring Term<br>weighting and<br>the vector space<br>model | Term frequency and weighting,<br>Vector space model, Variant tf-idf scoring  | 4               |
| 5.     | Link analysis  | Web as graph, PageRank   | 4               |
| 6.     | Information<br>retrieval tools                             | Web directory, Search engine, Meta search<br>engines, Web searching and search engine<br>architecture, Searching algorithms (Fish, Shark   | 6               |

|             |  |   | etc), and Page ranking algorithms.  |                     |  |  |
|-------------|--|---|---|---------------------|--|--|
| 7.          | Web (  | Crawling  | WebCrawler architecture and Web crawling (parallel, distributed and focused web crawling).  | 6                   |  |  |
| 8           | Taxor<br>Ontole  | nomy and<br>ogy   | Creating domain specific ontology, Ontology<br>life cycle<br>Semantic Web: Resource description   | 8                   |  |  |
|             |  |   | Framework (RDF), Turtle format, Storing RDF<br>in Databases/files, Language Tags and labels in<br>RDF files, RDF schema and web ontology<br>language (OWL). |                     |  |  |
|             |  |   | <b>Total Number of Lectures</b>   | 42                  |  |  |
| Evaluation  | Criteri  | ia –  |   |                     |  |  |
| Component   | ts   | Μ   | aximum Marks  |                     |  |  |
| T1          |  |   | 20  |                     |  |  |
| T2          |  |   | 20  |                     |  |  |
| End Semeste | er Exan  | nination  | 35  |                     |  |  |
| ТА          |  |   | 25  |                     |  |  |
| Total       |  | 100   |   |                     |  |  |
| Recommen    | ded Re   | eading Mat  | erial: Author(s), Title, Edition, Publisher, Year   | of Publication etc. |  |  |
| (Text books | , Refere   | ence Books,   | Journals, Reports, Websites etc. in the IEEE format   | t)                  |  |  |
| 1.          | 1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, "An introduction to Information Retrieval", 2009 Cambridge University Press UP. |   |   |                     |  |  |
| 2.          |  | Rijsbergen  | C. J., "Information Retrieval", 2 <sup>nd</sup> edition.  |                     |  |  |
| 3.          |  | Salton, G. and McGill, M.J., "Introduction to Modern Information Retrieval",<br>Computer Series. McGraw-Hill, New York, NY. |   |                     |  |  |
| 4.          |  | ACM Tran  | saction on Internet Technology.   |                     |  |  |

| Course Code     | 16B19CI602                     | Semester Eve                                | n         | Semeste<br>Month f | er VI <sup>th</sup> <b>Session</b> 2018-2019<br>from Jan-May |  |  |
|-----------------|--------------------------------|---|-----------|--------------------|--|--|--|
| Course Name     | Algorithmic Skill En           | hancement (Value Added Course)              |           |                    |  |  |  |
| Credits         | 2                              |   | Contact I | Hours              | 1-0-2  |  |  |
| Faculty (Names) | Coordinator(s)                 | Shariq Murtuza                              |           |                    |  |  |  |
|                 | Teacher(s)<br>(Alphabetically) | Anurag Goel, Himanshu Agrawal, Vartika Puri |           |                    |  |  |  |

| COURSE O  | UTCOMES  | COGNITIVE LEVELS         |
|-----------|--|--------------------------|
| C305-13.1 | Recognize, recall and select general principles with good<br>algorithm design techniques for developing efficient algorithms<br>by explaining when an algorithmic design situation calls for it. | Understanding<br>Level 2 |
| C305-13.2 | Apply mathematical preliminaries to the analysis and design<br>stages of different types of algorithms to write efficient<br>algorithms.   | Applying<br>Level 3      |
| C305-13.3 | Compare and analyze the time and space complexities of different types of algorithms and distinguish them on the basis of efficiency.  | Analyzing<br>Level 4     |
| C305-13.4 | Identify the class of solutions that can be applied to given<br>problem and solve an efficient algorithm for the problem.  | Applying<br>Level 3      |

| Module<br>No. | Title of the<br>Module  | Topics in the Module  | No. of<br>Lectures for<br>the module |
|---------------|---|---|--------------------------------------|
| 1.            | Introduction  | Introduction to problem solving approach; Asymptotic<br>Analysis: Growth of Functions and Solving Recurrences;<br>Notations- Big O, big omega, big theta, little o; Empirical<br>analysis of sorting and searching algorithms – Merge sort,<br>Quick sort, Heap sort, Radix sort, Count sort, Binary<br>search, and Median search   | 2                                    |
| 2.            | Basics of Data structures   | Array, Pointer, Structure, Linked List, Stack, Queue, Searching, Sorting  | 4                                    |
| 3.            | Trees and Graph<br>Handling   | Binary Trees, Heaps and Priority Queues   | 4                                    |
| 4.            | Divide-and-<br>Conquer<br>Algorithms, Greedy<br>Algorithms,<br>Dynamic<br>Programming | Closest Pair of Points, Strassen's Algorithm, Maximum<br>Subarray Sum, Job Sequencing Problem, Huffman Coding,<br>Dijkastra's Shortest Path Algorithm, Travelling Salesman<br>Problem, Graph Coloring, K-centers problem, Fractional<br>Knapsack Problem, Minimum number of coins required,<br>Sub-sequence, Largest Subsequence, Longest common Sub<br>Sequence, Maximum Sum in 3 D array, Longest repeating | 6                                    |

|                                    |  |   | and non-overlapping substring   |                   |  |
|------------------------------------|--|---|---|-------------------|--|
| 5.                                 |  | String Matching,<br>Prime Sieving,<br>Hashing     | Naive Pattern Searching, KMP Algorithm, Rabin-Karp<br>Algorithm, Segmented Sieve, Sieve of Eratosthenes,<br>Maximum Matching in Bipartite Graphs, | 4                 |  |
| 6.                                 |  | NoSQL Databases                                   | Introduction to NoSQL and MongoDB   | 4                 |  |
| 7.                                 |  | Web APIs  | Interacting with web services using API   | 4                 |  |
|                                    |  |   | Total number of Lectures  | 28                |  |
| Eval                               | uatior   | n Criteria  |   |                   |  |
| Com<br>Mid<br>(To b<br>End<br>Teac | ComponentsMaximum MarksMid Semester ExaminationTo be held along with T-2 Exam)30End Semester Examination40Feachers Assessment (TA)30Total100                               |   |   |                   |  |
| Reco<br>Refe                       | commended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, erence Books, Journals, Reports, Websites etc. in the IEEE format) |   |   |                   |  |
| 1.                                 | Corn   | nen, Thomas H., et al.                            | Introduction to algorithms. MIT press, 2009.  |                   |  |
| 2.                                 | Goodrich, Michael T., and Roberto Tamassia. Algorithm design: foundation, analysis and internet examples. John Wiley & Sons, 2006.   |   |   |                   |  |
| 3.                                 | Horowitz, Ellis, and Sartaj Sahni. Fundamentals of Computer Algorithm. WH Freeman & Co., 1978.   |   |   |                   |  |
| 4.                                 | Choc<br>Medi   | lorow, Kristina. Mongo<br>ia, Inc.", 2013.        | DDB: the definitive guide: powerful and scalable data storage. "  | O'Reilly          |  |
| 5.                                 | Allar<br>O'Re  | naraju, Subbu. Restful<br>illy Media, Inc.", 2010 | web services cookbook: solutions for improving scalability a  | and simplicity. " |  |

| Course Code  |   | 16B19CI699Semester Even<br>(specify Odd/Even)Semester VI<br>Month from January 2019 |                 |   | Session 2018 -2019<br>anuary 2019 |    |                            |
|--------------|---|---|-----------------|---|-----------------------------------|----|----------------------------|
| Course Name  | ¢   | Mobile Application Development Workshop (Value added course)                        |                 |   |                                   | e) |                            |
| Credits      |   | 2   |                 | Contact I   | Hours                             |    | 1-0-2                      |
| Faculty (Nam | les)  | Coordinator(s)  | Anurag Goel     |   |                                   |    |                            |
|              |   | Teacher(s)<br>(Alphabetically)  | Anurag Goel,    | Goel, Bansidhar Joshi, Rupesh Kumar Koshariya, Shailesh |                                   |    |                            |
| COURSE OU    | UTCOMES COGNITIVE LEVELS  |   |                 |   |                                   |    |                            |
| C305-15.1    | Apply java programming concepts to build mobile applicationsApply Levelusing Android.(Level 3)  |   |                 | Apply Level<br>(Level 3)                                |                                   |    |                            |
| C305-15.2    | Explain the various components and the various activity life cycleUnderstand Level (Le<br>2)  |   |                 |   | Understand Level (Level 2)        |    |                            |
| C305-15.3    | Demonstrate the use of implicit and explicit intent in android Understand Level (Lev 2)   |   |                 |   | Understand Level (Level 2)        |    |                            |
| C305-15.4    | Build mobile application which retrieves data from network and<br>saves the data in the mobile device storage.Create Level<br>(Level 6) |   |                 |   | Create Level<br>(Level 6)         |    |                            |
| C305-15.5    | Tes   | t mobile application or   | n various param | eters.  |                                   |    | Analyze Level<br>(Level 4) |

| Module<br>No. | Title of the<br>Module                    | Topics in the Module   | No. of<br>Lectures +<br>No. of Labs<br>for the<br>module |
|---------------|---|--|--|
| 1.            | Basics of Java<br>Programming             | History and Features of Java, Internals of Java – JDK, JRE,<br>and JVM, Java fundamentals - Data types, Variables,<br>Operators, Arrays, Loops, Strings, Input/Output. Object,<br>Class, Instance, Function overloading and overriding,<br>Constructor, Runtime polymorphism, static and dynamic<br>binding, Relationships between classes and objects –<br>inheritance, aggregation, and composition, Abstract class<br>and Interface, Packages. Exception Handling - Use of try<br>and catch block | 2+2  |
| 2.            | Introduction to<br>Android<br>Programming | Introduction to Android Programming, Installation of<br>Android Studio, Preparing the working environment,<br>Creating a project in Android Studio, Building "Hello<br>World" android application  | 2+2  |
| 3.            | User Interface and<br>Input Controls      | Organization of Resources in Android Studio, User<br>Interface – View Group, Layouts: Linear Layout, Relative<br>Layout, List View, Grid View. Input Controls – Buttons,<br>Checkboxes etc. Input Events, Event Listener, Toast.   | 2+2  |
| 4.            | Android App                               | Android App Components - Activities, Services, Content   | 2+2  |

|                        | Fundamentals   | Providers, Background Receivers. Intent and Activating Components. Activity LifeCycle.  |               |
|------------------------|--|---|---------------|
| 5.                     | Intent, App Icon,<br>Rotation Handling,<br>Debugging,<br>Fragments | Intent – Passing data across activities, App Icon -<br>Drawables, Rotation Handling – Saving data while rotation,<br>Android specific debugging, Fragments. | 2+2           |
| 6.                     | Saving Data  | Saving Data – Key-value pair, SQLite Database, File storage   | 2+2           |
| 7.                     | System<br>Permissions,<br>Networking,<br>Sensors                   | System Permissions, Networking: Connecting app to network, Location and Sensors   | 2+2           |
|                        |  | Total number of Lectures  | 14+14         |
| Evaluation             | n Criteria   |   |               |
| Componer<br>Mid Seman  | its<br>ter Examination   | Maximum Marks   |               |
| End Semes              | ter Examination  | 40  |               |
| TA                     |  | 30  |               |
| Total                  |  | 100   |               |
| Recomment<br>Reference | nded Reading materia<br>Books, Journals, Repor                     | <b>hl:</b> Author(s), Title, Edition, Publisher, Year of Publication etc.<br>rts, Websites etc. in the IEEE format)   | ( Text books, |

**2.** Android Programming – Pushing the limits by Hellman

| Course Co   | de  | 18B19CS391   |   | Semester Eve   | en  | Semeste<br>Month f   | ster VI <sup>th</sup> Session 2018-2019<br>h from Jan - May  |  |   |
|---|---|--|---|--|---|--|--|--|---|
| Course Nat  | me  | Core Java (V   | alue Ad   | ded Course)  |   |  |  |  |   |
| Credits   |   |  | 2   |  | Contact I   | Hours  |  | 10   | )2  |
| Faculty (Na   | ames)   | Coordinato   | r(s)  | Sudhanshu Ku   | lshrestha   |  |  |  |   |
|   |   | Teacher(s)<br>(Alphabetically)Gaurav Kumar Nigam, Raju Pal   |   |  |   |  |  |  |   |
| COURSE (  | OUTCO   | OMES   |   |  |   |  |  | COGNIT   | IVE LEVELS  |
| C305-14.1   | Defir   | ne the structure   | and mo  | del of the Java p  | programmin  | g languag  | ge.  | C1. Reme   | mbering   |
| C305-14.2   | Demo<br>progr   | onstrate the b<br>ramming exam   | oasic OO<br>ples.   | OP principles a  | and String  | methods  | with   | C2. Under  | rstanding   |
| C305-14.3   | Class<br>the e  | sify the various xception in two   | s types o<br>o differe  | of exception, and<br>nt ways – throw-  | d implication<br>-throws and  | ons of han<br>l try-catch  | dling<br>1.  | C4. Analy  | zing  |
| C305-14.4   | Evalu<br>desig<br>and H                                       | ate the given<br>n – interfaces,<br>HAS A (aggreg  | n requir<br>classes,<br>gation).  | ements and dee, and relationship   | cide the spin ps – IS A (   | uitable sy<br>generaliza   | /stem<br>ation)  | C5. Evalu  | ating   |
| C305-14.5   | Build<br>conce<br>Exce  | ild modular application connected to relational database using<br>ncepts like – JDBC, Design Patterns, Collection Framework, C3. Applying<br>ception Handling and File Handling. |   |  |   |  | ving   |  |   |
|   |   | <u> </u>   | /   | U  |   |  |  |  |   |
| Module<br>No.   | Title o<br>Modu   | of the<br>le   | Topics  | s in the Module  |   |  |  |  | No. of<br>Lectures for<br>the module  |
| Module<br>No.<br>1.                                       | Title o<br>Modul<br>Bas                                       | of the<br>le<br>ics of Java  | Topics<br>History<br>Java –<br>data ty  | y and Features<br>JDK, JRE, and<br>pes, Unicode cha  | of Java, N<br>JVM, JVN<br>aracter set.  | eed of Ja<br>A in detai  | iva, In<br>il, Vari  | ternals of<br>ables and  | No. of<br>Lectures for<br>the module<br>2                                     |
| Module<br>No.<br>1.<br>2.                                 | Title o<br>Modu<br>Bas<br>Obje<br>pro                         | of the<br>le<br>ics of Java<br>ect oriented<br>gramming<br>oncepts   | Topics<br>History<br>Java –<br>data ty<br>Object<br>overric<br>dynam<br>– inher<br>and Int<br>Static,   | y and Features<br>JDK, JRE, and<br>pes, Unicode cha<br>, Class, Insta<br>ling, Constructo<br>ic binding, Rela<br>ritance, aggregat<br>terface, Packages<br>this, final, strict   | of Java, N<br>JVM, JVM<br>aracter set.<br>ance, Fun<br>r, Runtime<br>tionships be<br>tion, and co<br>s<br>fp, and supe  | eed of Ja<br>A in detain<br>of the detain<br>polymorp<br>etween cla<br>polymosition<br>er keywar                                       | iva, In<br>il, Vari<br>verloac<br>ohism,<br>asses a<br>n, Abs<br>ds  | ternals of<br>tables and<br>ling and<br>static and<br>nd objects<br>tract class  | No. of<br>Lectures for<br>the module<br>2<br>6                                |
| Module<br>No.<br>1.<br>2.<br>3.                           | Title o<br>Modu<br>Bas<br>Obje<br>pro<br>c                    | of the<br>le<br>ics of Java<br>ect oriented<br>gramming<br>concepts  | Topics<br>History<br>Java –<br>data ty<br>Object<br>overric<br>dynam<br>– inher<br>and Int<br>Static,<br>Creatir<br>Use o<br>class, U         | y and Features<br>JDK, JRE, and<br>pes, Unicode cha<br>, Class, Insta<br>ling, Constructo<br>ic binding, Rela<br>ritance, aggregat<br>terface, Packages<br>this, final, stricts<br>ng strings, immu<br>f StringBuffer,<br>Use of toString n  | of Java, N<br>JVM, JVM<br>aracter set.<br>ance, Fun<br>r, Runtime<br>tionships be<br>tion, and co<br>s<br>fp, and supe<br>table string<br>StringToke<br>nethod  | eed of Ja<br>A in detain<br>opolymorp<br>etween cla<br>omposition<br>er keyward<br>s, method<br>enizer, an                             | iva, In<br>il, Vari<br>verloac<br>ohism,<br>asses a<br>n, Abs<br>ds<br>ds<br>ds<br>ds                            | ternals of<br>jables and<br>ling and<br>static and<br>nd objects<br>tract class<br>ring class,<br>ngBuilder                            | No. of<br>Lectures for<br>the module<br>2<br>6<br>4                           |
| Module<br>No.         1.         2.         3.         4. | Title o<br>Modu<br>Bas<br>Obje<br>pro<br>c<br>Strin<br>Except | of the<br>le<br>ics of Java<br>ect oriented<br>gramming<br>concepts<br>ig Handling   | Topics<br>History<br>Java –<br>data ty<br>Object<br>overric<br>dynam<br>– inher<br>and Int<br>Static,<br>Creatir<br>Use of<br>statem<br>keywo | y and Features<br>JDK, JRE, and<br>pes, Unicode cha<br>, Class, Insta<br>ling, Constructo<br>ic binding, Rela<br>ritance, aggregat<br>terface, Packages<br>this, final, stricts<br>ng strings, immu<br>f StringBuffer,<br>Use of toString n<br>try and catch bla<br>ents and finally | of Java, N<br>JVM, JVM<br>aracter set.<br>ance, Fun<br>r, Runtime<br>tionships be<br>tion, and co<br>s<br>fp, and supe<br>ttable string<br>StringToke<br>nethod<br>ock, Multip<br>y block, U<br>om exceptio | eed of Ja<br>A in detain<br>opolymorp<br>etween cla<br>omposition<br>er keyward<br>s, method<br>enizer, an<br>ole catch b<br>se of thr | iva, In<br>il, Vari<br>verloac<br>ohism,<br>asses a:<br>n, Abs<br>ds<br>ls of st<br>id Stri<br>ilocks,<br>row ar | ternals of<br>jables and<br>ling and<br>static and<br>nd objects<br>tract class<br>ring class,<br>ngBuilder<br>nested try<br>nd throws | No. of         Lectures for         1         2         6         4         4 |

|  | File Handling  | Compressing and uncompressing the Files, Taking input<br>form keybaord by Console, Scanner, and<br>InputStreamReader                  |          |  |  |  |
|--|--|---|----------|--|--|--|
| 6.   | Collection<br>Framework  | List (ArrayList, LinkedList), Queue (PriorityQuee,<br>DeQueue), Sets (HashSet, HashTable), Maps (HasMap), -<br>Classes and Interfaces | 2-4      |  |  |  |
| 7.   | Design Patterns and<br>JDBC (Java<br>Database<br>Connectivity)   | Class diagrams, Creational, Structural, Behavioral,<br>Connecting Java with Database tutorial   | 2-4      |  |  |  |
|  |  | Total number of Lectures  | 24-28    |  |  |  |
| Eval<br>Com<br>Mid<br>(To t<br>End<br>Teac | uation Criteria<br>ponents<br>Semester Examination<br>be held along with T-2 Exam<br>Semester Examination<br>hers Assessment (TA)<br>Total                                       | Maximum Marks ) 30 40 30 100  |          |  |  |  |
| Reco<br>Refe                               | <b>ommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, erence Books, Journals, Reports, Websites etc. in the IEEE format) |   |          |  |  |  |
| 1.   | Horstmann CS, Cornell G.   | Core Java 2: Volume I, Fundamentals. Pearson Education; 2002  | 2 Aug 1. |  |  |  |
| 2.   | Schildt, Herbert. Java 2: the complete reference. McGraw-Hill Professional, 2000.  |   |          |  |  |  |
| 3.   | 3. Nanyang Technical University - Java Programming Tutorial -<br>http://www.ntu.edu.sg/home/ehchua/programming/java/j2a_basicsexercises.html                                     |   |          |  |  |  |
|  | nup://www.nuu.edu.sg/nom   | e/enchua/programming/java/j2a_basicsexercises.num   |          |  |  |  |

| Course Code | 19B16CS315                              | Semester : EVEN<br>(specify Odd/Even) |                  | Semeste<br>Month | r VIth<br>rom Ja | Session 2018-2019<br>an-May |
|-------------|---|---------------------------------------|------------------|------------------|------------------|-----------------------------|
| Course Name | Advanced UNIX and System Administration |                                       |                  |                  |                  |                             |
| Credits     | Audit                                   |                                       | Contact <b>H</b> | Iours            |                  | 01-0-02                     |

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

| COURSE O  | UTCOMES  | COGNITIVE LEVELS  |
|-----------|--|-------------------|
| C305-16.1 | Explain and Demonstrate UNIX Utilities for system resource management.   | Understanding(02) |
| C305-16.2 | Experiment with different constructs of Perl language and develop programs Using Perl                          | Apply(03)         |
| C305-16.3 | Using advanced UNIX utilities and shell programming to solve real time computing problems                      | Evaluate (05)     |
| C305-16.4 | Analyze potential security threats using system calls and administration tools for real time attacks problems. | Analyzing(04)     |

| Module<br>No. | Title of the<br>Module                         | Topics in the Module  | No. of<br>Lectures for<br>the<br>module(L+P) |
|---------------|--|---|--|
| 1.            | AN OVERVIEW<br>OF PERL                         | File handles, Operators, Control Structures, Regular Expressions, List Processing   | (01+04)                                      |
| 2.            | SYNTAX AND<br>SYMANTICS OF<br>PERL             | Built-in Data Types, Terms, Pattern Matching, Operators,<br>Statements and Declarations, Subroutines, Formats<br>Special Variables                    | (01+04)                                      |
| 3.            |  | Perl Functions by Category  |  |
|               | PERL<br>FUNCTIONS                              | Perl Functions in Alphabetical Order  | (02+04)                                      |
| 4.            | REFERENCES<br>AND NESTED<br>DATA<br>STRUCTURES | What Is a Reference, Creating Hard References, Using<br>Hard References<br>Symbolic References, Braces, Brackets, and Quoting                         | (02+04)                                      |
| 5.            | UNIX FILE I/O                                  | Opening Files,<br>. The open() System Call, Owners of New Files,<br>Permissions of New Files, The creat() F unction, Return<br>Values and Error Codes | (03+06)                                      |

|             |                                     | Reading via read, Return Values, Reading All the Bytes  |       |  |
|-------------|-------------------------------------|---|-------|--|
|             |                                     | Nonblocking Reads, Other Error Values Size Limits on read()   |       |  |
|             |                                     | Writing with write(), Partial Writes, Append Mode   |       |  |
|             |                                     | Nonblocking Writes, Other Error Codes . Size Limits on write() Behavior of write() Synchronized I/O . fsync() and fdatasync() Direct I/O, Closing Files |       |  |
| 6.          | MAPPING FILES<br>INTO MEMORY        | Protection Flags, Architectures, and Security,<br>Synchronized, Synchronous, and Asynchronous Operations  | 02+02 |  |
| 7.          | FILE AND<br>DIRECTORY<br>MANAGEMENT | Files and Their Metadata, Directories. Links, Device Nodes,   | 02    |  |
|             | INTER PROCESS<br>COMMUNICATI<br>ON  | Interprocess communication, Networked processes, sockets, Asynchronous I/O  | 02+04 |  |
|             |                                     | Total number of Lectures  | 43    |  |
| Evaluation  | n Criteria                          |   |       |  |
| Componer    | nts                                 | Maximum Marks   |       |  |
| T1          |                                     | 20  |       |  |
| 12          |                                     | 20  |       |  |
| End Semes   | ter Examination                     | 35  |       |  |
| IA<br>Tetel |                                     | 25 (Quiz 02, Lab Day-to-Day evaluations)  |       |  |
| Total       |                                     | 100   |       |  |

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

| 1. | Advanced Programming in the UNIX Environment, by Richard Stevens. Addison Wesley Press.                                   |
|----|---|
| 2. | UNIX SYSTEMS Programming: Communication, Concurrency and Threads by Kay A. Robbins and Steven Robbins, Prentice Hall      |
| 3. | Jorba Esteve, J. & Suppi Boldrito, R. (2009). GNU/Linux advanced administration (2nd ed.). Barcelona, Spain: Eureca Media |
| 4. | Randal L. Schwartz, Tom Phoenix, brian d foyLearning Perl, 5th Edition, O'Reilly Media                                    |

| Course Code 18B11CS212                   |              |   | Semester : EVENSemester VIth(specify Odd/Even)Month from Jay  |  |  | h Session<br>Jan-May                  | 2018 -2019                   |                                     |                                      |  |
|--|--------------|---|---|--|--|---------------------------------------|------------------------------|-------------------------------------|--------------------------------------|--|
| Course Name Computers a                  |              | and Sec   | urity   |  |  |                                       |                              |                                     |                                      |  |
| Credits                                  |              |   | 04  |  | Contact H  | Hours                                 |                              | 3L+1                                | 3L+1T=04                             |  |
| Faculty (N                               | ames)        | Coordinato  | r(s)  | Dr. Charu  |  |                                       |                              |                                     |                                      |  |
| Teacher(s)<br>(Alphabetica               |              | ully)   |   |  |  |                                       |                              |                                     |                                      |  |
| COURSE                                   | OUTO         | COMES   |   |  |  |                                       |                              | COGNIT                              | IVE LEVELS                           |  |
| C330-17.1                                |              | List common sys<br>goals and princip  | stem vul<br>oles  | nerabilities, atta   | cks and def                                      | ine securi                            | ty                           | Remembe                             | r (01)                               |  |
| C330-17.2                                |              | Understand secu<br>network attacks;<br>network protoco                                      | rity goa<br>and cla<br>ls   | ls & principles; s<br>ssify OS security  | system vuln<br>v mechanisr                       | nerabilities<br>ms and                | s &                          | Understan                           | d (02)                               |  |
| C330-17.3                                |              | Apply security a in IT environment  | nd priva<br>nts.  | cy principles to   | solve secur                                      | ity proble                            | ems                          | Apply(03)                           |                                      |  |
| C330-17.4                                |              | Analyze the over<br>as networking d   | rarching<br>atabases  | rching importance of IT security in areas such<br>tabases operating systems, and web systems   |  |                                       | Analyze(04)                  |                                     |                                      |  |
| C330-17.5 Evaluate perform<br>principles |              | nance of various security mechanisms work, and<br>arity mechanisms with respect to security |   |  | Evaluate(05)                                     |                                       |                              |                                     |                                      |  |
| Module<br>No.                            | Title<br>Mod | of the<br>ule   | Topics  | in the Module  |  |                                       |                              |                                     | No. of<br>Lectures for<br>the module |  |
| 1.                                       | INT          | RODUCTION   | What Does a Secure Mean?, Attacks, The Meaning of<br>Computer Security, Computer Criminals, Methods of<br>Defense                                     |  |  |                                       | 03                           |                                     |                                      |  |
| 2. PROGRAM<br>SECURITY                   |              | OGRAM<br>URITY  | Secure Programs<br>Non malicious Program Errors,<br>Viruses and Other Malicious Code,<br>Targeted Malicious Code, Controls Against Program<br>Threats |  |  | 05                                    |                              |                                     |                                      |  |
| 3. WEB SECURITY                          |              |   | The W<br>Types<br>How I<br>Auther<br>Mislea<br>Protect<br>or Wel<br>Proble<br>Fake<br>(Inaccu<br>Agains   | Web—User Side, Browser Attacks Browser Attack<br>Web—User Side, Browser Attacks Browser Attack<br>Web Web Web Succeed: Failed Identification and<br>hentication Web Attacks Targeting Users False or<br>sleading Content Malicious Web Content<br>tecting Against Malicious Web Pages, Obtaining User<br>Website Data Code Within Data Website Data: A User's<br>blem, Too Foiling Data Attacks Email Attacks<br>we Email Fake Email Messages as Spam Fake<br>accurate) Email Header Data Phishing Protecting<br>ainst Email Attacks |  |                                       | 06                           |                                     |                                      |  |
| 4. SECURITY IN<br>NETWORKS               |              |   | Threat<br>Intrusi<br>Netwo  | s in Networks, N<br>on Detection S<br>rks Security, De   | Vetwork Sec<br>Systems, S<br>nial <u>of</u> Serv | curity Con<br>Secure E<br>vice, Distr | ntrols,<br>-Mail,<br>ributed | Firewalls,<br>Wireless<br>Denial of | 10                                   |  |

|  |  | Service, Scripted Denial-of-Service Attacks Bots, Botnets,<br>Malicious Autonomous Mobile Agents, Autonomous  |              |  |  |
|--|--|---|--------------|--|--|
|  |  | Mobile Protective Agents  |              |  |  |
| 5.                                     | AUTHENTICATI<br>ON   | Authentication Basics, Passwords, Attacking a Password<br>System, Countering Password Guessing Random Selection<br>of Passwords,Pronounceable and Other Computer-<br>Generated Passwords, User Selection of Passwords<br>,Reusable Passwords and Dictionary Attacks, Guessing<br>Through Authentication Functions Password Aging<br>,Challenge-Response Pass Algorithms ,One-Time<br>Passwords Hardware-Supported and Dictionary ,Biometrics  | 06           |  |  |
| 6.                                     | PRIVACY  | Privacy Concepts, Aspects of Information Privacy<br>Computer-Related Privacy Problems, Privacy on the Web<br>Understanding the Online Environment, Payments on the<br>Web, Site and Portal Registrations, Whose Page Is This?<br>Precautions for Web Surfing, Spyware, Shopping on the<br>Internet, Email Security, Where Does Email Go, and Who<br>Can Access It?, Interception of Email, Monitoring Email<br>Anonymous, Pseudonymous, and Disappearing, Email<br>Spoofing and Spamming, Privacy Impacts of Emerging<br>Technologies, Radio Frequency Identification, Electronic<br>Voting, VoIP and Skype, Privacy in the Cloud | 06           |  |  |
| 7.                                     | EMERGING<br>TOPICS   | The Internet of Things, Medical Devices, Mobile Phones<br>Security in the Internet of Things, Electronic Voting<br>What Is Electronic Voting?, What Is a Fair Election?<br>What Are the Critical Issues?, Cyber Warfare, What Is<br>Cyber Warfare?, Possible Examples of Cyber Warfare<br>Critical Issues   | 05           |  |  |
|  |  | Total number of Lectures  | 41           |  |  |
| Eval                                   | uation Criteria  |   |              |  |  |
| Com<br>T1<br>T2<br>End S<br>TA<br>Tota | ponents<br>Semester Examination  | Maximum Marks<br>20<br>20<br>35<br>25 (Assignments, 02 nos and Quiz)<br>100   |              |  |  |
| Reco                                   | mmended Reading materia  | al Author(s) Title Edition Publisher Vear of Publication etc.   | ( Text books |  |  |
| Refe                                   | ence Books, Journals, Report   | rts, Websites etc. in the IEEE format)  | (10100083,   |  |  |
| 1.                                     | Security in Computing (5th   | edition), Pfleeger, Pfleeger and Margulies, Pearson.  |              |  |  |
| 2.                                     | Introduction to Modern Cry   | /ptography (2nd edition), Katz and Lindell, Chapman & Hall/C  | RC           |  |  |
| 3.                                     | Cryptography Theory and F  | Practice (3rd edition), Stinson, Chapman & Hall/CRC   |              |  |  |
| 4.                                     | Computer Security: Art and Science by Matt Bishop, Addison-Wesley Educational Publishers Inc |   |              |  |  |

|  | <u>Detailed Syllabus</u><br>Lecture-wise Breakup  |   |   |  |  |                                     |                               |                                     |                                      |
|--|---|---|---|--|--|-------------------------------------|-------------------------------|-------------------------------------|--------------------------------------|
| Course Co  | de  | 16B1NCI638                                |   | Semester Even<br>(specify Odd/E                                      | n<br>Even)                             | Semeste<br>Month f                  | er VI.<br>from J              | Session<br>anuary to                | 2018 -2019<br>June                   |
| Course Na  | me  | Big data and                              | Data Ar   | nalytics   |  |                                     |                               |                                     |                                      |
| Credits  |   |   | 3-1-0   |  | Contact H                              | Iours                               |                               | Z                                   | 1                                    |
| Faculty (N   | ames)   | Coordinato                                | r(s)  | Dr Shikha Meh  | ta                                     |                                     |                               |                                     |                                      |
|  |   | Teacher(s)<br>(Alphabetica                | ally)   | Dr Shikha Meh  | ta                                     |                                     |                               |                                     |                                      |
| COURSE   | OUTC  | OMES                                      |   |  |  |                                     |                               | COGNIT                              | IVE LEVELS                           |
| C330-12.1  |   | Understand a database                     | nd Coi  | mpare SQL, N   | OSQL an                                | nd NewS                             | SQL                           | Unde                                | erstand level<br>(C2)                |
| C330-12.2  |   | Identify NoSQ volumes of stru             | L /New<br>actured a   | SQL Systems to and unstructured                                      | Store and data                         | process la                          | arge                          | Ар                                  | ply Level<br>(C3)                    |
| C330-12.3  |   | Develop a sir<br>database or Ha           | nple application and connect with a NoSQL doop distributed file system. |  |  | Apply Level<br>(C3)                 |                               |                                     |                                      |
| C330-12.4 Apply machine  |   |   | e learning algorithms for data analysis.                                |  |  | Ар                                  | ply Level<br>(C3)             |                                     |                                      |
| C330-12.5 Analyze parall computation in  |   | Analyze parall computation in             | el models of evolutionary algorithms for solving Atensive problems.     |  | Ana                                    | lyze Level<br>(C4)                  |                               |                                     |                                      |
| Module<br>No.  | Title o<br>Modu   | of the<br>lle                             | Topics  | s in the Module  |  |                                     |                               |                                     | No. of<br>Lectures for<br>the module |
| 1.   | Introd<br>Datab<br>and C<br>Comp  | uction to<br>ase Systems<br>loud<br>uting | Overvi<br>to Big<br>Data a<br>data ar                                   | iew of Database<br>Data, Introduct<br>nd its importance<br>nalytics. | Manageme<br>ion – distr<br>e, Four Vs, | nt Syster<br>ibuted fi<br>Drivers f | ns , In<br>le syst<br>for Big | troduction<br>em – Big<br>data, Big | 2                                    |
| 2  | Trade-offs in CloudDifferences between conventional (relational) databases and<br>cloud databases ACID database properties, CAP<br>Conjecture, and BASE properties of cloud databases |   |   | 2  |  |                                     |                               |                                     |                                      |
| 3.   | NoSQ  | L Databases                               | Cloud<br>model,   | Data Models: Ke<br>, Column Family                                   | ey-Value da<br>data mode               | ata model<br>I. Graph I             | , Docu<br>Data M              | ment data<br>lodel                  | 2                                    |
| 4. Cassandra<br>Architecture and<br>Cassandra Data<br>Model Internode Communication ,Data Distribution and<br>Replication ,Partitioning , Snitches ,Basic features of<br>Cassandra CDBMS, Formal definition of Cassandra column<br>family data model, Cassandra CQL query language and<br>CQL data model: Key space, Table definition, Column, and<br>Data Types |   |   | ion and<br>atures of<br>ra column<br>guage and<br>lumn, and             | 4  |  |                                     |                               |                                     |                                      |
| 5.   | Cassar<br>Consi   | ndra<br>stency Levels                     | Config<br>Reque   | guring Data Co<br>sts  | onsistency                             | -Write                              | Reque                         | sts, Read                           | 2                                    |
| 6.   | Cassa<br>Mecha<br>Transa  | ndra Repair<br>anisms ,<br>action         | Hinted<br>Transa<br>Transa  | Handoff Write<br>Actions and Contections                             | ites, Anti<br>ncurrency                | -entropy<br>Control,                | Node<br>Ligh                  | e Repair,<br>t Weight               | 3                                    |

|  | Processing   |  |                                       |
|--|--|--|---------------------------------------|
| 7. Cassandra CQL<br>Queries            |  | The Syntax of the SELECT Statement Simple SELECT<br>expressions ,Filtering Data using WHERE Clause ,Using<br>Indexes ,Filtering Collections , Querying Tables with<br>Columns of the counter Type<br>Keyspace Design Heuristics  | 3                                     |
| 8.                                     | SQL based Cloud<br>Databases                               | SQL compliancy, Transaction Control, Elasticity & Scalability. Case Study: nuoDB/ DB as a service  | 8                                     |
| 9. Hadoop Framework                    |  | <ul> <li>Apache Hadoop &amp; Hadoop EcoSystem – Moving Data in<br/>and out of Hadoop, Understanding inputs and outputs of<br/>MapReduce, Data Serialization.</li> <li>Hadoop Architecture, Hadoop Storage: HDFS, Common<br/>Hadoop Shell commands , Anatomy of File Write and<br/>Read., NameNode, Secondary NameNode, and DataNode,<br/>Hadoop MapReduce paradigm, Map and Reduce tasks, Job,<br/>Task trackers - Cluster Setup – SSH &amp; Hadoop<br/>Configuration – HDFS Administering –Monitoring &amp;<br/>Maintenance.</li> </ul> | 10                                    |
| 10. Applications to Data Mining        |  | Cluster analysis, K-means algorithm, Naïve Bayes, Parallel<br>k-means using Hadoop , parallel particle swarm algorithm<br>using MapReduce, case studies on big data mining   | 6                                     |
|  |  | Total number of Lectures   | 42                                    |
| Eval                                   | uation Criteria  |  |                                       |
| Com<br>T1<br>T2<br>End S<br>TA<br>Tota | ponents<br>Semester Examination                            | Maximum Marks<br>20<br>20<br>35<br>25 ()<br>100  |                                       |
| Reco<br>Refer                          | mmended Reading materi<br>rence Books, Journals, Repo      | <b>al:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. rts, Websites etc. in the IEEE format)   | ( Text books,                         |
| 1.                                     | Dan Sulliva ,NoSQL for M                                   | ere Mortals 1st Edition., Pearson Publishers   |                                       |
| 2.                                     | Pramod J. Sadalage, Martin<br>Persistence 1st Edition, Pea | n Fowler, NoSQL Distilled: A Brief Guide to the Emerging Wo<br>arson Publishers, ISBN-13: 978-0321826626   | rld of Polyglot                       |
| 3.                                     | John D. Kelleher, Brian Data Analytics:                    | Mac Namee, Aoife D'Arcy, Fundamentals of Machine Learning<br>Algorithms, Worked Examples, and Case Studies (The MIT Pr   | for Predictive ress)                  |
| 4.                                     | John D. Kelleher, Brendan                                  | Tierney, Data Science (MIT Press Essential Knowledge series)   | · · · · · · · · · · · · · · · · · · · |

5 Xin-She Yang , Nature-Inspired Algorithms and Applied Optimization (Studies in Computational Intelligence Book 744) 1st Edition,Springer

| Subject Code | 16B1NCI647             | Semester:<br>(specify Odd/Even):<br>Even | Semester: Sixth Session: 2018-19<br>Month: from January to June |
|--------------|------------------------|--|---|
| Subject Name | Image Processing and A | Applications                             |   |
| Credits      | 4                      | <b>Contact Hours</b>                     | 3 (L)   |

| Faculty            | Coordinator(s)  | Dr. Gyan Singh<br>Yadav |
|--------------------|---|-------------------------|
| Course<br>Outcome: |   | COGNITIVE<br>LEVELS     |
| C330-14.1          | Explain general terminology of image processing systems.  |                         |
| C330-14.2          | Apply intensity transformations, enhancement, restoration, and filtering techniques on binary, grayscale, and colour images in spatial domain |                         |
| C330-14.3          | Illustrate various image transformation methods like, DFT, DCT, and DWT.  |                         |
| C330-14.4          | Apply image segmentation methods on binary, grayscale, and colour images e.g., gradient, Laplacian, Watershed transformation, LOG etc.        |                         |
| C330-14.5          | Explain Morphological Processing operations such as dilation, erosion, opening, closing, pruning, thinning, etc.                              |                         |
| C330-14.6          | Demonstrate various image processing applications viz., Face Detection,<br>Finger print recognition, Optical Character Recognition etc.       |                         |

| Module No. | Subtitle of the Module                  | Topics in the module   | No. of Lectures for the module |
|------------|---|--|--------------------------------|
| 1.         | Introduction to Image<br>Processing     | Taxonomy of digital images and applications  | 4                              |
| 2.         | Spatial domain processing               | Geometric transformations, enhancement of gray images  | 8                              |
| 3.         | Frequency domain processing             | Fourier transformation-based processing  | 4                              |
| 4.         | Image Segmentation                      | Point, Line, and edge detection, thresholding,<br>Region based segmentation                              | 6                              |
| 5.         | Color image processing                  | Color Models: RGB, CMYK, HIS etc, Color<br>image enhancement, segmentation, filtering<br>in color images | 6                              |
| 6.         | Morphological Processing                | Dilation, erosion, opening, closing, pruning, thinning, etc.   | 6                              |
| 7.         | Computer Vision<br>Algorithms and other | Face Detection, Finger print recognition,<br>Optical Character Recognition                               | 8                              |

| image applications |                          |    |
|--------------------|--------------------------|----|
|                    | Total number of Lectures | 42 |

| <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.   | Bhabatosh Chanda, Dwijesh Dutta Majumder, "Digital Image Processing and Analysis",<br>Eighth edition, PHI Learning Pvt. Ltd, New Delhi, India, 2006 |  |  |  |  |  |
| 2.   | Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", 3rd edition, Pearson Education, New Delhi, India, 2009                            |  |  |  |  |  |
| 3.   | Rafael C. Gonzalez, Richard Eugene Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", 2nd edition, Pearson Education India, 2004     |  |  |  |  |  |
| 4.   | W. K. Pratt, "Digital Image Processing", 3rd Edition, John Wiley & sons, 2006   |  |  |  |  |  |
| 5.   | Milan Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing, Analysis, and Machine Vision", 2nd Edition, Thomson Learning, 2008                      |  |  |  |  |  |

| Course Code                |               | 16B1NCI646  | 16B1NCI646   |  | emester Even Semester V<br>pecify Odd/Even) Month from |            | er VI<br>from .                      | /I <b>Session</b> 2018 -2019<br>n January to June |                          |  |
|----------------------------|---------------|---|--|--|--|------------|--------------------------------------|---|--------------------------|--|
| Course Name                |               | Wireless Net  | Wireless Networks and Security   |  |  |            |                                      |   |                          |  |
| Credits 4                  |               | 4   |  |  | Contact Hours  |            |                                      | 3-1-0 (L-T-P)                                     |                          |  |
| Faculty (N                 | ames          | ) Coordinato  | r(s)   | Himanshu Agr   | awal   |            |                                      |   |                          |  |
| Teacher(s)<br>(Alphabetica |               |   | ully)  | Himanshu Agr   | awal   |            |                                      |   |                          |  |
| COURSE                     | OUT           | COMES   |  |  |  |            |                                      | COGNIT  | IVE LEVELS               |  |
| C305-24.1                  | L<br>d        | Define vulnerabili  | ties, pri<br>wireless  | es, privacy issues and security requirements for ireless networks. |  |            | Remembering Level<br>(C1)            |   |                          |  |
| C305-24.2                  | E<br>a        | Demonstrate varion nd security challed  | ous conc<br>enges in   | epts related to se<br>upcoming wirel                               | ecured wire<br>ess network                             | less netwo | orks                                 | Understar<br>(C2)                                 | Understanding Level (C2) |  |
| C305-24.3                  | A<br>c        | apply various cry<br>onfidentiality, int  | ptograpl<br>tegrity a  | hic algorithms to<br>nd availability.                              | achieve se   | curity suc | h as                                 | Applying  | Level (C3)               |  |
| C305-24.4                  | A<br>w<br>n   | ble to analyze the security model for various applications of vireless networks such as Internet of things, wireless sensor etworks, cognitive radio networks.  |  |  |  |            | Analyzing                            | ing Level (C4)                                    |                          |  |
| Module<br>No.              | Title<br>Mod  | e of the<br>lule  | of the Topics in the Module<br>le  |  |  |            | No. of<br>Lectures for<br>the module |   |                          |  |
| 1.                         | Intro<br>Basi | oduction &<br>c Concepts  | action &Wireless and Mobile Networks, Elements of a wireless<br>network, single hop, multiple hops, infrastructure based,<br>No infrastructure (adhoc), IEEE 802.11 standard,<br>terminology, elements, services, The Wi-Fi alliance, IEEE<br>802 Protocol Architecture  |  |  |            | eless<br>based,<br>ce, IEEE          | 8   |                          |  |
| 2.                         | Wire<br>Over  | eless Security<br>rview   | ecurity Wireless Security risk factors, Network Threats, Securing<br>Wireless Transmissions, signal-hiding techniques,<br>Encryption, Mobile Device Security, Wireless LAN<br>Security, IEEE 802.11i phases of operation, WEP, WAP,<br>802.11x/EAP, Discovery phase Authentication phase, Key<br>management phase. Protected data transfer phase |  |  |            | 6                                    |   |                          |  |
| 3.                         | Cryp<br>Over  | tographyClassical Encryption Techniques, Symmetric Cipher Model,<br>Substitution Techniques, Transposition Techniques, Block<br>Ciphers and the Data Encryption Standard,   |  |  |  | 5          |                                      |   |                          |  |
| 4.                         | Cryp<br>Over  | otography<br>rview - II   | Advanced Encryption Standard, Stream Ciphers, Public-<br>Key Encryption, Message Authentication and Hash<br>Functions, Digital Signatures and Authentication Protocols   |  |  |            | 7                                    |   |                          |  |
| 5.                         | Netv          | vork Security   | IP Security, IP Security Overview, IP Security7Architecture, Authentication Header, Encapsulating<br>Security Payload, Combining Security Associations,<br>Transport-level security, MAC-level security7   |  |  |            |                                      | 7   |                          |  |
| 6.                         | Key<br>and    | .ey Management<br>nd DistributionKey Distribution Issues, Symmetric Key Distribution Using<br>Public Keys, Hybrid Key Distribution, Distribution of<br>Public Keys, Public-Key Authority, Public-Key<br>Certificates, Public Key Infrastructure |  |  |  | 6          |                                      |   |                          |  |

| 7.           | Security and<br>privacy issues in<br>modern wireless<br>networks and<br>systems                   | cellular networks, wireless LANs, wireless PANs, mobile<br>ad hoc networks, vehicular networks, satellite networks,<br>wireless mesh networks, sensor networks | 3             |  |  |
|--------------|---|--|---------------|--|--|
|              |   | Total number of Lectures   | 42            |  |  |
| Eval         | uation Criteria   |  |               |  |  |
| Components   |   | Maximum Marks  |               |  |  |
| T1<br>T2     |   | 20   |               |  |  |
| End          | Semester Examination  | 35   |               |  |  |
| TA           |   | 25   |               |  |  |
| Tota         | 1   | 100  |               |  |  |
| Reco<br>Refe | ommended Reading materi<br>rence Books, Journals, Repo  | ial: Author(s), Title, Edition, Publisher, Year of Publication etc.<br>orts, Websites etc. in the IEEE format)   | ( Text books, |  |  |
| 1.           | Cryptography and Networl  | k Security: Principles and Practice, by William Stallings  |               |  |  |
| 2.           | Wireless Communications: Principles and Practice by Rappaport                                     |  |               |  |  |
| 3.           | Wireless communications and networks, by Williant Stallings                                       |  |               |  |  |
| 4.           | Security for Wireless Sensor Networks, by Liu and Ning  |  |               |  |  |
| 5.           | Security and Cooperation in Wireless Networks, by Buttyan and Hubaux                              |  |               |  |  |
| 6.           | Real 802.11 Security_ Wi-Fi Protected Access and 802.11i, Addison-Wesley 2004, by Edney, Arbaugh: |  |               |  |  |
| 7.           | Wireless Network Security, by Vacca.  |  |               |  |  |
| 8.           | Network Security: Current   | Status and Future Directions, by Douligeris and Serpanos   |               |  |  |

| Course Code     | 16B1NHS631                     | Semester E   | ven | Semester 6 <sup>th</sup> Session 2018-2019 |  |  |
|-----------------|--------------------------------|--|-----|--|--|--|
|                 |                                | Month from January 2019 to May 2019                        |     |  |  |  |
| Course Name     | PROJECT MANAGEMENT             |  |     |  |  |  |
| Credits         | 3                              | Contact Hours 2-1-0  |     |  |  |  |
| Faculty (Names) | Coordinator(s)                 | Dr. Santoshi Sengupta (Sec-62), Dr. Deepak Verma (Sec-128) |     |  |  |  |
|                 | Teacher(s)<br>(Alphabetically) | Dr. Deepak Verma, Dr. Santosh Dev, Dr. Santoshi Sengupta   |     |  |  |  |
|                 |                                |  |     |  |  |  |

| COURSE  | OUTCOMES   | COGNITIVE LEVELS    |
|---------|--|---------------------|
| 304-5.1 | Apply the basic concepts of project management such as features, objectives, life cycle, model and management, in a given context  | Apply Level (C3)    |
| 304-5.2 | Analyze projects and their associated risks by understanding the<br>various theoretical frameworks, non-numerical and numerical models<br>in order to make correct selection decisions | Analyze Level (C4)  |
| 304-5.3 | Evaluate the various stages of project management and identify and<br>determine correct techniques for planning, scheduling, controlling and<br>terminating the projects               | Evaluate Level (C5) |
| 304-5.4 | Evaluate project management processes, tools and techniques in order<br>to achieve overall project success   | Evaluate Level (C5) |

| Module<br>No. | Title of the<br>Module                              | Topics in the Module  | No. of<br>Lectures for<br>the module |
|---------------|---|---|--------------------------------------|
| 1.            | Project<br>Management:<br>Introduction              | Characteristics of project; Life Cycle of Project; Project<br>Model; Project Management as discipline; Contemporary<br>aspects of Project Management  | 4                                    |
| 2.            | Project Selection                                   | Theoretical Models; Non-numeric models; Numeric<br>Models; Financial Models; Project Portfolio process,<br>Significance and applicability of Monte Carlo simulation   | 6                                    |
| 3.            | Project<br>Organization,<br>Manager and<br>Planning | Pure Project organization; Functional Organizations; Mixed<br>organizations; Matrix organizations; Role, Attitudes and<br>Skills of Project Manager, Project Coordination, Systems<br>Integration, Work Breakdown Structure, Linear<br>Responsibility Charts. | 4                                    |
| 4.            | Risk Management                                     | Theoretical Aspects of risk, Risk Management process,<br>Numeric Techniques, Hillier model, Sensitivity Analysis,<br>Certainty Equivalent approach and Risk adjusted discount<br>rates, Game theory.  | 4                                    |
| 5.            | Project Scheduling<br>and Resource<br>Allocation    | Theoretical aspects-Importance, Focus Area-PERT/CPM,<br>AOA and AON charts, Probability Analysis, Gantt Charts,<br>Crashing of Projects- Time and Cost tradeoff, Basics-<br>Resource Leveling and Loading.  | 6                                    |
| 6.            | Budgeting, Control<br>and Project<br>Termination    | Estimating Project Budgets, Improving the process of cost<br>estimation, Basics, Importance, Purpose of control, Types<br>of Control, Desirable features of Control, Control Systems,   | 4                                    |
|   |  | Critical Ratio Method, Control of creative activities,<br>Control of change and scope creep, Why Termination,<br>Types of termination, typical termination activities. |  |  |  |  |
|---|--|--|--|--|--|--|
| Total number of Lectures                    |  |  |  |  |  |  |
| Eval  | uation Criteria  |  |  |  |  |  |
| Com   | ponents  | Maximum Marks  |  |  |  |  |
| T1  |  | 20   |  |  |  |  |
| T2 20                                       |  |  |  |  |  |  |
| End   | Semester Examination   | 35   |  |  |  |  |
| TA 25 (Assignment, Project, Oral Questions) |  |  |  |  |  |  |
| Total 100                                   |  |  |  |  |  |  |
|   |  |  |  |  |  |  |
| Reco<br>Refe                                | <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.  | Meredith, Mantel, Project Management-A Managerial Approach, 10 <sup>th</sup> Edition, Wiley Publications, First<br>Published 1985  |  |  |  |  |  |
| 2.  | Timmothy Kloppenborg, Contemporary Project Management, 1st Edition, Cengage Learning, 2014   |  |  |  |  |  |
| 3.  | Vohra, N. D., Quantitative Techniques in Management, 3 <sup>rd</sup> Edition, Tata McGraw Hill Publishing Company, 2007  |  |  |  |  |  |

| Course Code | 16B1NHS635           | Semester: Even |       | Semester: VI Session: 2018 -2019<br>Month: Jan 2019 to June 2019 |  |  |
|-------------|----------------------|----------------|-------|--|--|--|
| Course Name | Organizational Behav | vior           |       |  |  |  |
| Credits 3   |                      | Contact I      | Hours | 3(2-1-0)   |  |  |

| Faculty (Names) | Coordinator(s)                 | Ms Puneet Pannu (Sec 62) & Dr Anshu Banwari (Sec 128) |  |  |
|-----------------|--------------------------------|---|--|--|
|                 | Teacher(s)<br>(Alphabetically) | Dr Anshu Banwari<br>Ms Puneet Pannu                   |  |  |

| COURSE   | OUTCOMES   | COGNITIVE<br>LEVELS |
|----------|--|---------------------|
| C304-6.1 | Identify dynamic human behavior through an insight into relationships between<br>individuals, groups and organizations | Apply<br>(C3)       |
| C304-6.2 | Analyze individual management style as it relates to influencing and managing behavior in the organization.            | Analyze<br>(C4)     |
| C304-6.3 | Decide and justify set of strategies for meeting the special challenges in the 21st century competitive workplace      | Evaluate<br>(C5)    |
| C304-6.4 | Assess the potential effects of important developments in the external environment on behavior in organizations        | Evaluate<br>(C5)    |

| Module<br>No. | Title of the<br>Module                                 | Topics in the Module  | No. of<br>Lectures for<br>the module |
|---------------|--|---|--------------------------------------|
| 1             | Introduction to OB:<br>Challenges and<br>Opportunities | Interdisciplinary Field, Concepts, Approaches, Responding<br>to Globalization; Improving Quality & Productivity;<br>Improving Customer Service; Improving People Skill;<br>Empowering People; Stimulating Innovation & Change;<br>Coping with Temporariness; Positive Organizational<br>Behavior, Working in Networked Organizations; Balancing<br>Work-Life Conflict | 3                                    |
| 2             | Managing<br>Workforce<br>Diversity                     | Major forms of Workplace Diversity, Valuing Diversity,<br>Role of Disabilities, Discrimination, Diversity Initiatives,<br>Diversity Awareness and Affirmative Action, Diversity<br>Management and strategies to implement it Competitive<br>Advantage of Diversity Management<br>Generational Workforce   | 4                                    |
| 3.            | Job Design and<br>Flexible Job<br>Environment          | Job Design & its uses; Flexible Job Environment; Job Enrichment Model   | 2                                    |
| 4.            | Leadership:<br>Authentic<br>Leadership                 | Inspirational Approach to Leadership: Authentic, Ethical &<br>Servant Leadership Defining Authentic Leadership<br>through Intrapersonal, Interpersonal and Developmental<br>Aspects; Basic Model Of Authentic Leadership; Practical<br>Approach to Authentic Leadership through the research of<br>Terry and Bill George: Authentic Leadership: Trust and             | 6                                    |

|   |   | Ethics, Dimensions of Trust, Counseling & Mentoring  |   |
|---|---|--|---|
| 5. Power & Politics   |   | Concept of Power; Sources of Power<br>Contingencies of Power; Power Tactics; Measuring Power<br>Bases: Power Authority Obedience<br>Organizational Politics: Types<br>Factors contributing to Political Behavior; Consequences &<br>Ethics of Politics   | 5   |
| 6. Employee<br>Engagement   |   | Creating a Culture of Engagement, Models of engagement,<br>Benefits of Employee Engagement, Gallup Study, Methods<br>of engaging employees – from entry to exit, Managers Role<br>in Driving Engagement  | 2   |
| 7. Organizational<br>Culture &<br>Workplace<br>Spirituality                                   |   | Creating Organizational Culture<br>Approaches to Organizational Culture; How employees<br>learn culture; Measuring Organizational Culture;<br>Spirituality & Organizational Culture  | 3   |
| 8. Organizational Organiza<br>Change & Change;<br>Development Approach<br>Impleme<br>Organiza |   | Organizational Change: Meaning & Types; Technology &<br>Change; Resistance to Change v/s Inviting Change;<br>Approaches to Organizational Change; Planning &<br>Implementing Change;<br>Organizational Development; OD Interventions & Change  | 3   |
|   |   |  |   |
|   |   | Total number of Lectures   | 28  |
|   |   | Total number of Lectures<br>Evaluation Criteria  | 28  |
| Com<br>T1<br>T2<br>End S<br>TA<br>TA  | <b>ponents</b><br>Semester Examination  | Total number of Lectures         Evaluation Criteria         Maximum Marks       20         20       20         35       25 (Oral Questions, Assignment, Project)         100  | 28  |
| Com<br>T1<br>T2<br>End S<br>TA<br>Tota<br>Refer   | ponents<br>Semester Examination<br>I<br>mmended Reading mater<br>rence Books, Journals, Rep   | Total number of Lectures         Evaluation Criteria         Maximum Marks       20         20       20         35       25 (Oral Questions, Assignment, Project)         100       100  | 28<br>( Text books,                             |
| Com<br>T1<br>T2<br>End S<br>TA<br>Tota<br>Refer<br>1.   | ponents<br>Semester Examination<br>I<br>mmended Reading mater<br>rence Books, Journals, Rep<br>S. Robbins, T. Judge, S.                                     | Total number of Lectures         Evaluation Criteria         Maximum Marks       20         20       35         25 (Oral Questions, Assignment, Project)       100         tial: Author(s), Title, Edition, Publisher, Year of Publication etc. orts, Websites etc. in the IEEE format)         Sanghi, Organizational Behavior, 13th Ed, Prentice-Hall India,   | 28<br>( Text books,<br>2001                     |
| Com<br>T1<br>T2<br>End S<br>TA<br>Tota<br>Reco<br>Refer<br>1.<br>2.                           | ponents<br>Semester Examination<br>I<br>mmended Reading mater<br>rence Books, Journals, Repo<br>S. Robbins, T. Judge, S.<br>P.Subba Rao, Organizati<br>2015 | Total number of Lectures         Evaluation Criteria         Maximum Marks       20         20       35         25 (Oral Questions, Assignment, Project)       100         ial: Author(s), Title, Edition, Publisher, Year of Publication etc. orts, Websites etc. in the IEEE format)         Sanghi, Organizational Behavior, 13th Ed, Prentice-Hall India, ional Behavior: Text Cases & Games, 2 <sup>nd</sup> Edition, Himalaya Pu | 28<br>( Text books,<br>2001<br>blishing House , |

Debra L.Nelson and James C. Quick, Organizational Behavior, Cengage Learning, India Edition, 2009

Steven L. McShane and Mary Ann Von Glinow, Organizational Behavior Essentials, Tata McGraw

Hill Publishing Company Ltd, 2007 Jerald Greenberg, *Behavior in Organizations*, 10<sup>th</sup> Ed, PHI Learning Pvt Ltd

4.

5.

6.

| Subject Code | 16B1NHS632                     |                                  | Semester: EVEN              | Semester VI       | <b>Session</b> 2018-19 |  |
|--------------|--------------------------------|----------------------------------|-----------------------------|-------------------|------------------------|--|
|              |                                |                                  |                             | Month from Jan 20 | 019 to June 2019       |  |
| Subject Name | COGNITIVE PSYCHOLOGY           |                                  |                             |                   |                        |  |
| Credits 3    |                                |                                  | Contact Hours               | 2-1-0             |                        |  |
| Faculty      | Coordinator(s)                 | Dr. Ruchi Gautam Dr. Badri Bajaj |                             |                   |                        |  |
| (Names)      | Teacher(s)<br>(Alphabetically) | Dr.<br>Dr.                       | Badri Bajaj<br>Ruchi Gautam |                   |                        |  |

| COURSE      | OUTCOMES  | COGNITIVE LEVELS      |
|-------------|---|-----------------------|
| After pursu | ing the above mentioned course, the students will be able to:                     |                       |
| 304-4.1     | Understand and apply the concepts of cognitive psychology in everyday life        | Applying Level (C3)   |
| 304-4.2     | Analyze the different models of various cognitive processes                       | Analyzing Level (C4)  |
| 304-4.3     | Evaluate cognitive psychology issues and recommend possible solutions             | Evaluating Level (C5) |
| 304-4.4     | Evaluate interventions/solutions for self-development through cognitive processes | Evaluating Level (C5) |

| Module No. | Subtitle of the Module                  | Topics in the module   | No. of Lectures for the module |  |
|------------|---|--|--------------------------------|--|
| 1.         | Introduction to Cognitive<br>Psychology | Historical Background: Emergence of<br>modern cognitive Psychology;<br>Approaches: Information Processing and<br>PDP Model; Research Methods | 3                              |  |
| 3.         | Perceptual Processes                    | Perceptual learning and development; perception of shape, space and movement.  | 4                              |  |
| 3.         | Attention                               | Selective Attention and Divided Attention:<br>Meaning, Definition and Theories.  |                                |  |
| 4.         | Memory                                  | Short Term Memory  | 3                              |  |
| 5.         | Imagery                                 | Properties of mental images;<br>Representation of images and cognitive<br>maps.  | 3                              |  |
| 6.         | Language                                | Structure of language and its acquisition,<br>speech perception, factors affecting<br>comprehension.   | 4                              |  |
| 7.         | Thinking and Problem<br>Solving         | Types of thinking; Classification of<br>problems; Problems solving approaches,<br>Problems space theory by Newell and                        | 4                              |  |

|                    |               | Simon, Creativity   |    |
|--------------------|---------------|---|----|
| 8. Decision Making |               | Logical reasoning types and errors in reasoning processes.            | 3  |
|                    |               | Concept formation and categorization;<br>Judgment and decision making |    |
| Total number of    | of Hours      |   | 28 |
|                    | Ev            | aluation Criteria   |    |
| Components         | Maximum Ma    | arks  |    |
| T1                 | 20            |   |    |
| T2                 | 20            |   |    |
| End Semester E     | xamination 35 |   |    |
| ТА                 | 25 (Assignm   | ent, Quiz , Oral Questions)   |    |
| Total              | 100           |   |    |
| ( <u></u>          |               |   |    |

| <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.   | Ronald T. Kellogg, Fundamentals of Cognitive Psychology, 2 <sup>nd</sup> Ed., Sage Publishing, 2012               |  |  |  |  |
| 2.   | Robert Solso, Otto Maclin, M. Kimberly Maclin, Cognitive Psychology, 8 <sup>th</sup> Ed., Pearson Education, 2013 |  |  |  |  |
| 3.   | Kathleen M. Galotti, Cognitive Psychology, 5th Ed., Sage Publishing, 2014   |  |  |  |  |

| Course Code | 16B1NHS636           | Semester : Even |           | Semester VI Session 2018 -2019<br>Month from Jan 2019 to June 2019 |       |  |
|-------------|----------------------|-----------------|-----------|--|-------|--|
| Course Name | Literature & Adaptio | n               |           |  |       |  |
| Credits 3   |                      |                 | Contact H | Iours  | 2-1-0 |  |

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

| COURSE   | COURSE OUTCOMES  |                          |  |
|----------|--|--------------------------|--|
| C304-3.1 | Understand and outline the elements and theories of adaptation and its various forms, and relate with the texts reflecting the cultural, moral and linguistic changes in the contemporary society.   | Understand<br>Level (C2) |  |
| C304-3.2 | Utilize visual literacy to analyze the language and style adopted in filmed texts<br>and examine them as reflections of Readers' and Audience' values and<br>perceptions in the context of myriad cultures and multidisciplinary settings<br>individually and in groups. | Apply Level (C3)         |  |
| C304-3.3 | Analyze texts and their adaptations beyond the surface level of narrative or<br>character as reflections of value systems of various cultures and times individually<br>and in a team.   | Analyse Level<br>(C4)    |  |
| C304-3.4 | Evaluate, interpret and document source texts and adaptations thematically and stylistically to learn the nuances of language, culture and values of the society.  | Evaluate Level (C5)      |  |
| C304-3.5 | Compose and make an effective presentation of a literary/non literary piece in any genre and design an ethical adaptation of any literary/non literary piece in another form individually and in groups.   | Create Level<br>(C6)     |  |

| Module<br>No. | Title of the<br>Module           | Topics in the Module   | No. of<br>Lectures for<br>the module |
|---------------|----------------------------------|--|--------------------------------------|
| 1.            | Introduction<br>Literary Devices | Figures of speech, Character, Plotline, Conflict, Point of View  | 2                                    |
| 2.            | Literature &<br>Adaptation       | Understanding Cultural Contexts<br>Forms of Adaption<br>Cinematography & Narratology   | 4                                    |
| 3.            | Framework                        | Adaptation Theories; Reader Response & Audience<br>Response Theories   | 4                                    |
| 4.            | Play & adaptations               | The Pygmalion: George Bernard Shaw<br>Hamlet : William Shakespeare   | 6                                    |
| 5.            | Novel &<br>Adaptations           | Pride & Prejudice: Jane Austen<br>The Kite Runner: Khalid Hossenni<br>The Namesake: Jhumpa Lahiri<br>The Godfather: Mario Puzo | 12                                   |

|                            | Total number of Lectures                             | 28 |
|----------------------------|--|----|
| <b>Evaluation Criteria</b> |  |    |
| Components                 | Maximum Marks  |    |
| T1                         | 20   |    |
| T2                         | 20   |    |
| End Semester Examination   | 35   |    |
| ТА                         | 25 (Assignment, Poster Presentation, Oral Questions) |    |
| Total                      | 100  |    |

| Reco | mmended Reading material:  |
|------|--|
| 1.   | Linda Hutcheon, A Theory of Adaptation, Routledge, 2006  |
| 2.   | Mark William Roche, <i>Why Literature matters in the 21<sup>st</sup> Century</i> , 1 <sup>st</sup> edition, Yale University Press 2004     |
| 3.   | George Bernard Shaw, Pygmalion, Electronic Version, Bartleyby.com, New York, 1999  |
| 4.   | <b>Stanley Wills &amp; Gary Taylor</b> , <i>The Complete Works. The Oxford Shakespeare</i> (Compact ed.). Oxford: Clarendon Press. , 1988. |
| 5.   | Jhumpa Lahiri, The Namesake, 1 <sup>st</sup> Edition, Houghton Mifflin US, 2003  |
| 6.   | Jane Austen, Pride & Prejudice, Reprint, Thomas Egerton, 2013  |
| 7.   | Mario Puzo, The Godfather, 1st Edition, G. P. Putnam's Sons, USA, 1969   |
| 8.   | Khalid Hossenni, The Kite Runner, 1 <sup>st</sup> edition, Riverhead Books US, 2003  |

| Course Code     | 19B12HS612                     | Semester : Eve   | n         | Semeste<br>Month f | er VI Session 2018 -2019<br>From Jan 2019 to June 2019 |
|-----------------|--------------------------------|------------------|-----------|--------------------|--|
| Course Name     | Social Media and Society       |                  |           |                    |  |
| Credits         | 3 Contact                      |                  | Contact I | Hours              | 2-1-0  |
| Faculty (Names) | Coordinator(s)                 | Dr. Shirin Alavi |           |                    |  |
|                 | Teacher(s)<br>(Alphabetically) | Dr. Shirin Alavi |           |                    |  |

| COURSE O | DUTCOMES   | COGNITIVE LEVELS      |
|----------|--|-----------------------|
| C304-1.1 | Infer the implications of digital change, and the concept of social<br>media and e-marketing in the context of the changing marketing<br>landscape | Apply Level(C3)       |
| C304-1.2 | Elaborate the implications of cyber branding and digitization on online marketing mix decisions  | Create Level (C6)     |
| C304-1.3 | Develop specific models related to social media and social media analytics   | Create Level (C6)     |
| C304-1.4 | Evaluate concepts related to Search Engine Marketing, Customer<br>Centric Web Business models and Web Chain Analysis                               | Evaluate Level(C5)    |
| C304-1.5 | Illustrate the new age marketing practices   | Understand Level (C2) |

| Mod<br>ule<br>No. | Title of the Module   | Topics in the Module  | No. of<br>Lectures for<br>the module |
|-------------------|---|---|--------------------------------------|
| 1.                | Introduction , Individuals<br>Online and Rules for<br>engagement for social media | What is social media marketing, the importance of<br>social media for influencing target audience, Patterns<br>of internet usage, Internet user demographics, The<br>Behavioural Internet, E-Marketing, The Virtual world,<br>the changing Marketing Landscape, E -Marketing-<br>Strengths and Applications, Online Marketing<br>Domains, Digital Marketing Optimization, The Need<br>for Digital Engagement                          | 4                                    |
| 2.                | The Online Marketing Mix  | The Online Marketing Mix, Consumer Segmentation,<br>Consumer Traits, Consumers and Online Shopping<br>Issues, E-Product, E-Place, E-Price, E-Promotion,<br>Website Characteristics affecting online purchase<br>decision.   | 3                                    |
| 3.                | The Online Consumer and<br>Social Media   | The Digital Ecosystem, Online Consumer Behavior,<br>Cultural Implications of key web characteristics,<br>Models of website visits, Web 2.0 and Marketing, The<br>collaborative web, Network evolution, Network<br>science, Marketing with networks, Metcalfe's law,<br>Netnography, Social Media Model by McKinsey,<br>Social Media Tools-Blogs, Wikis, Online<br>Communities, Facebook, Twitter, You Tube, Flickr,<br>Microblogging. | 4                                    |

| 4.Online Branding and Traffic<br>BuildingCyberbranding, Online<br>enhancement, The Digital Brand Ecosystem, Brand<br>Experience, Brand Customer Centricity, Brands and<br>Emotions, The Diamond Water paradox, Internet<br>Traffic Plan, Search Marketing Methods, Internet<br>Cookies and Traffic Building, Traffic Volume and<br>quality, Traffic Building Goals, Search Engine<br>Marketing, Keyword Advertising, Keyword value,<br>Internet Marketing Metrics, Websites and Internet<br>Marketing.45.Web Business Models<br>,Social Media Strategy<br>,Social Media Marketing<br>PlanThe value of a Customer Contact, Customer Centric<br>Business Management, Web Chain of Events,<br>Customer Value Analysis and the Internet, Business<br>Models, Revenue Benefits, Value Uncertainty,<br>Purchase Importance, Define a social media plan,<br>explain the social Media marketing planning cycle, list<br>the 8C's of strategy development.4 |  |  |  |  |
|--|--|--|--|--|
| 5.Web Business Models<br>,Social Media Strategy<br>,Social Media Marketing<br>PlanThe value of a Customer Contact, Customer Centric<br>Business Management, Web Chain of Events,<br>Customer Value Analysis and the Internet, Business<br>Models, Revenue Benefits, Value Uncertainty,<br>Purchase Importance, Define a social media plan,<br>explain the social Media marketing planning cycle, list<br>the 8C's of strategy development.46.Market Influence analytics inEngagement Marketing through Content Management,4  |  |  |  |  |
| 6. Market Influence analytics in Engagement Marketing through Content Management, 4  |  |  |  |  |
| a Digital Ecosystem Online Campaign Management, Consumer<br>Segmentation, Targeting, and Positioning using Online<br>Tools, Market Influence Analytics in a Digital<br>Ecosystem, The Digital Ecosystem, Knowledge as a<br>value proposition, CGM and Consumer behavior, The<br>value of the power of influence, Amplifying Social<br>Media Campaigns.   |  |  |  |  |
| 7. The Contemporary Digital<br>Revolution and its impact on<br>society Online Communities and Co-creation, The<br>fundamentals of online community management<br>strategies, The World of Facebook, The Future of<br>Social media Marketing—Gamification and Apps,<br>Game based marketing The world of Apps, Apps and<br>the Indian Diaspora  |  |  |  |  |
| 8.Integrating Mobile into<br>Social Media MarketingTypes of Mobile Marketing, Progression of the mobile<br>as a Marketing channel, some Indian mobile marketing<br>campaigns, Impact of Social Media on government, the<br>economy, development, and education2  |  |  |  |  |
| Total number of Lectures     28  |  |  |  |  |
| Evaluation Criteria  |  |  |  |  |
| ComponentsMaximum MarksT120T220End Semester Examination35TA25 (Assignment and Class Test)Total100  |  |  |  |  |
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books,   |  |  |  |  |
| Social Media Marketing A Strategic Approach Malissa Barker Donald Parker Second Edition. Congress  |  |  |  |  |

| 1. | Learning ,2017.  |
|----|--|
| 2. | Digital Marketing ,Seema Gupta,First Edition ,Mc Graw Hill Education (India) Private Limited ,2018 |
| 3. | Digital Marketing, Vandana Ahuja, First Edition, Oxford University Press, 2015                     |
| 4. | Social Media Marketing, Liana "Li" Evans, First Edition, Pearson, 2011.                            |
|    |  |

### **Detailed Syllabus**

| Lecture-wise Breakup |                                 |                |           |                    |  |
|----------------------|---------------------------------|----------------|-----------|--------------------|--|
| Course Code          | 19B12HS613                      | Semester: Even |           | Semeste<br>Month f | r VI Session 2018-2019<br>From: Jan 2019-June 2019 |
| Course Name          | International Trade and Finance |                |           |                    |  |
| Credits              | 03                              |                | Contact I | Hours              | 2-1-0  |
| Faculty (Names)      | Coordinator(s)                  | Dr Amba Aga    | rwal      |                    |  |

| Faculty (Maines) | Cool ulliator (s)              | D1. 7 Hilod 7 Kgai wai |
|------------------|--------------------------------|------------------------|
|                  | Teacher(s)<br>(Alphabetically) | Dr. Amba Agarwal       |

| COURSE      | OUTCOMES  | COGNITIVE LEVELS         |
|-------------|---|--------------------------|
| After pursu | ing the above mentioned course, the students will be able to:   |                          |
| C304-8.1    | Explain the foundations of international trade and finance in the era of globalisation.                 | Understanding Level (C2) |
| C304-8.2    | Analyze the major models and theories of international trade.   | Analyzing Level (C4)     |
| C304-8.3    | Identify the effects of tariffs, quotas and technical progress on economic growth.                      | Applying Level (C3)      |
| C304-8.4    | Examine the equilibrium in the Balance of Payments (BOP) and measures to correct disequilibrium.        | Analyzing Level (C4)     |
| C304-8.5    | Compare the fixed and flexible exchange rate, monetary policy, foreign trade multiplier & trade policy. | Analyzing Level (C4)     |
| C304-8.6    | Analyze the working of regional blocks & international organization.                                    | Analyzing Level (C4)     |

| Module<br>No. | Title of the<br>Module                               | Topics in the Module  | No. of<br>Lectures for<br>the module |
|---------------|--|---|--------------------------------------|
| 1.            | Introduction   | International trade and globalisation.  | 2                                    |
| 2.            | Theory of<br>International Trade                     | The pure theory of international trade -Theories of absolute<br>advantage, comparative advantage and opportunity costs,<br>modern theory of international trade; Theorem of factor<br>price equalization; Theory of absolute cost and comparative<br>cost.  | 4                                    |
| 3.            | Economic Growth<br>and International<br>Trade Policy | Terms of trade, Technical progress: Neutral, Labour Saving<br>and Capital Saving, Trade Restrictions: Tariffs, General<br>equilibrium analysis of a tariff in a small and large country,<br>Optimum tariff. Non-Tariff Barriers: Import Quota,<br>Dumping, Voluntary Export Restraints, Export Subsidy. | 5                                    |
| 4.            | Balance of<br>Payments                               | Meaning and components of balance of payments; balance<br>of trade, equilibrium and disequilibrium in the balance of<br>payments; Measuring Deficit or Surplus in BOP, Measures<br>to correct it.   | 4                                    |
| 5.            | Fixed and<br>Flexible<br>Exchange Rate               | Fixed exchange rates and flexible exchange rates; Internal<br>and External Balance, IS-LM-BP Model, Expenditure-<br>reducing and expenditure-switching policies.  | 4                                    |
| 6.            | Trade and<br>Monetary Policy                         | Foreign Trade Multiplier, Devaluation, Review of the<br>monetary approach to the theory of balance of payments<br>adjustment. Trade problems and trade policies in India.   | 3                                    |
| 7.            | The Theory of<br>Regional Blocs &                    | Rationale and economic progress of SAARC/SAPTA and ASEAN regions. Regionalism (EU, NAFTA); Functions of   | 6                                    |

|      | International<br>organisationGATT/WTO (TRIPS, TRIMS), Custom Unions, IMF and<br>World Bank.                                |  |                 |  |  |  |  |
|------|--|--|-----------------|--|--|--|--|
|      |  | Total number of Lectures                                     | 28              |  |  |  |  |
| Eval | Evaluation Criteria  |  |                 |  |  |  |  |
| Com  | ponents  | Maximum Marks  |                 |  |  |  |  |
| T1   |  | 20   |                 |  |  |  |  |
| T2   |  | 20   |                 |  |  |  |  |
| End  | Semester Examination   | 35   |                 |  |  |  |  |
| TA   |  | 25 (Assignment, Test, Quiz)                                  |                 |  |  |  |  |
| Tota | Total 100  |  |                 |  |  |  |  |
| Reco | ommended Reading materi  | al:  |                 |  |  |  |  |
| 1.   | Bhagwati, J., Internationa   | Trade, Selected Readings, Cambridge, University Press, Massa | achusetts, 1981 |  |  |  |  |
| 2.   | Kindleberger, C.P., Intern   | national Economics, R.D. Irwin, Homewood, 1973               |                 |  |  |  |  |
| 3.   | Salvatore, D., International Economics, Prentice Hall, Upper Saddle River, N.J., New York, 1997                            |  |                 |  |  |  |  |
| 4.   | Soderston, Bo, International Economics, The Macmillan Press Ltd., London, 1991   |  |                 |  |  |  |  |
| 5.   | <b>Dana, M.S.</b> , International Economics: Study, Guide and Work Book, (5th Edition), Routledge Publishers, London, 2000 |  |                 |  |  |  |  |

| Course Code  |  | 19B12HS611   | Semester : EVENSemester :(specify Odd/Even)Month from |                     | r ː `<br>rom | VI Session 2018-2019<br>m: January- June |                           |
|--|--|--|---|---------------------|--------------|--|---------------------------|
| Course Name  |  | Econometric Analysi  | S   |                     |              |  |                           |
| Credits  |  | 03   |   | Contact Hours 2-1-0 |              | 2-1-0                                    |                           |
| Faculty (Names)  |  | Coordinator(s)   | Manas Ranjan Behera                                   |                     |              |  |                           |
|  |  | Teacher(s)<br>(Alphabetically)   | Manas Ranjan Behera                                   |                     |              |  |                           |
| COURSE OUTCOMES COGNITIVE LEVELS   |  |  |   |                     |              |  |                           |
| After pursuing the above mentioned course, the students will be able to: |  |  |   |                     |              |  |                           |
| C304-2.1   | Der<br>the   | nonstrate the key con-<br>properties of a set of d   | cepts from basic<br>ata.                              | c statistics f      | to underst   | and                                      | Understanding Level –(C2) |
| C304-2.2   | App<br>stuc  | <i>Apply</i> Ordinary Least Square method to undertake econometric A studies.                |   |                     |              |  | Apply Level – (C3)        |
| C304-2.3   | <i>Examine</i> whether the residuals from an OLS regression are well-<br>behaved. Analyze $Level - (C4)$ |  |   |                     |              | Analyze Level – (C4)                     |                           |
| C304-2.4   | Eva  | <i>Evaluate</i> different model selection criteria for forecasting. Evaluation Level $-(C5)$ |   |                     |              |  |                           |
| C304-2.5   | Cre  | eate models for predict  | ion from a given                                      | set of data         |              |  | Creation Level – (C6)     |

| Module<br>No. | Title of the<br>Module              | Topics in the Module  | No. of<br>Lectures for<br>the module |
|---------------|-------------------------------------|---|--------------------------------------|
| 1.            | Statistical Inference               | Point and interval estimation; ;The Z distribution ;The Null<br>and Alternate hypotheses ;The chi-square distribution; The<br>F distribution; The t distribution  | 3                                    |
| 2.            | Regression<br>Analysis              | Two variable regression model; The concept of the PRF;<br>Classical assumptions of regression; Derivation of the OLS<br>estimators and their variance; Properties of OLS estimators<br>under classical assumptions; Gauss-Markov Theorem;<br>Tests of Hypothesis, confidence intervals for OLS<br>estimators; Measures of goodness of fit: R square and its<br>limitations; Adjusted R square and its limitations | 7                                    |
| 3.            | Econometric Model<br>Specification  | Identification: Structural and reduced form; Omitted<br>Variables and Bias; Misspecification and Ramsay RESET;<br>Specification test; Endogeneity and Bias  | 5                                    |
| 4.            | Failure of Classical<br>Assumptions | Multi-collinearity and its implications; Auto-correlation:<br>Consequences and Durbin-Watson test ;Heteroskedasticity:<br>Consequences and the Goldfeld -Quandt test  | 2                                    |
| 5.            | Forecasting                         | Forecasting with a)moving averages b) linear trend c)<br>exponential trend CAGR; Forecasting with linear<br>regression; Classical time series decomposition; Measures<br>of forecast performance: Mean square error and root mean<br>square error; Limitations of econometric forecasts   | 5                                    |

| 6.           | Time Series<br>Analysis  | Univariate Time Series Models: Lag Operator, ARMA,<br>ARIMA models, Autoregressive Distributed Lag<br>Relartionship | 3  |  |  |  |
|--------------|--|---|----|--|--|--|
| 7.           | Linear<br>Programming  | Linear programming; Dual of a linear programming<br>problem; Simplex method Transportation                          | 3  |  |  |  |
|              |  | Total number of Lectures  | 28 |  |  |  |
| Eval         | uation Criteria  |   |    |  |  |  |
| Com          | ponents  | Maximum Marks   |    |  |  |  |
| T1           |  | 20  |    |  |  |  |
| T2           |  | 20  |    |  |  |  |
| End          | Semester Examination   | 35  |    |  |  |  |
| TA           |  | 25 (Quiz+ Assignment+Viva -Voce)  |    |  |  |  |
| Tota         | <u>l</u>   | 100   |    |  |  |  |
| Reco<br>Refe | <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.           | 1. Gujarati, D.N. (2002), Basic Econometric (4 <sup>th</sup> ed.), New York: McGraw Hill.  |   |    |  |  |  |
| 2.           | Greene, W.H. (2003), Econometric Analysis, New Jersey: Prentice Hall.  |   |    |  |  |  |
| 3.           | Madala, G.S. (1992), Intro   | duction to Econometrics (2 <sup>nd</sup> ed.), New York: Macmillan.   |    |  |  |  |

| Course Code   |                                    | 18B12HS611                                    | I Semester :EVEN Semester VI S<br>Month from Ja  |  | <b>Session</b> 2018 - 2019<br>Jan 2019 to June 2019         |  |                          |                                    |                                      |
|---------------|------------------------------------|---|--|--|---|--|--------------------------|------------------------------------|--------------------------------------|
| Course Name   |                                    | Marketing Management                          |  |  |   |  |                          |                                    |                                      |
| Credits       |                                    |   | 3  |  | Contact H   | lours  |                          | 2-1                                | -0                                   |
| Faculty (N    | ames)                              | Coordinator                                   | r(s)   | Dr Swati Sharn   | na  |  |                          |                                    |                                      |
|               |                                    | Teacher(s)<br>(Alphabetica                    | lly)   | Dr. Swati Shari  | ma  |  |                          |                                    |                                      |
| COURSE        | OUTCO                              | OMES  |  |  |   |  |                          | COGNIT                             | IVE LEVELS                           |
| After pursu   | ing the a                          | above mention                                 | ed cours   | e, the students w  | vill be able  | to:  |                          |                                    |                                      |
| C304-7.1      | To illu<br>and ma                  | strate the fur<br>thet research               | ndament  | als of marketing   | g, marketing  | g environ                                    | iment                    | Understar                          | ding Level (C2)                      |
| C304-7.2      | To mo                              | del the dynami                                | cs of ma   | arketing mix   |   |  |                          | Applying                           | Level (C3)                           |
| C304-7.3      | To der<br>market                   | monstrate the ing and emerging                | implica  | tions of current keting trends.  | t trends in   | social r                                     | nedia                    | Understan                          | ding Level (C2)                      |
| C305-7.4      | To ap<br>respon                    | ppraise the isolity                           | importa  | nce of market  | ting ethics   | s and s                                      | social                   | Evaluating                         | g(C5)                                |
| C-305-<br>7.5 | To con<br>develo<br>advant         | nduct environi<br>p marketing<br>age.         | duct environmental analysis, design business portfolios and<br>marketing strategies for businesses to gain competitive Creating (C6)<br>ge.  |  |   |  |                          |                                    | C6)                                  |
| Module<br>No. | Title o<br>Modul                   | f the<br>le                                   | Topics   | in the Module  |   |  |                          |                                    | No. of<br>Lectures for<br>the module |
| 1.            | Under<br>New A<br>Marke            | standing<br>ge<br>eting                       | Defining Marketing For 21 <sup>st</sup> Century<br>The importance of marketing and marketing's role in<br>business and society.<br>Introduction to Digital Marketing.<br>Online Communication Tools.<br>The Social Media-Conversations, Community and<br>Content.<br>Affiliate Marketing and Mobile Engagement.<br>The Digital Campaigns |  |   |  | s's role in<br>unity and | 5                                  |                                      |
| 2             | Marke<br>Enviro<br>Marke<br>and ir | eting<br>onment and<br>et Research<br>asights | Internal and external forces impacting marketers.<br>Marketing and Customer Value.<br>Gathering Information and Scanning the environment.<br>Company's Micro and Macro Environment<br>Responding to the Marketing Environment  |  |   |  | 3                        |                                    |                                      |
| 3             | Strates<br>and th<br>Proces        | gic Planning<br>e marketing<br>s              | Ex<br>act<br>De<br>De<br>Di  | plore the impa<br>ions.<br>escribe how techn<br>esigning the busin<br>scuss the Strate | nological ch<br>nological ch<br>ness Portfol<br>gic Plannii | ial forces<br>nange affe<br>lio<br>ng Proces | s on a sects ma          | marketing<br>rketing.<br>Strategic | 5                                    |

|  |   | Marketing Process.   |                  |
|--|---|--|------------------|
| 4                                      | Consumer and<br>Business Buyer<br>Behavior                        | Consumer Markets and consumer buyer behaviour.<br>The buying decision process.<br>Business Markets and business buyer behaviour.<br>Discuss the modern ethical standards.  | 5                |
| 5                                      | Branding  | Brand Image, Identity and Association.<br>Product brands and Branding decisions.<br>Product line and mix decisions.<br>Consumer Brand Knowledge.<br>New Product Development and Product life cycle<br>strategies.  | 4                |
| 6                                      | Pricing products:<br>Pricing<br>considerations and<br>strategies  | Factors to consider when setting prices.<br>New product pricing strategies.<br>Product mix pricing strategies.<br>Price adjustments and changes.   | 4                |
| 7                                      | The New Age<br>Social Marketing                                   | <ul> <li>Ethics and social responsibility in marketing.</li> <li>Ethical behavior in business.</li> <li>Ethical decision making.</li> <li>Social forces affecting marketing.</li> <li>Impact of culture on marketing.</li> <li>Discuss modern ethical standards.</li> <li>Importance of marketing in CSR and business sustainability.</li> </ul> | 2                |
|  |   | Total number of Lectures   | 28               |
| Eval                                   | uation Criteria   |  | 1                |
| Com<br>T1<br>T2<br>End 3<br>TA<br>Tota | ponents<br>Semester Examination                                   | Maximum Marks<br>20<br>20<br>35<br>25 (Assignment and Viva)<br>100   |                  |
| Reco<br>Book                           | <b>ommended Reading materia</b><br>as, Journals, Reports, Website | <b>l:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. es etc. in the IEEE format)   | (Reference       |
| 1.                                     | Kotler, Philip and Gary An 2017.                                  | rmstrong, Principles of Marketing, 17 <sup>th</sup> Edition, New Delhi, Pe   | arson Education, |
| 2.                                     | Kotler, Philip., and Kevin Education, 2014.                       | Lane Keller, Marketing Management, 15 <sup>th</sup> Edition, New Delhi   | , Pearson        |
| 3.                                     | Grewal D., &Levy Michae<br>2017.                                  | el, Marketing, 5 <sup>th</sup> Edition, Mc graw Hill Education (India) Priva   | ate Limited      |
| 4.                                     | Winer, Russell S., Market   | ting Management, 4 <sup>th</sup> Edition, Prentice Hall,2014.  |                  |

| Course Code              |   | 16B1NHS634   | 4             | Semester: Even Semester VI |              | Session 2018 -2019 |                    |                         |
|--------------------------|---|--|---------------|----------------------------|--------------|--------------------|--------------------|-------------------------|
|                          |   |  |               |                            |              | Month              | from               | Jan 2019 to June2019    |
| Course N                 | ame   | Theatre and  | Perfor        | mance                      |              |                    |                    |                         |
| Credits                  |   | 2  |               |                            | Contact      | ntact Hours 1-0-2  |                    |                         |
| Faculty<br>(Names)       |   | Coordinat  | or(s)         | Dr Nilu Choudhary          |              |                    |                    |                         |
|                          |   | Teacher(s)<br>(Alphabetic  | ally)         | Dr Nilu Choudhary          |              |                    |                    |                         |
|                          | COL   |  | MEG           |                            |              |                    |                    |                         |
| CO Code                  | COL   | RSE OUICC  | DMES          |                            |              |                    |                    | COGNITIVE LEVELS        |
| C305-20.1                | Dem<br>theat  | onstrate proble<br>re performance  | m solvi<br>s. | ng ability and ef          | fective life | skills thro        | ugh                | Understanding level(C2) |
| C305-20.2                | Deve  | elop awareness   | of the r      | ole of these arts          | in human li  | fe                 |                    | Understanding level(C2) |
| C305-20.3                | Appl<br>throu   | Apply skills of listening, articulation, awareness and collaborationApplying level(C3)through the creation of performance. |               |                            |              |                    | Applying level(C3) |                         |
| C305-20.4                | Design and present an original performance alone or in collaborationCreating level(C6)with other artists. |  |               |                            |              |                    |                    |                         |
|                          |   |  |               |                            |              |                    |                    |                         |
| Module Title of the Topi |   |  | Topic         | s in the Mod               | ule          |                    |                    | No. of                  |

| No. | Module                      | l opics in the Module  | No. of<br>Lectures for<br>the module |
|-----|-----------------------------|--|--------------------------------------|
| 1.  | Introduction of<br>Theatre  | History of theatre: role of theatre in human culture with special reference to India                             | 2                                    |
| 2.  | Characterization            | Tips for developing character, thinking about thoughts, Flash –back, Performance                                 | 2                                    |
| 3.  | Script Writing              | Turning a story into a play, How to write a one Act,<br>setting the scene ,character, stage direction, Dialogues | 3                                    |
| 4.  | School of Drama             | Natya-Shastra, Stanislavsky and Brecht   | 3                                    |
| 5.  | Text and its interpretation | Mother Courage ,Galileo , Aadhe Adhure (any one)   | 3                                    |
| 6.  | Back-stage work             | Management, planning, execution  | 1                                    |
|     |                             | Total number of Lectures   | 14                                   |

| Module<br>No. | Title of the Module | List of Experiments/Activities   | CO            |
|---------------|---------------------|--|---------------|
| 1.            | Moving in Space.    | Students will be moving around the room, filling up the space, changing pace, changing direction, being aware of other people but not touching them. Find new ways of moving, with a different emphasis each time – smooth, jagged, slow, fast, heavy, light, high up, low down and so on. Every now and again Teacher will shout "Freeze! And Students need to freeze every muscle in your body. Absolutely NO LAUGH, LOOKING | C305-<br>20.1 |

|    |                              | AROUND, OR MOVING. You will be out.   |               |
|----|------------------------------|---|---------------|
| 2. | Mirror Activity              | A great way to get students aware of body movement and working together.  | C305-<br>20.1 |
| 3. | Characterization             | Developing and analyzing characters to reveal the special<br>qualities and personalities of the characters in a story, making<br>character believable.  | C305-<br>20.2 |
| 4. | Script Writing               | The more passionate you feel about your idea, the more attractive your play will be. Divide the idea into a beginning, middle and end.  | C305-<br>20.3 |
| 5. | Role Assignment              | No acting or movement at this point – just sit together to speak<br>and hear the script carefully. Discuss and clarify any confusing<br>aspects of the script and any apparent challenges in bringing the<br>script to the stage. Division of script into small "units" and<br>rehearsed separately   | C305-<br>20.3 |
| 6. | Turning story into a<br>play | Read thru each episode or unit separately "on its feet". Actors<br>moving around the stage space. Set blocking for each episode.<br>Use ideas generated from Mini-Episodes, and Staging with<br>Images. Make sure the gestures, movements, and stage pictures<br>tell the story clearly.  | C305-<br>20.3 |
| 7. | Stage blocking               | Practice the blocking and the lines so that everyone knows what<br>happens when and what their performance responsibilities are.<br>Memorize lines. Work on making characters, relationships, and<br>dialogue clear. This is a good place in which to use the Creating<br>the Character lessons. Pay attention to vocal projection and<br>articulation. Generate ideas about any technical elements you<br>want to incorporate using the Transformation of Objects. | C305-<br>20.3 |
| 8. | Script to performance        | Finalize and run the entire play from beginning to end without<br>stopping to check any additional rehearsal required to get<br>everything running smoothly or not. Finally Perform!!   | C305-<br>20.4 |

| <b>Evaluation</b> Criteria |  |
|----------------------------|--|
| Components                 | Maximum Marks                                      |
| Mid Term                   | 30   |
| End Term                   | 40   |
| ТА                         | 30 (Presentation 1, Presentation 2 and Assignment) |
| Total                      | 100  |

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

| 1. | Eric Bentley, ed., The Theory of the Modern Stage: An Introduction to Modern Theatre and Drama,<br>Penguin Books, 1968 |
|----|--|
| 2. | Mark Fontier, Theory/ Theatre: An Introduction, New York: Routledge, 2002  |
| 3. | Michael Holt, Stage Design and Property, Oxford: Phaidon, 1986   |
| 4. | Michael Holt, Costume and Make-up, Oxford: Phaidon, 1988   |
| 5. | Natyashastra, tr. by Adya Rangacharya, New Delhi: Munshiram Manoharlal, 1996,  |
|    |  |

#### **Detailed Syllabus**

# Lecture-wise Breakup

| Course Code | 19B13HS611  | Semester: Even                   |            | Semester: VI Session: 2018-2019 |       |
|-------------|---|----------------------------------|------------|---------------------------------|-------|
|             |   | Month From Jan 2019 to June 2019 |            | From Jan 2019 to June 2019      |       |
| Course Name | Morality of Everyday Living and Moral Decision Making |                                  |            |                                 |       |
| Credits     | 2   |                                  | Contact Ho |                                 | 1-0-2 |

| Faculty (Names) | Coordinator(s)                 | Ms Puneet Pannu, Dr Deepak Verma   |  |  |
|-----------------|--------------------------------|--|--|--|
|                 | Teacher(s)<br>(Alphabetically) | Ms Puneet Pannu, Dr Ekta Srivastava, Dr Praveen Sharma, Dr<br>Deepak Verma |  |  |

| COURSE OUTCOMES   |  |          |  |
|---|--|----------|--|
| C305-3.1  | Apply and Analyze morality in all facets of personal and professional life |          |  |
|   |  | Analyze  |  |
|   |  | (C4)     |  |
| C305-3.2  |  |          |  |
| Discover ways to address moral dilemmas by deliberating on the pros and cons to |  |          |  |
|   | find the best possible outcome   |          |  |
| C305-3.3  |  | Evaluate |  |
|   | Justify and Formulate morally correct decisions and stand by them          | (C5)     |  |
| C305-3.4  |  | Create   |  |
|   | Adapt and develop a character respected by peers and superior alike        | (C6)     |  |

| Module<br>No.            | Title of the<br>Module                              | Topics in the Module   | No. of<br>Lectures for<br>the module |  |
|--------------------------|---|--|--------------------------------------|--|
| 1.                       | The Big<br>Questions:<br>Origins of<br>Morality     | What is morality? Universal aspects of morality, Evolution<br>of Morality, Development of Morality, Morality Theories,<br>Everyday Dilemmas and Decision Making  | 4                                    |  |
| 2.                       | Compassion/<br>Empathy                              | Reason/Emotion; Where does concern for others come from?<br>Empathy—and is more empathy necessarily a good thing? And<br>what can we learn from the study of those who seemingly lack<br>normal moral feelings, such as violent psychopaths? | 3                                    |  |
| 3.                       | Moral<br>Differences                                | How does culture influence our moral thought and moral<br>action? What role does religion play? Why are some of us<br>conservative and others liberal, and how do political<br>differences influence our sense of right and wrong?           | 2                                    |  |
| 4.                       | Moral Circles:<br>Family, Friends,<br>and Strangers | Moral feelings: Family, Friends, and allies. Reciprocal<br>Altruism, The Morality of Group Preference, Morality of racial<br>and ethnic bias. : Stereotypes, How Do We Treat Strangers   | 2                                    |  |
| 5.                       | Moral Decision<br>Making                            | Contemporary Everyday Ethical Issues   | 3                                    |  |
| Total number of Lectures |   |  |                                      |  |

| Module<br>No. | Title of the<br>Module   | List of Experiments/Activities  | СО                               |  |  |
|---------------|--|---|----------------------------------|--|--|
| 1.            | The Big<br>Questions:<br>Origins of<br>Morality                      | Experiential Sharing: Morality & its significance to them<br>Case Study: No such thing as free drink.   | C305-3.1                         |  |  |
| 2.            | The Big<br>Questions:<br>Universal Aspects<br>of Morality            | Universal Aspects of Morality: Big Questions: Why be good?<br>Universal Aspects of Morality: Big Questions: Is it permissible<br>to lie?<br>Universal Aspects of Morality: Big Questions: Is it good to<br>gossip?? | C305-3.1                         |  |  |
| 3.            | The Big<br>Questions:<br>Everyday<br>Dilemmas and<br>Decision Making | UPSC Case Study<br>Ethical Dilemma of a Marketing Manager   | C305-3.2<br>C305-3.3             |  |  |
| 4.            | Evolution &<br>Development of<br>Morality                            | Ethical Analysis: A young Professor's Career  | C305-3.1<br>C305-3.2<br>C305-3.3 |  |  |
| 5.            | Compassion/<br>Empathy: Reason<br>v/s Emotion                        | Discussion: Can we do better than the Golden Rule<br>Discussion: Obligation to Others/ Is jealousy & Resentment<br>always bad?  | C305-3.1<br>C305-3.4             |  |  |
| 6             | Compassion/<br>Empathy   | EI Assessment<br>Discussion on Reading: What's the matter with Empathy?   | C305-3.1<br>C305-3.4             |  |  |
| 7             | Moral Differences  | Case Study: Difference in Morality<br>Experiential Exercise: Country/ Org/ Home Moral Culture   | C305-3.4                         |  |  |
| 8             | Moral Circles:<br>Family, Friends,<br>and Strangers                  | Experiential Sharing: Moral Circles and their influence on us<br>Stereotyping in Morality   | C305-3.4                         |  |  |
| 9             | Moral Decision<br>Making   | Contemporary Real World Scenario: Analyzing it through CATWOE   |                                  |  |  |

| Evaluation Criteria      |   |  |  |  |
|--------------------------|---|--|--|--|
| Components               | Maximum Marks   |  |  |  |
| Mid Term                 | 30 (Project Presentation)                               |  |  |  |
| End Semester Examination | 40 (End Term Written Paper)                             |  |  |  |
| ТА                       | 30 ( Case Study Assessment, Assignment, Oral Questions) |  |  |  |
| Total                    | 100   |  |  |  |

| Reference Books, Journals, Reports, Websites etc. in the IEEE format) |  |  |  |  |
|---|--|--|--|--|
| 1.  | Martin, Clancy "Moral Decision Making: How to approach everyday Ethics", The Great Courses, USA, 2014        |  |  |  |
| 2.  | Shukla T., Yadav A.& Chauhan G.S." Human Values & Professional Ethics", Cengage Learning India Pvt Ltd, 2018 |  |  |  |
| 3.  | Khanka S.S. "Business Ethics & Corporate Governance (Principles & Practices)", S. Chand, 2014                |  |  |  |
| 4.  | Mruthyunjaya H.C.," Business Ethics & Value systems", PHI Learning Pvt Ltd, 2013                             |  |  |  |

| Lecture wise Dreakup |   |                 |  |                                  |                               |  |  |
|----------------------|---|-----------------|--|----------------------------------|-------------------------------|--|--|
| Course Code          | 18B13HS612  | Semester : Even |  | Semeste                          | Semester VI Session 2018-2019 |  |  |
|                      |   |                 |  | Month from Jan 2019 to June 2019 |                               |  |  |
| Course Name          | Effective tools for Career Management and Development |                 |  |                                  |                               |  |  |
| Credits              | 2   | Contact Ho      |  | ours                             | 1-0-2                         |  |  |
|                      |   |                 |  |                                  |                               |  |  |

| Faculty (Names) | Coordinator(s)                 | Dr Kanupriya Misra Bakhru |
|-----------------|--------------------------------|---------------------------|
|                 | Teacher(s)<br>(Alphabetically) | Dr Kanupriya Misra Bakhru |
|                 |                                |                           |

| COURSE   | OUTCOMES  | COGNITIVE LEVELS     |
|----------|---|----------------------|
| C305-2.1 | Assess ones personal priorities, skills, interests, strengths, and values<br>using a variety of contemporary assessment tools and reflection<br>activities. | Evaluate Level (C 5) |
| C305-2.2 | Apply knowledge of all the Career Stages in making informed career decisions.   | Apply Level (C 3)    |
| C305-2.3 | Develop and maximize ones potential for achieving the desired career option.  | Create Level (C6)    |
| C305-2.4 | Analyze the processes involved in securing and managing career by employees of different organizations.   | Analyze Level (C 4)  |

| Module<br>No. | Title of the<br>Module  | Topics in the Module  | No. of<br>Lectures and<br>Tutorial for<br>the module |
|---------------|---|---|--|
| 1.            | Introduction to<br>Career Life cycle  | Introduction to Career Life Cycle of an individual-Role and<br>importance of human resource in an organization, Evolution<br>of Strategic Human Resource Management.  | 3  |
| 2.            | Self Branding and<br>strategies to do well<br>in Recruitment and<br>Selection | Introduction to complete cycle of Recruitment and<br>Selection, Introduction to various tools used for assessment<br>and testing candidates-aptitude test, personality test,<br>graphology test etc. Introduction to Workforce planning,<br>Importance and practical application of Job Analysis, Job<br>Description and Job Specification.   | 3  |
| 3.            | Personnel<br>Development and<br>your career                                   | Introduction to various learning and development,<br>Introduction to various techniques used for learning and<br>development, measure of training effectiveness, Training<br>techniques / delivery, Kirkpatrick Model, Introduction to<br>Succession Planning, Transactional Analysis.  | 3  |
| 4.            | Human Resource<br>Evaluation and<br>Compensation                              | Performance Management: Measurement Approach,<br>Developing Job Descriptions, Key Result Areas, Key<br>Performance Indicators, Assessment Centre, 360 Degree<br>feedback, Balanced Scorecard, Effective Performance<br>Metrics. Compensation Strategy and trends- Compensation<br>package, ESOPs, Performance based pay, Recognition,<br>Retrial benefits, Reward management, Team rewards. | 3  |
| 5.            | Human Resource<br>Control   | Human Resources Audit, The Human Resource Information<br>System (HRIS), Human Resources Accounting,   | 2  |

| Practices in India, Internationalization of Human Resource<br>Management Commonly Used Jargons. |
|---|
|---|

#### Total number of Lectures

14

| Module<br>No. | Title of the<br>Module  | List of Experiments/Activities  | CO                   |
|---------------|---|---|----------------------|
| 1.            | Introduction to Career<br>Life cycle  | Practical Sessions on Resume and<br>Cover Letter Writing  | C305-2.1, C30<br>2.2 |
| 2.            | Self Branding and<br>strategies to do well in<br>Recruitment and<br>Selection | Practical Sessions on Job Description, Job Specification and Self-<br>Branding  | C305-2.3, CC         |
| 3.            | Personnel<br>Development and your<br>career                                   | Practical Sessions on Johari Window-Knowing Thyself, Transaction<br>Analysis-Parent, Child, Adult Ego State for effective interpersonal<br>communication. | C305-2.1, C30<br>2.3 |
| 4.            | HumanResourceEvaluationandCompensation  | Practical Sessions on HR Interview and Mock HR Interview  | C305-2.2, C30<br>2.4 |
| 5.            | Human Resource<br>Control<br>and special topics                               | Practical Sessions on Group Discussions and Mock Group Discussions  | C305-2.2, C30<br>2.4 |

| Evaluation Criteria |  |
|---------------------|--|
| Components          | Maximum Marks                                |
| Mid Term            | 30 (Project)                                 |
| End Term            | 40 (Written)                                 |
| ТА                  | 30 (Class Mock Activities, Assignment, Quiz) |
| Total               | 100  |
| _ • • • • • •       |  |

| Reco | Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. ( Text books, |  |  |  |  |  |
|------|--|--|--|--|--|--|
| Refe | Reference Books, Journals, Reports, Websites etc. in the IEEE format)                                      |  |  |  |  |  |
| 1.   | Pande and Basak, Human Resource Management- Text and Cases, Pearson, 2012                                  |  |  |  |  |  |
| 2.   | Dessler and Varkkey, Human Resource Management, Pearson, 2011  |  |  |  |  |  |
| 3.   | VSP Rao, Human Resource Management, Excel Books, 2007  |  |  |  |  |  |
| 4.   | Aswathappa, Human Resource Management, McGraw-Hill, 2010   |  |  |  |  |  |
| 5.   | Gary Dessler, Human Resource Management, Pearson/Prentice Hall, 2005                                       |  |  |  |  |  |

| <b>Course Code</b> 16E                     |  | 16B19HS692   |  | Semester: EVENSemester VIMonth from Ja   |             | Se<br>Jan 2019 to | ession 2018-19<br>June 2019 |             |                                      |
|--|--|--|--|--|-------------|-------------------|-----------------------------|-------------|--------------------------------------|
| Course Na                                  | me   | Psychological                                      | Psychological Testing  |  |             |                   |                             |             |                                      |
| Credits                                    |  | 2  |  |  | Contact H   | lours             | 1-0-2                       |             |                                      |
| Faculty (Na                                | ames)  | Coordinator(                                       | s)   | Dr. Ruchi Gaut   | tam         |                   |                             |             |                                      |
|  |  | Teacher(s)<br>(Alphabeticall                       | y)   | Dr. Ruchi Gautam   |             |                   |                             |             |                                      |
| CO Code                                    | COU  | RSE OUTCON   | 1ES  |  |             |                   |                             | COGNIT      | IVE LEVELS                           |
| C305-19.1                                  | Explain the various concepts of psychological testing. Understan |  |  |  | Understan   | nding Level (C2)  |                             |             |                                      |
| C305-19.2 Apply concepts from p scenarios. |  |  | psychological testing to researches and real life            |  |             | Apply Level (C3)  |                             |             |                                      |
| C305-19.3                                  | Anal   | Analyze the different psychological tests. Analyze |  |  |             |                   | ze Level (C4)               |             |                                      |
| C305-19.4 Evaluate the psychol             |  |  | gical  | testing procedure  | es.         |                   |                             | Evalua      | te Level (C5)                        |
| Module<br>No.                              | Title (<br>Modu  | of the<br>le                                       | Topi   | ics in the Mod   | ule         |                   |                             |             | No. of<br>Lectures for<br>the module |
| 1.   | Introdu<br>Psycho<br>Testing                                     | iction to<br>ological                              | Psycl  | sychological Testing: History and Overview 1   |             |                   |                             | 1           |                                      |
| 2.   | Nature<br>Psycho   | of<br>blogical Tests                               | Time<br>Tests<br>Tests<br>Uses                               | Fimeline; Types of Tests: Intelligence Tests, AptitudeFests, Achievement Tests, Creativity Tests, PersonalityFests, Interest inventories, and Behavioral procedures;Uses of tests. |             |                   |                             |             |                                      |
| 3.   | Types  | of Scales  | Conc   | cept and Differer val, and Ratio.  | nt types of | scales: No        | ominal                      | l, Ordinal, | 2                                    |
| 4.   | Item W   | riting   | ting Test Construction; Principles of Item Writing; Factor 2 |  |             |                   | 2                           |             |                                      |

|         |                             | Interval, and Ratio.   |    |
|---------|-----------------------------|--|----|
| 4.      | Item Writing                | Test Construction; Principles of Item Writing; Factor Analysis   | 2  |
| 5.      | Item Analysis               | Concept, Procedure, Factor Analysis, Discrimination<br>Index, Difficulty Value, Criteria for Selection & Rejection<br>Items. | 2  |
| 6.      | Interpretation of<br>Scores | Standardized procedure; Scores or categories; Norms or standards; and Prediction of non-test behavior                        | 1  |
| 7.      | Reliability                 | Meaning, Types: Test-Retest Reliability, Parallel-Forms Reliability, and Internal Consistency Reliability.                   | 2  |
| 8.      | Validity                    | Concept, Types: Face validity, Content validity, Construct validity, and Criterion validity.                                 | 2  |
| Total 1 | number of Lectures          |  | 14 |

| Mod<br>No.  | ule Title of the Module   | Title of the Module List of Experiments/Activities CO   |                                     |  |  |  |  |  |
|---|---|---|-------------------------------------|--|--|--|--|--|
| 1.  | Item Writing<br>Item Analysis<br>Interpretation of Scores<br>Reliability<br>Validity  | of Scores Personality Big Five Inventory / Personality Assessment   |                                     |  |  |  |  |  |
| 2.  | Item Writing<br>Item Analysis<br>Interpretation of Scores<br>Reliability<br>Validity  | Item Writing<br>Item AnalysisCognitive Emotion Regulation Questionnaire/ Indian<br>Adaptation of the Multidimensional Aptitude Battery -<br>MAB - IIInterpretation of Scores<br>Reliability<br>ValidityMAB - II |                                     |  |  |  |  |  |
| 3.  | Item WritingCognitive Failures Scale/ Test of Memory and LearningItem Analysis- Second Ed. (TOMAL-2)Interpretation of ScoresReliabilityValidityValidity |   |                                     |  |  |  |  |  |
| 4.  | Item Writing<br>Item Analysis<br>Interpretation of Scores<br>Reliability<br>ValidityFive Facet Mindfulness Questionnaire (FFMQ)                         |   |                                     |  |  |  |  |  |
| 5.  | Item Writing<br>Item Analysis<br>Interpretation of Scores<br>Reliability<br>Validity  | Resilience Scale/ Social Skills Inventory   | C305-19.2<br>C305-19.3<br>C305-19.4 |  |  |  |  |  |
| 6. Item Writing<br>Item Analysis<br>Interpretation of Scores<br>Reliability<br>Validity |   | Hamilton Depression Rating Scale (HDRS)/ Children's<br>Academic Intrinsic Motivation Inventory  | C305-19.2<br>C305-19.3<br>C305-19.4 |  |  |  |  |  |
| 7.  | Item Writing<br>Item Analysis<br>Interpretation of Scores<br>Reliability<br>Validity  | The Warwick–Edinburgh Mental Well-being Scale<br>(WEMWBS)/ Emotions & Expressions/ Problem<br>Solving Picture Cards   | C305-19.2<br>C305-19.3<br>C305-19.4 |  |  |  |  |  |
| Evalu   | ation Criteria  |   |                                     |  |  |  |  |  |
| Comp<br>Mid S<br>End S<br>TA<br>Total   | ComponentsMaximum MarksMid Sem30End Semester Examination40TA30 (Lab Assignment and Research Assignment)Total100   |   |                                     |  |  |  |  |  |
| Reco<br>Refer   | <b>mmended Reading material:</b> A<br>ence Books, Journals, Reports, W  | uthor(s), Title, Edition, Publisher, Year of Publication etc. (<br>Vebsites etc. in the IEEE format)  | Text books,                         |  |  |  |  |  |
| 1.  | Ronald Jay Cohen & Mark E. Swerdlik, Psychological Testing and Assessment 9th Edition, McGraw-Hill<br>Education, 2017                                   |   |                                     |  |  |  |  |  |
| 2.  | Anne Anastasi & Susana Urbina, Psychological Testing, 7 <sup>th</sup> Ed., Pearson Education, 2012.   |   |                                     |  |  |  |  |  |
| 3.  | Frank S. Freeman, Theory and P  | Practice of Psychological Testing, 3 <sup>rd</sup> Ed., Oxford & IBH Pu   | blishing, 2010.                     |  |  |  |  |  |
| 4.  | Robert J. Gregory, Psychological Testing: History, Principles and Applications, 1 <sup>st</sup> Ed., Pearson Publishing, 2006.                          |   |                                     |  |  |  |  |  |

# **Detailed Syllabus**

## Lecture-wise Breakup

| Subject Co   | ode  | 18B12M   | IA612  | Semester Even Sem  |            | Semester VI Session 2018-2019<br>Month from Jan2019 to June 2019 |                             |  |
|--|--|--|--|--|------------|--|-----------------------------|--|
| Subject Name   |  | Applied Mathematical Methods   |  |  |            |  |                             |  |
| Credits  |  | 4 Contact Hours 3-1-0  |  |  |            |  | )                           |  |
| Faculty (N   | ames)  | Coordi   | nator(s)   | Dr. Puneet Rar   | na         |  |                             |  |
|  | ,  | Teacher<br>(Alphab   | r(s)<br>petically)   | Dr. Puneet Rar   | na, Dr. N  | leha Ahlawat   |                             |  |
| COURSE OUTCOMES  |  |  |  |  |            |  |                             |  |
| After pursuing the above mentioned course, the students will be able to: |  |  |  |  |            | COGNITIVE<br>LEVELS  |                             |  |
| C302-4.1   | explair<br>physic  | n the funct<br>al problen  | tional and its<br>n.   | variations requi   | red to op  | otimize the  | Understanding<br>Level (C2) |  |
| C302-4.2   | apply o<br>variation   | different for a state of the second s | orms of Eule<br>ems with fix   | r–Lagrange equa<br>ed boundaries.  | ation on   | the various  | Applying Level (C3)         |  |
| C302-4.3   | explain<br>from I  | n different<br>VP and B  | types of inte<br>VP.   | egral equations in   | ncluding   | their conversions  | Understanding<br>Level (C2) |  |
| C302-4.4   | solve V<br>analyti   | Volterra an cal metho  | nd Fredholm<br>ds.   | integral equation  | ns using   | various  | Applying Level (C3)         |  |
| C302-4.5   | explair  | n various 1  | numerical me   | thods along with   | n their st | ability analysis.  | Understanding<br>Level (C2) |  |
| C302-4.6   | apply o  | apply different numerical methods for solving differential equations.  |  |  |            |  | Applying Level (C3)         |  |
| Module   | Title  | of the   | Topics in t  | he Module  |            |  | No. of Lectures             |  |
| No.  | Modu   | ule  |  |  |            |  | for the module              |  |
| 1.   | Function its Var   | Functional and Introduction, problem of brachistochrone, problem of geodesics, isoperimetric problem, variation and its properties, comparison between the notion of extrema of a function and a functional  |  |  |            |  | 8                           |  |
| 2.   | Variational<br>Problems with<br>FixedEuler's equation, the fundamental lemma of the<br>calculus of variations, examples, functionals in the<br>form of integrals, special cases contaning only some<br>of the variables, examples, functionals involving<br>more than one dependent variables and their first<br>derivatives the system of Euler's equations |  |  |  | 5          |  |                             |  |
| 3.   | Variati<br>Proble:<br>(contin  | tional<br>ems<br>nued)<br>Functionals depending on the higher derivatives of<br>the dependent variables, Euler- Poisson equation,<br>functionals containing several independent variables,<br>Ostrogradsky equation, Variational problems in<br>parametric form, applications to differential<br>equations.  |  |  |            | 5  |                             |  |
| 4.   | Fredho<br>Volteri<br>Integra<br>Equatio  | olm and<br>ra<br>Il<br>ons   | Introduction<br>Conversion<br>Conversion<br>decomposit<br>approximat<br>Fredholm a | itroduction and basic examples, Classification,<br>onversion of Volterra Equation to ODE,<br>onversion of IVP and BVP to integral equation,<br>ecomposition, direct computation, successive<br>pproximation, successive substitution methods for<br>redholm and Volterra integral equations. |            |  |                             |  |
| 5.   | Numer<br>Metho   | ical<br>ds   | Finite diffe<br>polynomial<br>implicit n<br>applications                           | te difference method, derivation from Taylor's 8<br>ynomial, Accuracy and order, explicit method,<br>dicit method, Crank–Nicolson method and<br>lications  |            |  |                             |  |
| 6.   | FEM<br>compa   | and its<br>rison   | Galerkin fin<br>problems, v  | erkin finite element method for one dimensional 8<br>olems, various type of elements and their shape   |            |  |                             |  |

|  |   | functions stiffness matrix assembly of equations            |                   |  |  |  |  |  |  |
|--|---|---|-------------------|--|--|--|--|--|--|
|  |   | handling of the boundary conditions, triangular and         |                   |  |  |  |  |  |  |
|  |   | nanding of the boundary conditions, trangular and           |                   |  |  |  |  |  |  |
|  |   | rectangular elements, stillness matrices and                |                   |  |  |  |  |  |  |
|  |   | assembly. Comparison of FEM and FDM.                        |                   |  |  |  |  |  |  |
| Tota   | l number of Lectures  |   | 42                |  |  |  |  |  |  |
| Eval   | uation Criteria   |   |                   |  |  |  |  |  |  |
| Com  | ponents   | Maximum Marks   |                   |  |  |  |  |  |  |
| T1   |   | 20  |                   |  |  |  |  |  |  |
| T2   |   | 20  |                   |  |  |  |  |  |  |
| End  | Semester Examination  | 35  |                   |  |  |  |  |  |  |
| TA   | 25 (Quiz, Assignments, Tutorials)   |   |                   |  |  |  |  |  |  |
| Tota   | 'otal 100   |   |                   |  |  |  |  |  |  |
| Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text |   |   |                   |  |  |  |  |  |  |
| book   | s, Reference Books, Jou   | irnals, Reports, Websites etc. in the IEEE format)          |                   |  |  |  |  |  |  |
| 1.   | Hilderbrand, F.B., M  | ethods of Applied Mathematics, 2ndEdition, Prentice Ha      | ıll, 1969.        |  |  |  |  |  |  |
| 2.   | Gupta, A.S., Calculus of Variations with Applications, Prentice Hall of India, 1997.            |   |                   |  |  |  |  |  |  |
| 3.   | Gelfand, I.M., Fomin  | S.V. Calculus of Variations, Prentice Hall, 1963.           |                   |  |  |  |  |  |  |
| 4  | Elsgolts, L., Differen  | tial Equations and the Calculus of Variations, Mir Pul      | blishers, Moscow, |  |  |  |  |  |  |
| 4.   | 1973.   |   |                   |  |  |  |  |  |  |
| 5.   | 5. Petrovsky, I.G., Lectures on the Theory of Integral Equations, Mir Publishers, Moscow, 1971. |   |                   |  |  |  |  |  |  |
| 6.   | Zienkiewicz, O.C., M  | organ, K., Finite Elements and Approximation, John Wi       | iley, 1983.       |  |  |  |  |  |  |
| 7  | Smith, G. D., Nume  | rical solution of partial differential equations: finite di | fference methods. |  |  |  |  |  |  |
| /.   | Oxford University Pre   | Oxford University Press, 1985                               |                   |  |  |  |  |  |  |

| Course Code                                |                   | 16B1NMA631                                       | Semester Even Semester VI<br>(specify Odd/Even) Month from   |                | Session 2018 - 2019 |         |                    |                                      |
|--|-------------------|--|--|----------------|---------------------|---------|--------------------|--------------------------------------|
| Course Name C                              |                   | Computational Con                                | tinuum Mechanic  | Even)          | Month               | Irom J  | an 2019-Ju         | ne2019                               |
| Credits 4                                  |                   |  |  | S<br>Contact I | Jours               | 3-1-0   | )                  |                                      |
| Faculty (Names) Coordinator(s)             |                   |  | Prof Sanieev Sharma  |                |                     |         |                    |                                      |
|  |                   | Toochor(s)                                       | Tion. Banjeev i  | Jildi Illa     |                     |         |                    |                                      |
|  |                   | (Alphabetically)                                 | Prof. Sanjeev S  | Sharma         |                     |         |                    |                                      |
| COURSE                                     | OUTCO             | OMES   |  |                |                     |         | COGNIT             | <b>TVE LEVELS</b>                    |
| After pursu                                | ing the           | above mentioned cou                              | rse, the students v  | will be able   | to:                 |         |                    |                                      |
| C302-2.1                                   | expla<br>value    | in the concept of exist<br>problems and their s  | stence and unique olutions.  | eness theore   | m of initi          | al      | Understar          | nding Level (C2)                     |
| C302-2.2                                   | apply<br>equat    | / matrix algebra to fin<br>tions.                | nd the solution of   | system of d    | ifferentia          | 1       | Applying           | Level (C3)                           |
| C302-2.3                                   | expla<br>funct    | uin Sturm-Liouville be<br>ions and Fourier serie | oundary value pro  | oblems, orth   | logonality          | y of    | Understar          | nding Level (C2)                     |
| C302-2.4                                   | ident<br>syste    | ify the phase plane, c ms.                       | ritical points and   | paths of nor   | nlinear             |         | Applying           | Level (C3)                           |
| C302-2.5                                   | expla<br>dime     | in the basic mechanic nsional system.            | cs of materials in   | two and thr    | ee                  |         | Understar          | nding Level (C2)                     |
| C302-2.6                                   | solve             | and examine the phy                              | vsical problems us   | sing differen  | ntial equa          | tions.  | Analyzing          | g Level (C4)                         |
| Module<br>No.                              | Title o           | of the Module                                    | Topics in the M  | Iodule         |                     |         |                    | No. of<br>Lectures for<br>the module |
| 1.   | Exister<br>Theore | nce and Uniqueness<br>em                         | The fundamental existence and uniqueness theorem,<br>dependence of solutions on initial conditions and on<br>the functions.  |                |                     | 8       |                    |                                      |
| 2.   | Sturm-<br>Bound   | Liouville<br>ary Value Problem                   | Sturm-Liouville problems, orthogonality of<br>characteristic functions, the expansion of a function<br>in a series of orthogonal functions, trigonometric<br>Fourier series.   |                |                     |         | function<br>netric | 12                                   |
| 3.   | Matrix<br>ODE's   | Methods to solve                                 | Matrix Method for Homogeneous Linear systems with Constant Coefficients.   |                |                     |         | stems              | 4                                    |
| 4.   | Theory<br>Differe | of Nonlinear ential Equations                    | Phase Plane, Paths and Critical Points and Paths of Nonlinear Systems.   |                |                     |         | 4                  |                                      |
| 5.   | Basic Contin      | Theory of<br>uum Mechanics                       | Stress, Strain, Differential Equation of Equilibrium in<br>a general three-dimensional stress system, Principal<br>Stresses and Strains, Generalized Hook's Law,<br>Mechanical Properties of Different Materials.<br>Applications. |                |                     |         | 6                  |                                      |
| 6.   | Plane T<br>Proble | Thermoelastic<br>ms                              | Plane Strain, Plane Stress, Stress Function, Complex<br>Variable Method, Potential Method, Finite<br>Difference Method.  |                |                     | Complex | 8                  |                                      |
| Total number of Lectures                   |                   |  |  |                |                     |         |                    | 42                                   |
| Evaluation Criteria                        |                   |  |  |                |                     |         |                    |                                      |
| T1 20                                      |                   |  |  |                |                     |         |                    |                                      |
| $\begin{array}{c} 11 \\ T2 \\ \end{array}$ |                   |  |  |                |                     |         |                    |                                      |
| 12<br>End Sam                              | aton E-           | 20<br>mination 25                                |  |                |                     |         |                    |                                      |
|  | ster Exa          | unination <b>35</b>                              | iz Aggionment-   | Tutoriala      |                     |         |                    |                                      |
| IA<br>Total                                |                   | 25 (Qu<br>100                                    | iz, Assignments,   | r utoriais)    |                     |         |                    |                                      |
| Total                                      |                   | 100  |  |                |                     |         |                    |                                      |

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

| 1. | Noda, N., Hetnarski, R.B., Tanigawa, Y., Thermal Stresses, 2 <sup>nd</sup> Ed., Taylor & Francis, New York, 2003. |
|----|---|
| 2. | Ross, S.L., Differential Equations, 3 <sup>rd</sup> Ed., John Wiley & Sons, 2004.                                 |
| 3. | Chandramouli, P.N., Continuum Mechanics, Yes Dee Publishing India, 2014.  |
| 4. | Hearn, E.J., Mechanics of Materials, Vol. 1 & 2, 3 <sup>rd</sup> Ed., Elsevier, 2008.                             |
| 5. | Gupta, R.S., Elements of Numerical Analysis, by 1st Ed., Macmillan, 2009.   |

| Course Code | 19M12MA611  | Semester - Even    | Semeste                              | Semester VI Session 2018-2019 |  |  |
|-------------|---|--------------------|--------------------------------------|-------------------------------|--|--|
|             |   | (specify Odd/Even) | Month from January 2019 to June 2019 |                               |  |  |
| Course Name | Mathematical Foundations of Geographic Information System |                    |                                      |                               |  |  |
| Credits     | 4   | Contact            | Hours                                | 3-1-0                         |  |  |

| Faculty (Names) | Coordinator(s)                 | Dr. Lakhveer Kaur |
|-----------------|--------------------------------|-------------------|
|                 | Teacher(s)<br>(Alphabetically) | Dr. Lakhveer Kaur |

| COURSE      | OUTCOMES  | COGNITIVE LEVELS         |
|-------------|---|--------------------------|
| After pursu | ing the above mentioned course, the students will be able to:   |                          |
| C302-5.1    | Understand the concept of Trigonometry, Coordinate systems and<br>Geometric Transformations and then its applications for Geographic<br>information system. | Applying Level (C3)      |
| C302-5.2    | Identify basic set operations and database technology based on predicates, quantifiers and predicate Logic.   | Understanding Level (C2) |
| C302-5.3    | Describe Geo-statistical methods, used for Geographic information system.   | Understanding Level (C2) |
| C302-5.4    | Explain quantitative aspects for image analysis by using analytic and numerical methods.  | Analyzing Level (C4)     |
| C302-5.5    | Understand the concepts of space and time in spatial information systems and spatiotemporal data models.  | Evaluating Level (C5)    |

| Module<br>No. | Title of the Module  | Topics in the Module  | No. of<br>Lectures for |
|---------------|----------------------|---|------------------------|
|               |                      |   | the module             |
| 1.            | Trigonometry         | Trigonometric functions, allied angles, compound angles.  | 4                      |
| 2.            | Coordinate Systems   | Cartesian rectangular coordinate system, distance formula,  | 4                      |
|               |                      | section formula, Straight lines, slopes, types of straight lines, Application in solving life science problems. |                        |
| 3.            | Geometric            | Geometric Transformations and its applications for  | 2                      |
|               | Transformations      | Geographic information system   |                        |
| 4.            | Set Theory           | Review of Set Theory, Overlay operations in Geoinformatics  | 3                      |
| 5.            | Propositional and    | Relational database technology based on Predicates,   | 5                      |
|               | Predicate Logic      | Quantifiers and Predicate Logic.  |                        |
| 6.            | Geo-statistical      | Principle of Least Squares, Fitting of straight line and  | 6                      |
|               | methods              | parabola, Correlation - Karl Pearson's coefficient of correlation and Spearmann's rank correlation              |                        |
| 7.            | Regression and ANOVA | Linear regression, One way and two way classification of ANOVA.   | 6                      |
| 8             | Image analysis and   | Quantitative aspects in decision making for image analysis,   | 6                      |
|               | Map Algebra          | Tools available for image analysis -analytical and  |                        |
|               |                      | numerical-Fourier series, Fourier Transforms, Map   |                        |
|               |                      | Algebra.  |                        |
| 9             | Spatial Modeling and | Spatial Data and Information, Concepts of Space and Time  | 6                      |
|               | Database Design      | in Spatial information Systems, Database Design, Spatial  |                        |
| Tatal         | mb an af Lastrias    | Data models, Spatio-temporal Data models.   | 42                     |
| Total nul     | nder of Lectures     |   | 42                     |
| Evaluatio     | on Criteria          |   |                        |

| Components               | Maximum Marks                     |
|--------------------------|-----------------------------------|
| T1                       | 20                                |
| Τ2                       | 20                                |
| End Semester Examination | 35                                |
| ТА                       | 25 (Quiz, Assignments, Tutorials) |
| Total                    | 100                               |

| Reco | ommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books,   |
|------|--|
| Refe | rence Books, Journals, Reports, Websites etc. in the IEEE format)  |
| 1.   | Edward, B., Introduction to Mathematics for life scientist – Springer, 1979.   |
| 2.   | Burrough, P. A. and McDonnell R. A., Principles of Geographical Information Systems. Oxford  |
| -    | University riess, 1996. $\mathbf{V} = \mathbf{V} + \mathbf{U} + \mathbf{U}$ |
| 3.   | Leung, Y., Intelligent Spatial Decision Support Systems. Springer-Verlag, Berlin, Heidelberg, 1997.  |
| 4.   | Mackenzie, A., Mathematics and Statistics for Life Scientists, Taylor & Francis, New York, 2005.   |
| 5    | Leung, Y., Intelligent Spatial Decision Support Systems. Springer-Verlag, Berlin, Heidelberg, 1997.  |
| 6.   | Gupta, S. C. and Kapoor, V. K., Fundamentals of Applied statistics, Sultan Chand and sons, 2003.   |

| Course Code     | 19M12MA612                     | Semester Even<br>(specify Odd/Even)               |  | Semester VI Session 2018 -2019<br>Month from Jan – June 2019 |  |  |
|-----------------|--------------------------------|---|--|--|--|--|
| Course Name     | Mathematical Model             | ing with Emphasis on Epidemics and Social Aspects |  |  |  |  |
| Credits         | 4                              | Contact Hours 3-1-0                               |  |  |  |  |
| Faculty (Names) | Coordinator(s)                 | Dr. Pankaj Kumar Srivastava                       |  |  |  |  |
|                 | Teacher(s)<br>(Alphabetically) | Dr. Pankaj Kumar Srivastava                       |  |  |  |  |
|                 |                                |   |  |  |  |  |

| COURSE      | OUTCOMES  | COGNITIVE LEVELS         |  |
|-------------|---|--------------------------|--|
| After pursu |   |                          |  |
| C302-6.1    | explain the basic concepts of differential equations, eigen values, eigen vectors and stability theory. | Understanding Level (C2) |  |
| C302-6.2    | develop mathematical models through differential equations.   | Applying Level (C3)      |  |
| C302-6.3    | explain linear and nonlinear population models.   | Understanding Level (C2) |  |
| C302-6.4    | analyze models of epidemic nature.  | Analyzing Level (C4)     |  |
| C302-6.5    | analyze modeling on social aspects.   | Analyzing Level (C4)     |  |

| Module<br>No. | Title of the<br>Module  | Topics in the Module  | No. of<br>Lectures for<br>the module |
|---------------|---|---|--------------------------------------|
| 1.            | Basic concepts of<br>differential<br>equations and eigen<br>vectors | Basics of differential equations, formation of differential<br>equations, separable, linear and exact differential equations,<br>reducible to these forms, eigen values and eigen vectors,<br>system of differential equations, stability theory and<br>bifurcation | 9                                    |
| 2.            | Mathematical<br>models through<br>differential<br>equations         | Problem definition and formation of mathematical models,<br>principles of mathematical modeling, mechanical<br>applications of differential equations, models through<br>system of differential equations   | 12                                   |
| 3.            | Mathematical linear<br>and nonlinear<br>population models           | Types of linear and nonlinear population models, prey-<br>predator model, harvesting models, fishery models   | 5                                    |
| 4.            | Various<br>mathematical<br>models of<br>Epidemics                   | Susceptible-Infective-Recovered (SIR) type models, Viral infection models, HIV model  | 8                                    |
| 5.            | Various<br>mathematical<br>models in Social<br>Aspects              | Traffic flow model, medicine, arms race battles models, international trades models, Pitfalls in modeling   | 8                                    |
|               |   | Total number of Lectures  | 42                                   |
| Evaluation    | n Criteria  |   |                                      |
| Compone       | nts   | Maximum Marks   |                                      |

| T1                       | 20                                 |
|--------------------------|------------------------------------|
| T2                       | 20                                 |
| End Semester Examination | 35                                 |
| ТА                       | 25 (Quiz , Assignments, Tutorials) |
| Total                    | 100                                |

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| Reco<br>Refe | <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>M. D. Raisinghania</b> , Ordinary and Partial Differential Equations, 19 <sup>th</sup> edition, S. Chand Publishing, 2017.  |  |  |  |  |
| 2.           | J. N. Kapur, Mathematical Modeling, New Age International press, 2000.   |  |  |  |  |
| 3.           | <b>D. N. Murthy, N. W. Page, E. Y. Rodin</b> , <i>Mathematical Modelling: a tool for problem solving in engineering, physical, biological, and social sciences</i> , Pergamon Press, 1990. |  |  |  |  |
| 4.           | C. L. Dym, Principles of Mathematical Modelling, Elsevier Press, Second Edition, 2004.   |  |  |  |  |
| 5.           | E. A. Bender, An Introduction to Mathematical Modeling, Dover, 2000.   |  |  |  |  |
| 6.           | <b>W. E. Boyce and R. C. Diprima</b> , <i>Elementary Differential Equations and Boundary Value Problems</i> , 7th Edition, Wiley, 2001.  |  |  |  |  |

| Course Co            | de18B12MA611SemesterEvenSemesterVISessionMonth fromJan 2011                        |  |  |  |             | ion 2018 -2019<br>2019 - June 2019 |                     |                     |
|----------------------|--|--|--|--|-------------|------------------------------------|---------------------|---------------------|
| Course Na            | me   | Operations Res                           | searc  | h  |             |                                    |                     |                     |
| Credits              | -  | 4  |  | (  | Cor         | tact Hours                         | 3-1-0               |                     |
| Faculty Coordinator( |  |  | s)   | ) Dr. Pato Kumari                            |             |                                    |                     |                     |
| (Names)              | Teacher(s)   |  | Prof A K Aggarwa   | al   |             |                                    |                     |                     |
| (Alphabetical        |  |  | v)   | Dr. Amita Bhagat                             | uı          |                                    |                     |                     |
| COURSE OUTCOMES      |  |  |  |  |             |                                    | COGNITIVE<br>LEVELS |                     |
| After pursu          | ing the  | e above mention                          | ed co  | ourse, the students wil                      | ll be       | e able to:                         |                     |                     |
| C302-3.1             | const<br>linear<br>meth  | ruct mathemation<br>r programming<br>od. | cal n<br>prol  | nodels for optimizati<br>blems (LPP) using   | ion<br>gra  | problems and<br>phical and sin     | solve<br>nplex      | Applying Level (C3) |
| C302-3.2             | apply<br>progr   | v two-phase, l<br>camming problem        | Big-N<br>ns.   | A and dual simple                            | ex          | method for l                       | inear               | Applying Level (C3) |
| C302-3.3             | make   | use of sensitivi                         | ty an  | alysis to linear progra                      | ımn         | ning problems.                     |                     | Applying Level (C3) |
| C302-3.4             | solve  | transportation,                          | assig  | nment and travelling                         | sale        | esman problems                     |                     | Applying Level (C3) |
| C302-3.5             | apply cutting plane and branch & bound techniques to integer programming problems. |  |  |  | teger       | Applying Level (C3)                |                     |                     |
| C302-3.6             | examine optimality conditions and solve multivariable nonlinear problems.          |  |  |  | inear       | Analyzing<br>Level (C4)            |                     |                     |
| Module<br>No.        | TitleoftheTopics in the ModuleModule   |  |  | No. of Lectures for the module               |             |                                    |                     |                     |
| 1.                   | Preli  | minaries                                 | Intr<br>Pha  | oduction, Operation<br>uses and Scope of O.R | ns<br>2. Si | Research Mo<br>tudies.             | odels,              | 3                   |
| 2.                   | Linea  | ar                                       | Convex Sets, Formulation of LPP, Graphical                                       |  |             | 8                                  |                     |                     |
|                      | Prog   | amming                                   | Solutions, Simplex Method, Big-M Method,   |  |             |                                    |                     |                     |
|                      | Problems (LPP)   |  |  | thod   | eci         | al Cases in Sin                    | npiex               |                     |
| 3                    | Dual   | ity and                                  | Prin   | nal-Dual Relations                           | shir        | Duality                            | Dual                | 8                   |
|                      | Sensi  | tivity Analysis                          | Sin  | plex Method, Sensitiv                        | vity        | Analysis.                          |                     | -                   |
| 4.                   | Trans  | sportation                               | Intr   | oduction, Matrix For                         | rm,         | Applications,                      | Basic               | 5                   |
|                      | Prob   | ems                                      | Fea  | sible Solution- Nor                          | th          | West Corner                        | Rule,               |                     |
|                      |  |  | Lea  | ist Cost Method, N                           | v og        | el's Approxim                      | ation               |                     |
|                      |  |  | Method. Degeneracy, Resolution on<br>Degeneracy Optimal Solution Maximization TP |  |             | on<br>n TP                         |                     |                     |
|                      |  |  | Mo   | del.   | 10101       | on, municul                        |                     |                     |
| 5.                   | Assig<br>Probl   | gnment<br>lems                           | Def<br>Sal   | finition, Hungarian esmen Problems.          |             | Method, Trav                       | reling              | 4                   |
| 6.                   | Integ  | er Linear                                | Pur  | e and Mixed Intege                           | er l        | Linear Program                     | ming                | 6                   |
|                      | Progr<br>Probl   | ramming<br>lems                          | Pro<br>Boi   | blems, Cutting Plane<br>and Method.          | e N         | Method, Branch                     | and                 |                     |
| 7.                   | Non  | Linear                                   | Intr   | oduction to NLP,                             | col         | nvex functions                     | and                 | 8                   |
|                      | Prog   | ramming                                  | graj   | phical solution, U                           | ncc         | onstrained Prol                    | olem,               |                     |
|                      |  |  | eau  | ality constraints K                          | · L<br>uhr  | agrange Metho<br>Tucker Condi      | tions               |                     |
|                      |  |  | for  | inequality co                                | onst        | raints, Quad                       | dratic              |                     |
|                      |  | Programming -Wolfe's Method              |  |  |             |                                    |                     |                     |
| Total num            | ber of   | Lectures                                 |  |  |             |                                    |                     | 42                  |
| Evaluation           | Crite  | ria                                      |  |  |             |                                    |                     |                     |

| Components   |  | Maximum Marks  |  |  |  |  |
|--|--|--|--|--|--|--|
| T1   |  | 20   |  |  |  |  |
| T2   |  | 20   |  |  |  |  |
| End  | Semester Examination   | 35   |  |  |  |  |
| ТА   |  | 25 (Quiz, Assignments, Tutorials)                                  |  |  |  |  |
| Total  |  | 100  |  |  |  |  |
| Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text |  |  |  |  |  |  |
| books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)                       |  |  |  |  |  |  |
| 1.   | Taha, H. A Operations R  | esearch - An Introduction, Pearson Education, 2005.                |  |  |  |  |
| 2.   | Hadley, G Linear Programming, Massachusetts: Addison-Wesley, 1962.                         |  |  |  |  |  |
| 3.   | Hiller, F.S. and Lieberman, G. J Introduction to Operations Research, San Francisco, 1995. |  |  |  |  |  |
| 4.   | Wagner, H. M Principle   | s of Operations Research with Applications to Managerial Decision, |  |  |  |  |
|  | PHI, 1975.   |  |  |  |  |  |
| 5.   | Vohra, N. D., Quantitative   | Techniques in Management, Second Edition, TMH, 2003.               |  |  |  |  |
| 6.   | Taha, H. A Operations R  | esearch - An Introduction, Pearson Education, 2005.                |  |  |  |  |

| Course Code   |  | 16B1NMA63  | 33 Semester : Even  |   | en                          | Semester VI Session 2018 -2019<br>Month from Jan 2019 to June 2019    |                                |  |
|---------------|--|--|---|---|-----------------------------|---|--------------------------------|--|
| Course Name   |  | Statistics   |   |   |                             |   |                                |  |
| Credits       |  | 4  | )   |   |                             |   |                                |  |
| Faculty (N    | ames)  | Coordinato   | r(s)  | Dr Himanshu   | Agar                        | wal   | ,<br>                          |  |
| i acuity (i)  | unicsy   | Too ah ar(a)   | (3)   | Dr. Anui Dhor   | durai                       | Dr. Himonshu A comu   | al Dr Dinkay                   |  |
|               |  | (Alphabetically) Dr. Anuj Bhardwaj, Dr. Himanshu Agarw |   |   |                             | DI. Himanshu Agarw  | al, DI. Plikey                 |  |
| COURSE        | OUTCO  | OMES   |   |   |                             |   | COGNITIVE<br>LEVELS            |  |
| After pursu   | After pursuing the above mentioned course, the students will be able to:   |  |   |   |                             |   |                                |  |
| C302-1.1      | make use of measures of central tendency, dispersion, skewness and, kurtosis for description and visualization of population data. |  |   |   |                             | Applying Level (C3)   |                                |  |
| C302-1.2      | apply correlation and regression in statistical analysis of data.  |  |   |   |                             |   | Applying Level<br>(C3)         |  |
| C302-1.3      | explain sampling theory and its distributions.   |  |   |   | Understanding<br>Level (C2) |   |                                |  |
| C302-1.4      | explain the concepts and properties of estimation theory.  |  |   |   |                             |   | Understanding<br>Level (C2)    |  |
| C302-1.5      | apply s  | sampling and e   | stimatio  | on theory to find   | the c                       | onfidence interval.   | Applying Level (C3)            |  |
| C302-1.6      | analyze small and large sample data by using the test of hypothesis.   |  |   |   |                             |   | Analyzing Level (C4)           |  |
| Module<br>No. | Title o<br>Modu  | f the<br>le  | Topics in the Module  |   |                             |   | No. of Lectures for the module |  |
| 1.            | Descri<br>Statisti   | ptive<br>ics   | Graphical representation such as histogram,<br>frequency polygon, AM, GM, HM, median,<br>mode, measures of dispersion, skewness and<br>kurtosis such as central and non-central<br>moments, population variance, $\beta$ , $\gamma$ coefficient,<br>Box and Whisker plot. |   |                             |   | 8                              |  |
| 2.            | Correla<br>Regres<br>Analys  | ation and<br>ssion<br>sis                              | Scatter<br>rank of<br>regress   | c diagram. Karl<br>correlation coef   | 5                           |   |                                |  |
| 3.            | Sampling and<br>Sampling<br>Distributions  |  | Populations and Sample, random sample, statistics, sample moments, law of large numbers, central limit theorem, distribution of sample mean and sample variance, MGF, Chi-square distribution, F-distribution, Student's <i>t</i> distribution.                           |   |                             |   | 7                              |  |
| 4.            | Parametric Point<br>Estimation   |  | General concept of point estimation, methods of<br>moments and maximum likelihood for finding<br>estimators, unbiasedness, consistency,<br>efficiency, UMVUE, Cramer-Rao inequality,<br>sufficiency, factorization theorem, completeness,<br>Rao-Blackwell theorem.       |   |                             | 10  |                                |  |
| 5.            | Parame<br>Estima   | etric Interval<br>tion                                 | definit<br>quantit<br>differe<br>for sma  | ion of confidence in<br>ty, confidence in<br>nce of means an<br>all and large sam | 5                           |   |                                |  |
| 6.            | Hypothesis Testing   |  | The b<br>alterna<br>testing   | asic idea of si<br>tive hypothesis,<br>of small and                               | gnifi<br>type<br>large      | cance test. null and<br>-I and type II errors,<br>e samples for mean, | 7                              |  |

|  |  | variance, difference in means, and difference in     |                 |  |  |  |  |  |
|--|--|--|-----------------|--|--|--|--|--|
|  |  | variances.   |                 |  |  |  |  |  |
| Total number of Lectures 42  |  |  |                 |  |  |  |  |  |
| Eval   | Evaluation Criteria  |  |                 |  |  |  |  |  |
| Com  | ponents  | Maximum Marks  |                 |  |  |  |  |  |
| T1   |  | 20   |                 |  |  |  |  |  |
| T2   |  | 20   |                 |  |  |  |  |  |
| End  | Semester Examination   | 35   |                 |  |  |  |  |  |
| TA   |  | 25 (Quiz, Assignments, Tutprials)                    |                 |  |  |  |  |  |
| Tota   | 1  | 100  |                 |  |  |  |  |  |
| Recommended Reading material: Author(s), Title, Edition, Publisher, Year of Publication etc. (Text |  |  |                 |  |  |  |  |  |
| books, Reference Books, Journals, Reports, Websites etc. in the IEEE format)                       |  |  |                 |  |  |  |  |  |
| 1  | Biswas and Srivastava, A Textbook, Mathematical Statistics Ist Edition, Narosa Publishing        |  |                 |  |  |  |  |  |
| 1.   | House, New Delhi.  |  |                 |  |  |  |  |  |
| 2  | W. Feller, Introduction to Probability Theory and its Applications Vol. I and II. Wiley Eastern- |  |                 |  |  |  |  |  |
| 2.   | Ltd, 1971  |  |                 |  |  |  |  |  |
| 3.   | V. K.Rohatgi, An Introduction to Probability Theory and Mathematical Statistics Wiley Eastern,   |  |                 |  |  |  |  |  |
|  | 1984   |  |                 |  |  |  |  |  |
| 4.   | R. V. Hogg, A. T. Craig, Introduction to Mathematical Statistics, McMillan, 1971                 |  |                 |  |  |  |  |  |
| 5  | AM. Mood, F. A. Graybill, and D. C. Boes, Introduction to the Theory of Statistics McGraw        |  |                 |  |  |  |  |  |
|  | Hill, 1974   |  |                 |  |  |  |  |  |
| 6.   | Des Raj & Chandak, Sampling Theory, Narosa Publishing House, 1998.                               |  |                 |  |  |  |  |  |
| 7.   | Sheldon Ross, A First Course in Probability, 6th edition, Pearson Education Asia, 2002.          |  |                 |  |  |  |  |  |
| 8.   | Meyer, P.L, Introductory   | Probability and Statistical Applications Addison-Wes | sley Publishing |  |  |  |  |  |
|  | Company, 1965.   |  |                 |  |  |  |  |  |
| Course Code     | 16B1NPH632                     | Semester EVEN                             |           | Semester VI Session 2018 -2019<br>Month from January to June |   |  |
|-----------------|--------------------------------|---|-----------|--|---|--|
| Course Name     | SOLID STATE ELE                | LID STATE ELECTRONIC DEVICES              |           |  |   |  |
| Credits         | 4 Cont                         |   | Contact I | Hours  | 4 |  |
| Faculty (Names) | Coordinator(s)                 | Dr. Dinesh Tripathi & Dr. Sandeep Chhoker |           |  |   |  |
|                 | Teacher(s)<br>(Alphabetically) | Dr. Dinesh Tripathi & Dr. Sandeep Chhoker |           |  |   |  |

| COURSE   | OUTCOMES   | COGNITIVE LEVELS   |
|----------|--|--------------------|
| C302-7.1 | Define terminology and concepts of semiconductors with solid state electronic devices.                                       | Remembering (C1)   |
| C302-7.2 | Explain various electronic, optical and thermal properties of semiconductors; various techniques used in device fabrication. | Understanding (C2) |
| C302-7.3 | Solve numerical problems based on solid state electronic devices.  | Applying (C3)      |
| C302-7.4 | Examine the impact of various parameters on semiconductor devices and their performances.                                    | Analyzing (C4)     |

| Module<br>No.                  | Title of the<br>Module   | Topics in the Module   | No. of<br>Lectures for<br>the module |
|--------------------------------|--|--|--------------------------------------|
| 1.                             | Energy band and<br>charges carriers in<br>conductors<br>Bonding forces and energy bands in solids, charge carriers<br>in semiconductors, carries concentrations, drift of carriers in<br>electric and magnetic fields, Invariance of the Fermi level at<br>equilibrium, optical absorption, Luminescence, Carrier<br>lifetime and photoconductivity, diffusion of carriers |  |                                      |
| 2.                             | Junctions  | Fabrication of p-n junctions, equilibrium conditions, steady<br>state conditions, reverse bias breakdown, recombination<br>and generation in the transition region, metal semiconductor<br>junctions, heterojunctions, | 10                                   |
| 3.                             | Transistors  | Field effect transistor (FET), Metal-insulator FET, Metal-<br>insulator-semiconductor FET, MOS FET, Bipolar junction<br>transistors  | 08                                   |
| 4.                             | Devices  | Photodiodes, solar cell, light emitting diodes,<br>semiconductor lasers, Negative conductance Microwave<br>devices: Tunnel diode, IMPATT diode, Gunn diode   | 10                                   |
|                                |  | Total number of Lectures   | 40                                   |
| Evaluation                     | n Criteria   |  |                                      |
| Compone                        | nts  | Maximum Marks  |                                      |
| T1<br>T2                       |  | 20   |                                      |
| 12<br>Fnd Semester Examination |  | 20 35  |                                      |
| TA                             |  | 25 [2 Quiz (10), Attend. (10) and Class performance (5)]   |                                      |
| Total                          |  | 100  |                                      |

| Reco | Recommended Reading material:  |  |  |  |
|------|--|--|--|--|
| 1.   | Donald A Neamen & Dhrubes Biswas, Semiconductor Physics and Devices, McGraw Hill Education |  |  |  |

| 2. | S. M. Sze, Physics of Semiconductor devices, Wiley-Interscience          |
|----|--|
| 3. | Streetman and Banerjee, Solid State Electronic devices, PHI              |
| 4. | Umesh Mishra and Jasprit Singh, Semiconductor Device Physics and Design, |

| Course Code              |  | 16B1NPH633                                     | 3   | Semester :Even Semester VI S<br>Month: Januar  |  | Session 2018 -2019<br>ary to June                           |   |            |            |
|--------------------------|--|--|---|--|--|---|---|------------|------------|
| Course Name Photovoltaic |  |  | Techniq   | lues   |  |   |   |            |            |
| Credits                  |  |  | 4   |  | Contact H  | Iours   |   | Z          | ł          |
| Faculty (N               | ames)  | Coordinator                                    | r(s)  | Dr. B. C. Joshi  | and Dr. Pra  | ashant Ch   | auhan   |            |            |
|                          |  | Teacher(s)                                     |   | Dr. B. C. Joshi and Dr. Prashant Chauhan   |  |   |   |            |            |
| COURSE                   | OUTCO  | OMES   |   |  |  |   |   | COGNIT     | IVE LEVELS |
| C302-8.1                 | Classif<br>of phot   | y various type tovoltaic devic                 | of renev<br>e.  | wable energy sou   | urces and ex   | kplain wo   | rking   | Remembe    | ring (C1)  |
| C302-8.2                 | Demor  | nstrate the use                                | of basic  | principles to mo   | del photov   | oltaic dev  | vices   | Understan  | ding (C2)  |
| C302-8.3                 | Identif<br>various   | y challenges ar<br>s type of solar             | nd apply<br>cells   | v strategies to opt  | timize perfo   | ormance of  | of  | Applying   | (C3)       |
| C302-8.4                 | Analyz<br>module   | ze Solar PV mo<br>e                            | odule, m  | ismatch paramet  | ter and ratin  | ng of PV  |   | Analyzing  | g (C4)     |
| C302-8.5                 | Evalua<br>battery  | te the performation of the performand AC and E | ance of DC load   | various stand-al   | one PV sys   | tems with   | 1   | Evaluating | (C5)       |
| Module<br>No.            | Title of the<br>ModuleTopics in the Module   |  |   | No. of<br>Lectures for<br>the module   |  |   |   |            |            |
| 1.                       | Review Energy issues, conventional energy sources, Renewable energy sources, Solar Energy  |  |   | Renewable  | 02   |   |   |            |            |
| 2.                       | Solar cellFundamental of semicon<br>motion in semicondu<br>recombination, p-n junc<br>cell, p-n junction under<br>V), open circuit voltage<br>Maximum power, curr<br>Ouantum Efficiency  |  |   | conductor,<br>ductors, c<br>inction dio<br>er illuminat<br>ge $(V_{OC})$ , s<br>irrent and | charge c<br>arriers<br>de, intro-<br>tion, Cu<br>short circ<br>voltage | arriers<br>genera<br>ductior<br>rrent-V<br>cuit cu<br>and H | and their<br>tion and<br>n to solar<br>Voltage (I-<br>rrent (I <sub>SC</sub> )<br>Efficiency, | 10         |            |
| 3.                       | Design<br>cells  | n of solar                                     | solarUpper limits of cell parameters, loses in solar cell, solar cell<br>design, design for high Isc, Voc, FF, solar simulators08 |  |  | 08  |   |            |            |
| 4.                       | Solar<br>technologiescellProduction of Si, Si wafer based solar cell technology, thin<br>film solar cell technologies (CIGS, microcrystalline and<br>polycrystalline Si solar cells, amorphous Si thin film solar<br>cells), multijunction solar cells, Emerging solar cell<br>technologies: organics solar cells, Dye-sensitized solar cell<br>(DSC), GaAs solar cell |  | 12  |  |  |   |   |            |            |
| 5.                       | Photovoltaic<br>systemPV system : Introduction, Stand alone system, Grid<br>connected system, Hybrid system, Designing of PV system,<br>Balance of system- BOS (Inverters, Controllers, Wiring,<br>Batteries) Photovoltaic Cells, Estimating PV system size<br>and cost, Photovoltaic safety.0   |  |   | 08   |  |   |   |            |            |
|                          |  |  |   |  | T  | otal nun  | iber of   | f Lectures | 40         |
| Evaluation               | Criter   | ia   | Mart  | um Maula   |  |   |   |            |            |
| Componen                 | lts  |  | waxim   | um Marks   |  |   |   |            |            |

| 20   |
|--|
| 20   |
| 35   |
| 25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)] |
| 100  |
|  |

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

| 1. | Tom Markvart and Luis Castaner, "Solar Cells: Materials, Manufacture and Operations," Elsevier, 2006 |
|----|--|
| 2. | Stuart R. Wenhem, Martin A. Green, M.E. Watt, "Applied Photovoltaics," Earthscan, 2007               |
| 3. | Jenny Nelson, "The Physics of Solar Cells" Imperial college press," 003. Aatec publications, 1995.   |
| 4. | C S Solanki, Solar Photovoltaics, PHI  |

| Course Co                                 | ode   | 16B1NPH634                                       | Semester: EvenSemester VIMonth: from .   |                    | Session 2018 -2019<br>January to June |                  |   |
|---|---|--|--|--------------------|---------------------------------------|------------------|---|
| Course Name Applied Statistical Mechanics |   |  |  |                    |                                       |                  |   |
| Credits                                   |   | 4  |  | Contact I          | Hours                                 |                  | 4 |
| Faculty (Names)                           |   | Coordinator(s)                                   | Dr. Navendu Goswami  |                    |                                       |                  |   |
|   |   | Teacher(s)<br>(Alphabetically)                   | Dr. Navendu Goswami  |                    |                                       |                  |   |
| COURSE                                    | COURSE OUTCOMES COGNITIVE LEVELS  |  |  |                    |                                       | COGNITIVE LEVELS |   |
| C302-9.1                                  | C302-9.1 Define the fundamental parameters of Thermodynamics and Statistical Mechanics.                       |  | stical   | Remembering (C1)   |                                       |                  |   |
| C302-9.2                                  | <b>302-9.2</b> Explain the Thermodynamic potentials, Maxwell's equations and Heat Understanding (C equations. |  |  | Understanding (C2) |                                       |                  |   |
| C302-9.3                                  | Apply<br>unders   | the concepts of there<br>tand the phase space as | ermodynamics and statistical ensembles to Applying (C3)<br>e and distribution functions. |                    |                                       | Applying (C3)    |   |
| C202 0 4                                  | Determine the distribution functions in case of various types of $E_{\text{Evaluating}}(C5)$                  |  |  | Evaluating (C5)    |                                       |                  |   |

| C302-9.4 | physical and chemical ensembles.   | Evaluating (C5) |
|----------|--|-----------------|
| C302-9.5 | Evaluate the ideas of Entropy with respect to Probability and Information Theory; and conclude Liouville's equation. | Evaluating (C5) |

| Module<br>No.                                      | Title of the<br>Module   | Topics in the Module  | No. of<br>Lectures for<br>the module |  |  |
|--|--|---|--------------------------------------|--|--|
| 1.   | Basic<br>Thermodynamics  | Overview of basic laws of Thermodynamics; Microscopic<br>and macroscopic parameters, Thermodynamic potentials;<br>Introduction to equilibrium and non-equilibrium systems<br>and related problems; Entropy and probability; |                                      |  |  |
| 2.   | Statistical<br>Ensembles   | Concept of Statistical ensembles, Density of States; Micro canonical, Canonical, Grand-canonical emsembles  | 5                                    |  |  |
| 3.   | Distribution<br>functionsMaxwell-Boltzmann, Bose-Einstein, Fermi-Dirac and their<br>applications |   | 6                                    |  |  |
| 4.   | Non-equilibrium systems  | Liouville's equation, von Neumann equation; Random walk, Stochastic methods;  | 6                                    |  |  |
| 5.   | Modeling and Simulations   | Ising model and its applications, Molecular dynamics,<br>Monte-Carlo simulations and Multi-scale modeling for<br>materials properties and engineering applications.   | 15                                   |  |  |
| 6.   | Applications   | Applications of ensemble formalism in dynamics of neural<br>networks, ensemble forecasting of weather, propagation of<br>uncertainty over time, regression analysis of gravitational<br>orbits etc.,                        | 5                                    |  |  |
|  |  | Total number of Lectures  | 40                                   |  |  |
| Evaluatio  | n Criteria   |   |                                      |  |  |
| Components<br>T1<br>T2<br>End Semester Examination |  | Maximum Marks<br>20<br>20<br>35<br>25 [2 Quiz (10 M), Attendence (10 M) and Cose performance  | (5 M)]                               |  |  |

| Tota         | l 100   |
|--------------|---|
| Reco<br>Refe | <b>Ommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books, rence Books, Journals, Reports, Websites etc. in the IEEE format) |
| 1.           | Frederick Reif, Fundamentals of Statistical and Thermal Physics, Waveland Pr Inc, 2008.   |
| 2.           | Kerson Huang, Statistical Mechanics, Wiley, 2 <sup>nd</sup> Ed., 1987.  |
| 3.           | R K Pathria, Paul D. Beale, Statistical Mechanics, Academic Press, 3rd Ed., 2011.   |
| 4.           | Daniel V. Schroeder, An Introduction to Thermal Physics, Addison-Wesley, 1st Ed., 1999  |
| 5.           | L D Landau, <i>Statistical Physics, Part 1: Volume 5 (Course of Theoretical Physics)</i> , Butterworth-<br>Heinemann, 3 <sup>rd</sup> Ed., 1980                                 |

| Course Code   |                                     | 16B1NPH63  | 5   | Semester Even   Semester VI     Month from Ja   |                            | I <b>Session</b> 2018 -2019<br>n January to June |                         |                                      |            |
|---|-------------------------------------|--|---|---|----------------------------|--|-------------------------|--------------------------------------|------------|
| Course Name   |                                     | Analytical Te  | Analytical Techniques for Materials                                   |   |                            |  |                         |                                      |            |
| Credits   |                                     |  | 4   |   | Contact H                  | lours  |                         | 4                                    | ļ          |
| Faculty (N  | ames)                               | Coordinato   | r(s)  | Dr. Himanshu  | Pandey                     |  |                         |                                      |            |
|   |                                     | Teacher(s)<br>(Alphabetica   | ally)   | Dr. Himanshu  | Pandey                     |  |                         |                                      |            |
| COURSE  | OUTC                                | COMES  |   |   |                            |  |                         | COGNIT                               | IVE LEVELS |
| C302-10.  | 1 Ro                                | ecall preliminar<br>r the structure-p  | y conce<br>roperty  | pts of various cl<br>relationship of n  | haracterizat<br>naterials. | ion techn  | iques                   | Remembe                              | ring (C1)  |
| C302-10.2   | O<br>ba                             | utline different<br>sic knowledge a  | sophisti<br>bout wo   | icated character<br>orking principle.   | ization tool               | ls and ex  | plain                   | Understan                            | ding (C2)  |
| C302-10.3   | Id<br>ar<br>va                      | entify characteriallysis and solver solver and solver a | ization to<br>ve relate<br>s.   | ool as per the ne<br>ed problems bas  | cessity of n<br>sed on cor | neasureme<br>ncepts use                          | ent or<br>ed in         | Applying                             | (C3)       |
| C302-10.4   | Ez<br>sp                            | kamine material<br>ecific technique  | 's prope<br>s.  | rties and analyz  | the result                 | s in conte                                       | ext of                  | Analyzing                            | g (C4)     |
| Module<br>No.   | lule Title of the<br>Module         |  |   | Topics in the Module  |                            |  |                         | No. of<br>Lectures for<br>the module |            |
| 1.  | 1. Structural analysis<br>by X-rays |  | X-rays<br>rays, S<br>Crysta<br>Diffrac<br>method<br>perfect<br>analys | X-rays and their properties, Production and detection of X-<br>rays, Safety precautions; X-ray interaction with matter,<br>Crystal structure, Different types of lattices, X-ray<br>Diffraction, Bragg's Law; X-ray spectroscopy, diffraction<br>methods, Scherrer formula, grain size, particle size, crystal<br>perfection; Determination of crystal structure (detailed<br>analysis only for cubic structures), X-ray reflectivity |                            |  |                         |                                      | 10         |
| 2.  | Microstructural analysis            |  |   | canning electron microscopy, practical aspect of the<br>chnique, Composition analysis by EDX; Transmission<br>ectron microscopy and its analysis, sample preparation  |                            |  |                         | 08                                   |            |
| 3.  | Mole<br>spect                       | cular<br>roscopy   | Regior<br>Infrare   | Regions of spectrum, Spectroscopy (Microwave and Infrared), Fourier transform IR, Raman spectroscopy  |                            |  | 08                      |                                      |            |
| 4. Electronic<br>spectroscopies of<br>surfaces                      |                                     | Photoelectron spectroscopy (X-ray, Ultra-violet), peak<br>shifts, information about chemical state and elemental<br>compositions   |   |   | 05                         |  |                         |                                      |            |
| 5. Surface A<br>Morphology by w<br>scanning probe m<br>microscopy v |                                     |  | Atomic<br>wide a<br>micros  | Atomic force microscopy (contact & non-contact mode),<br>vide areas of applications, AFM basics, Magnetic force<br>nicroscopy   |                            |  | ct mode),<br>etic force | 05                                   |            |
| 6. Thermal analysis N   |                                     |  | Nomer<br>therma   | Iomenclature, Thermo gravimetric analysis, Differential nermal analysis, Differential scanning calorimetry  |                            |  | 04                      |                                      |            |
|   | · <u> </u>                          |  |   |   | T                          | 'otal num  | ber of                  | Lectures                             | 40         |
| Evaluation Criteria   |                                     |  |   |   |                            |  |                         |                                      |            |

| Components               | Maximum Marks  |
|--------------------------|--|
| T1                       | 20   |
| Τ2                       | 20   |
| End Semester Examination | 35   |
| ТА                       | 25 [2 Quiz (10 M), Attendance (10 M) and Cass performance (5 M)] |
| Total                    | 100  |
|                          |  |
|                          |  |

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

2. C. Kittel, *Introduction to Solid State Physics*, Wiley-India.

3. Colin N. Banwell&Elaine M. McCas, *Fundamentals of Molecular Spectroscopy*, Tata McGraw-Hill.

4. Elton N. Kaufmann, *Characterization of Materials (Vol.1)*, John Wiley & Sons.

5. Williams, David B., Carter, C. Barry, Introduction to Transmission electron microscopy, Springer.

| Course Code  |   | 16B1NPH636   | Semester: Eve                                     | en            | Semeste            | r: VI  | Session 2018 - 2019 |  |
|--------------|---|--|---|---------------|--------------------|--------|---------------------|--|
|              |   |  |   |               | Month f            | rom: J | lanuary to June     |  |
| Course Name  |   | Medical & Industrial Applications of Nuclear Radiation |   |               |                    |        |                     |  |
| Credits      |   | 4  |   | Contact Hours |                    |        | 4                   |  |
| Faculty (Nam | nes)  | Coordinator(s)   | Dr Papia Chowdhury                                |               |                    |        |                     |  |
|              |   | Teacher(s)<br>(Alphabetically)                         | Dr Papia Chowdhury & Dr Manoj Tripathi            |               |                    | i      |                     |  |
| COURSE OU    | JTCO  | OMES   |   |               |                    |        | COGNITIVE LEVELS    |  |
| C302-11.1    | Def<br>resc   | ine nuclear structure, ponance process.                | properties and re                                 | actions; Nu   | clear mag          | netic  | Remembering (C1)    |  |
| C302-11.2    | 2 Explain models of different nuclear imaging techniques; CNO cycle; principle of radioactive decays.   |  |   |               | Understanding (C2) |        |                     |  |
| C302-11.3    | -11.3 Apply knowledge of nuclear reaction mechanisms in atomic devices, dosimetry, radiotracers, medical imaging, SPECT, PET, tomography etc. |  |   |               | Applying (C3)      |        |                     |  |
| C302-11.4    | Ana   | alyze different radiocar                               | rent radiocarbon dating mechanisms and processes. |               |                    | s.     | Analyzing (C4)      |  |

| Module<br>No. | Title of the<br>Module                | Topics in the Module   | No. of<br>Lectures for<br>the module |
|---------------|---------------------------------------|--|--------------------------------------|
| 1.            | Nucleus,<br>Radioactivity &<br>Dating | Structure of matter; Nucleus: Nuclear Size, Structure and<br>forces; Binding energy and Nuclear stability, mass defect;<br>Nuclear reaction: Fission, Fusion, chain reaction. Nuclear<br>fusion in stars, Formation of basic elements: proton-proton<br>chain, CNO cycle, Hydrostatic equilibrium; Applications:<br>atom bomb, hydrogen bomb, nuclear power plants, Nuclear<br>reactor problems, precautions. <b>ii)</b> Radioactive decay,<br>kinetics of radioactive decay, Types of radioactive decay<br>and their measurement, Half life, decay constant,<br>Population of states, Production of radionuclides.<br>Radioactive dating, Radiocarbon dating: Formation,<br>mechanism of dating, carbon cycle, radiocarbon clock and<br>applications, advantages, disadvantages, precautions; Other<br>dating techniques, protein dating, accuracy in dating; | 17                                   |
| 2.            | Radiation and matter interactions     | Dosimetry and applications: Interaction of Radiation of<br>matter: Biological effects of radiations; dosimetry, working<br>principles, Tools and radiotherapy, Doses, Radioisotopes,<br>Radiotracers;  | 09                                   |
| 3.            | NMR and MRI                           | Nuclear Magnetic Resonance: General Introduction to<br>Magnetic Resonance, Reference Frame; RF Pulses, Larmor<br>precision, Basic principles of NMR & ESR Spectroscopy,<br>Nuclear shielding, Chemical shifts; Couplings, Nuclear<br>Imaging; 1D,2D, 3D Images, Application of NMR in<br>medical industry as MRI, working MRI, Types of differen<br>MRI, Applications of NMR in quantum computation;   | 09                                   |

| 4.   | Nuclear Medicine<br>and NuclearNuclear Medicine<br>preclinical imaging, detector designing, photon counting,<br>Medical imaging using β+γ coincidences, SPECT AND<br>PET: Radiation tomography, applications; |  |               |  |  |  |  |  |
|------|---|--|---------------|--|--|--|--|--|
|      | 40  |  |               |  |  |  |  |  |
| Eval | uation Criteria   |  |               |  |  |  |  |  |
| Com  | ponents   | Maximum Marks  |               |  |  |  |  |  |
| T1   |   | 20   |               |  |  |  |  |  |
| T2   |   | 20   |               |  |  |  |  |  |
| End  | Semester Examination  | 35   |               |  |  |  |  |  |
| TA   | TA 25 [2 Quiz (10 M), Attendance (10 M) and Cass performance  |  |               |  |  |  |  |  |
| Tota | Total 100   |  |               |  |  |  |  |  |
|      |   |  |               |  |  |  |  |  |
| Reco | mmended Reading materi  | al: Author(s), Title, Edition, Publisher, Year of Publication etc. | ( Text books, |  |  |  |  |  |
| Refe | rence Books, Journals, Repo   | orts, Websites etc. in the IEEE format)                            |               |  |  |  |  |  |
| 1.   | Basic Sciences of Nuclear Medicine; Magdy M K halil, Springer   |  |               |  |  |  |  |  |
| 2.   | Physics and Radibiology of Nuclear Medicine; Gopal B Saha, Springer   |  |               |  |  |  |  |  |
| 3.   | A. Beiser, Concepts of Modern Physics, Mc Graw Hill International.  |  |               |  |  |  |  |  |
| 4.   | Radionuclide Techniques in Medicine, JM McAlister (Cambridge University Press, 1979).   |  |               |  |  |  |  |  |

5. Nuclear Physics; S.N.Ghosal

| Course Code   |  | 16B1NPH63  | 1   | Semester: Eve   | en                       | Semester: VI Session 20<br>Month from: Jan-June |            | 2018 -2019 |            |  |
|---|--|--|---|---|--------------------------|---|------------|------------|------------|--|
| Course Name C   |  | Computation  | Computational Physics   |   |                          |   |            |            |            |  |
| Credits   |  |  | 4   |   | Contact H                | lours   |            | Z          | ŀ          |  |
| Faculty (N  | ames)                                      | Coordinato   | r(s)  | Vikas Malik   |                          |   |            |            |            |  |
|   |  | Teacher(s)<br>(Alphabetica                           | ally)   | lly) Vikas Malik  |                          |   |            |            |            |  |
| COURSE  | OUTC                                       | OMES   |   |   |                          |   |            | COGNIT     | IVE LEVELS |  |
| C302-12.1   | De<br>Ra                                   | fine key concep<br>ndom walks, pe                    | ots used<br>ercolatio   | in Monte Carlo<br>on and Numerica   | Simulation,<br>l methods | ,   |            | Remembe    | ring (C1)  |  |
| C302-12.2   | Ex<br>me<br>wa                             | plain basics of the chanics, Monte like, neural netv | numeric<br>carlo s<br>vorks   | al analysis, stati<br>imulations, perc  | stical<br>olation, ran   | dom   |            | Understan  | ding (C2)  |  |
| C302-12.3   | Mo<br>net                                  | odel and simula<br>works; interpre                   | te magn<br>et simula  | etic systems, po<br>tion data   | lymers and               |   |            | Applying   | (C3)       |  |
| C302-12.4 Develop advance<br>Optimization production productin production production produc |  | velop advancec<br>timization prob<br>works.          | d Monte Carlo techniques to solve Analyz<br>blems. Simulate percolation of complex  |   |                          |   | Analyzing  | ng (C4)    |            |  |
| Module<br>No.   | Title of the<br>ModuleTopics in the Module |  |   |   |                          | No. of<br>Lectures for<br>the module            |            |            |            |  |
| 1. Numerical Methods  |  |  | Locating Roots of Equations, Interpolation and NumericalDifferentiation, Numerical Integration,Systems of Linear Equations, Ordinary DifferentialEquations, Fourier Transform Techniques.   |   |                          |   |            | 10         |            |  |
| 2.  | 2. Simulation<br>Techniques                |  |   | Random Number Generation and Monte Carlo Methods,<br>Equilibrium Statistical mechanics, Importance sampling,<br>Metropolis algorithm. |                          |   | 10         |            |            |  |
| <b>3.</b> Applications of Computer Simulations in Physics   |  |  | Ising Model Simulations of Magnetic Solids and Phase<br>Transitions, Monte Carlo Intergration, Random Walk and<br>its Applications to Polymers, Cluster Identification<br>algorithms, Percolation and Fractal Phenomena, Chaos and<br>Non-Linear Systems. |   |                          | 15  |            |            |            |  |
| 4. Advanced<br>Simulation<br>Techniques   |  |  | Cluster Algorithms, Variational Methods and Optimization Techniques.  |   |                          | timization                                      | 05         |            |            |  |
|   |  |  |   | Т   | 'otal num                | ber of  | f Lectures | 40         |            |  |
| Evaluation Criteria<br>Components<br>T1<br>T2<br>End Semester Examination<br>TA   |  |  | Maxim<br>20<br>20<br>35<br>25 [2 (  | <b>um Marks</b><br>Quiz (10 M), Att   | endance (10              | 0 M) and  | Cass p     | erformance | (5 M)]     |  |
| Total   |  |  | 100   |   | *                        |   |            |            |            |  |

| Reco<br>Refe | <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.           | S. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall India, 2005.   |  |  |  |  |  |
| 2.           | Kerson Huang, Statistical Mechanics, 2nd Edition, John Wiley, 2009.  |  |  |  |  |  |
| 3.           | K. Binder & D. Heermann, Monte Carlo Simulation in Statistical Physics, 2nd Edition, Springer, 2013.   |  |  |  |  |  |
| 4.           | Newman & Barkema, Monte Carlo Methods in Statistical Physics, Clarendon Press, 1999.   |  |  |  |  |  |
| 5.           | Landau & Binder, A guide to Monte Carlo Simulations in Statistical Physics, Cambridge University Press, 2014   |  |  |  |  |  |
| 6.           | M. H. Kalos and P. A. Whitlock, <i>Monte Carlo Methods</i> , John Wiley and Sons, 2009.  |  |  |  |  |  |

| Course Code   |   | 16B19PH692  |   | Semester Even       Semester VI       Sess         Month from:       January |              | Session Z  | ion 2018 -2019<br>ary to June        |        |               |
|---|---|---|---|--|--------------|------------|--------------------------------------|--------|---------------|
| Course Name   |   | Light Emitting Diodes: Basics & Applications                              |   |  |              |            |                                      |        |               |
| Credits   |   | V   | alue Ad   | ded  | Contact H    | Iours      |                                      | 2      |               |
| Faculty (N  | ames)   | Coordinato  | r(s)  | Dr. Bhubesh C  | hander Josh  | ni         |                                      |        |               |
|   |   | Teacher(s)<br>(Alphabetica  | ully)   | Dr. Bhubesh C  | hander Josł  | ni         |                                      |        |               |
| COURSE  | OUTCO   | OMES  |   |  |              |            |                                      | COGNIT | IVE LEVELS    |
| C305-6.1  | Recall junctio  | the basic conc<br>on diode and lig  | epts of ght emit  | semiconducting ting diodes.  | materials,   | working o  | of p-n                               | Remer  | nbering (C1)  |
| C305-6.2  | Explai<br>fabrica   | n the various tion of LEDs.   | physica   | al parameters in   | volved in    | designing  | g and                                | Unders | standing (C2) |
| C305-6.3  | Solve<br>spectru  | various proble<br>1m of LEDs  | ems rela  | ted to efficienc   | y, emission  | intensity  | and                                  | Арр    | lying (C3)    |
| C305-6.4  | Analys<br>high bi   | se the problems<br>rightness LEDs   | s in desig<br>s.  | gning & fabricat   | ting blue, w | hite and g | reen                                 | Anal   | yzing (C4)    |
| Module<br>No.   | Title o<br>Modu   | f the<br>le   | Topics in the ModuleNo. of<br>Lectures for<br>the module      |  |              |            | No. of<br>Lectures for<br>the module |        |               |
| 1.  | Histor  | y of LEDs   | History of SiC, GaAs, GaAsP, GaInP, GaN, and InGaN 4<br>LEDs. |  |              |            |                                      | 4      |               |
| 2.  | Theory of<br>Recombination'sRadiative and non-radiative recombination's, Low-level<br>and high-level excitations, Bio-molecular rate equation for<br>quantum well structure, Van Roosbroeck-Shockley Model,<br>Einstein Model.  |   |   |  |              | 6          |                                      |        |               |
| 3.  | LED Basics     Electrical properties: I-V characteristics, parasitic resistances, carrier distribution in homo and hetero junctions, carrier losses, carrier overflow in heterojunctions, Optical properties: Internal, external, extraction and power efficiencies, Emission spectra, escape cone and temperature dependency |   |   |  | 6            |            |                                      |        |               |
| 4.  | Growt<br>Fabric   | wth & LED materials, Organic LEDs, Growth, Fabrication and 4<br>rications |   |  |              | 4          |                                      |        |               |
| 5.  | ApplicationsSolid state lighting, White LEDs, HB LEDs, Color Mixing<br>and Rendering, LED Drivers, Display Devices, AMOLED,<br>Communication, High Voltage LEDs   |   |   |  | 10           |            |                                      |        |               |
| Total number of Lectures  |   |   |   |  |              | 30         |                                      |        |               |
| Evaluation CriteriaComponentsMaxirMid Term Examination30End Semester Examination40TA30 [PTotal100 |   |   | Maxim<br>30<br>40<br>30 [Pro<br><b>100</b>                    | um Marks<br>esentation/projec  | ct (15 M) +  | Attendan   | ce (15                               | M)]    |               |

| Reco<br>Refe | <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.           | . Text 1: Light-Emitting Diodes, Schubert E. Fred, Cambridge University Press, 3rd Edition 2018.   |  |  |  |  |
| 2.           | <b>Reference:</b> Introduction to Light Emitting Diode Technology and Applications, Held Gilbert, Auerbach Publications, 2008.   |  |  |  |  |
| 3.           | <b>Reference:</b> Light-Emitting Diodes; Materials, Processes, Devices and Applications, Editors: Jinmin Li, G. Q ZHANG, Springer, 2019  |  |  |  |  |

| Course Code | 18B13EC314                             | Semester<br>Even     | Semester VI Session 2018-2019<br>January |  |  |  |
|-------------|--|----------------------|--|--|--|--|
| Course Name | Machine Learning for Signal Processing |                      |  |  |  |  |
| Credits     | Audit course                           | <b>Contact Hours</b> | 3  |  |  |  |

| Faculty | Coordinator(s)                              | Dr. Abhinav Gupta                    |               |  |  |
|---------|---|--------------------------------------|---------------|--|--|
| (Names) | Teacher(s)<br>(Alphabetically)              | Dr. Abhinav Gupta                    |               |  |  |
| COURSE  | OUTCOMES                                    | <b>COGNITIVE LEVELS</b>              |               |  |  |
| CO1     | Illustrate various mach                     | Understanding (C2)                   |               |  |  |
| CO2     | Experiment with the c<br>feature selection  | Applying (C3)                        |               |  |  |
| CO3     | Apply and analyze var learning applications | Analyzing (C4)                       |               |  |  |
| CO4     | Make use of deep learn                      | ing techniques in real life problems | Applying (C3) |  |  |

| Module No. | Title of the Module                                   | Topics in the Module   | No. of Lectures for the module |
|------------|---|--|--------------------------------|
| 1.         | Introduction and Basic<br>Concepts                    | Linear algebra, Probability distributions,<br>Representing signals, Types of Features<br>and Proximity measures  | 8                              |
| 2.         | Linear Models for Regression<br>and Feature Selection | Regression: Linear Basis Function Models,<br>The Bias-Variance DecompositionTypes of<br>Feature Selection : Mutual Information<br>(MI) for Feature Selection, Goodman–<br>Kruskal Measure, Laplacian Score, SVD,<br>Ranking for Feature Selection, Feature<br>Selection for Time Series Data | 12                             |
| 3.         | Linear Models for<br>Classification                   | Discriminant Functions, Probabilistic<br>Generative Models, Probabilistic<br>Discriminative Models, The Laplace<br>Approximation   | 6                              |
| 4.         | Decision Tree Learning                                | Decision Tree Representation, Hypothesis<br>space search, Inductive bias, Issues in<br>decision tree learning  | 7                              |
| 5.         | Support Vector Machines                               | Linear maximum margin classifier for<br>linearly separable data, Linear soft margin<br>classifier, Kernel induced feature spaces,<br>Nonlinear classifiers, Regression by SVM,<br>SVM variants   | 6                              |
| 6.         | Introduction to Deep<br>Networks                      | Convolutional neural networks and applications   | 4                              |
|            | 43  |  |                                |

| <b>Evaluation Criteria</b> |               |  |
|----------------------------|---------------|--|
| Components                 | Maximum Marks |  |
| T1                         | NA            |  |
| T2                         | 30            |  |
| End Semester Examination   | 40            |  |
| ТА                         | 30            |  |
| Total                      | 100           |  |

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

| 1. | Pattern Recognition and Machine Learning, C.M. Bishop, 2nd Edition, Springer, 2011.             |
|----|---|
| 2. | Deep Learning, I. Goodfellow, Y, Bengio, A. Courville, MIT Press, 2016.                         |
| 3. | The Elements of Statistical Learning, T. Hastie, R. Tibshirani, J. Friedman., 2nd Edition, 2008 |
| 4. | Machine Learning, T. Mitchell, McGraw Hill, 1997.   |

| Course Code  |   | 19B13BT311  |  | Semester EvenSemester VI(specify Odd/Even)Month from Jacobia                                      |                             | Session 2018 -2019<br>anuary-June |                                      |        |            |
|--|---|---|--|---|-----------------------------|-----------------------------------|--------------------------------------|--------|------------|
| Course Na  | Course Name Nanoscience in Food Technology                            |   |  |   |                             |                                   |                                      |        |            |
| Credits  |   | 2   |  | Contact H   | Contact Hours               |                                   | 2                                    |        |            |
| Faculty (N   | ames)   | Coordinato  | r(s)   | Prof. Sudha Srivastava  |                             |                                   |                                      |        |            |
|  | Teacher(s)<br>(Alphabetically)  |   |  | Prof. Sudha Srivastava  |                             |                                   |                                      |        |            |
| COURSE   | OUTCO   | OMES  |  |   |                             |                                   |                                      | COGNIT | IVE LEVELS |
| C305-1.1   | Explain properties of nanoparticles and nanoemulsions Understand Leve |   |  |   |                             | and Level (C2)                    |                                      |        |            |
| C305-1.2   | Outline food processing, pack   |   |  | caging and preservation   |                             | Understand Level (C2)             |                                      |        |            |
| C305-1.3   | Apply nanotechnology conce<br>shelf life                              |   |  | epts to improve food quality, texture, and  |                             | Apply Level (C3)                  |                                      |        |            |
| C305-1.4   | Apply concepts of nanoscient  |   |  | ce for improving  | ng agriculture yields Apply |                                   | y Level (C3)                         |        |            |
| C305-1.5   | Analyz<br>nanose  | Analyze food quality degradation and pathogens detection, using nanosensors Ar  |  |   | Analy                       | Analyze Level (C4)                |                                      |        |            |
| Module<br>No.  | Title of the<br>Module  |   | Topics in the Module   |   |                             |                                   | No. of<br>Lectures for<br>the module |        |            |
| 1.   | Introduction to Intr<br>Nanomaterials                                 |   |  | oduction to nanomaterials, nanoemulsions, method of synthesis and identification of nanoemulsions |                             |                                   | 5                                    |        |            |
| 2.   | Food<br>and Pi  | Food Packaging Introduction to food processing, packaging and preservation. Modified atmosphere packaging, active packaging and intelligent packaging.  |  |   |                             | 6                                 |                                      |        |            |
| 3.   | Applic<br>nanote<br>Food a<br>agricul                                 | Application of<br>nanotechnology in<br>Food and<br>agricultureMicroemulsions for delivery of nutraceuticals, edible films<br>and coating for food, Polymer nanocomposites, effect of<br>nanomaterials on mechanical, thermal and barrier properties<br>of polymers. Application of nanotechnology for pesticide<br>delivery, nutrient uptake etc. Nanomaterials in Food-<br>Health and Safety Issues7 |  |   |                             |                                   | 7                                    |        |            |
| 4.   | Biosen<br>monito<br>quality   | sors for<br>pring food  | Time temperature indicators, pathogen detection using biosensors, Pesticide detection using biosensor.     6 |   |                             | 6                                 |                                      |        |            |
| Total number of Lectures 24  |   |   |  |   | 24                          |                                   |                                      |        |            |
| Evaluation CriteriaComponentsMaximum MarksMid Term30End Term40TATA30 (Presentation, Class Test)Total100          |   |   |  |   |                             |                                   |                                      |        |            |
| <b>Recommended Reading material:</b> Author(s), Title, Edition, Publisher, Year of Publication etc. (Text books. |   |   |  |   |                             |                                   |                                      |        |            |

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

| 1. | VellaichamyChelladurai, Digvir S. Jayas, 2018 Nanoscience and Nanotechnology in Foods and<br>BeveragesCRC Press, ISBN 9781498760638 |
|----|---|
| 2. | Recent Research papers  |