# DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING(ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING) Course outcomes

### SEMESTER - 1 & 2

| Course code | Course Name                              | Course outcomes   | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------------|--|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
|             |  | CO 1 solve systems of linear equations, diagonalize matrices and characterise quadratic forms   | 3   | 3   | 3   | 3   | 2   | 1   |     |     | 1   | 2    |      | 2    |
|             |  | CO 2 compute the partial and total derivatives and maxima and minima of multivariable functions   | 3   | 3   | 3   | 3   | 2   | 1   |     |     | 1   | 2    |      | 2    |
| MAT 101     | LINEAR ALGEBRA<br>AND CALCULUS           | compute multiple integrals and apply them to find areas and volumes of geometrical shapes, CO 3 mass and centre of gravity of plane laminas   | 3   | 3   | 3   | 3   | 2   | 1   |     |     | 1   | 2    |      | 2    |
|             |  | perform various tests to determine whether a given series is convergent, absolutely CO 4 convergent or conditionally convergent   | 3   | 2   | 3   | 2   | 1   | 1   |     |     | 1   | 2    |      | 2    |
|             |  | CO 5 determine the Taylor and Fourier series expansion of functions and learn their applications.   | 3   | 3   | 3   | 3   | 2   | 1   |     |     | 1   | 2    |      | 2    |
|             |  | Compute the quantitative aspects of waves and oscillations in engineering systems.  | 3   | 2   |     |     |     |     |     | 1   | 2   |      |      | 1    |
|             |  | Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments.             | 3   | 2   |     |     |     |     |     | 1   | 2   |      |      | 1    |
| PHT 100     | ENGINEERING<br>PHYSICS A<br>(FOR CIRCUIT | Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.            | 3   | 2   |     |     |     |     |     | 1   | 2   |      |      | 1    |
|             | BRANCHES)                                | Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems                         | 3   | 1   |     |     |     |     |     | 1   | 2   |      |      | 1    |
|             |  | Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system                          | 3   | 1   |     |     |     |     |     | 1   | 2   |      |      | 1    |
|             |  | Apply the basic concepts of electrochemistry and corrosion to explore its possible CO 1 applications in various engineering fields.   | 1   | 2   | 1   |     |     |     |     |     |     |      |      |      |
|             |  | Understand various spectroscopic techniques like UV-Visible, IR, NMR and its CO 2 applications.   | 1   | 1   |     | 1   | 2   |     |     |     |     |      |      |      |
| CYT 100     | ENGINEERING<br>CHEMISTRY                 | Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterisation of CO 3 nanomaterials. | 1   | 1   |     | 1   | 2   |     |     |     |     |      |      |      |
|             |  | Learn about the basics of stereochemistry and its application. Apply the knowledge of CO 4 conducting polymers and advanced polymers in engineering.                                  | 2   | 1   |     |     |     |     |     |     |     |      |      |      |
|             |  | Study various types of water treatment methods to develop skills for treating CO 5 wastewater.  | 1   |     |     | 1   |     |     | 3   |     |     |      |      |      |
|             |  | CO 1 Recall principles and theorems related to rigid body mechanics   | 2   | 2   |     |     |     |     |     |     |     |      |      |      |
|             |  | CO 2 Identify and describe the components of system of forces acting on the rigid body  | 3   | 3   |     |     |     |     |     |     |     |      |      |      |
| EST 100     | ENGINEERING<br>MECHANICS                 | Apply the conditions of equilibrium to various practical problems involving different force co 3 system   | 3   | 3   |     |     |     |     |     |     |     |      |      |      |

|         |                             | CO 4  | Choose appropriate theorems, principles or formulae to solve problems of mechanics   | 3 | 3 |   |   |   |   |   |   |   |   |
|---------|-----------------------------|-------|--|---|---|---|---|---|---|---|---|---|---|
|         |                             | CO 5  | Solve problems involving rigid bodies, applying the properties of distributed areas and masses                                     | 3 | 3 |   |   |   |   |   |   |   |   |
|         |                             | CO 1  | Draw the projection of points and lines located in different quadrants   | 3 |   |   |   |   |   |   |   |   |   |
|         |                             | CO 2  | Prepare multiview orthographic projections of objects by visualizing them in different positions                                   | 3 |   |   |   |   |   |   |   |   |   |
| EST 110 | ENGINEERING                 | CO 3  | Draw sectional views and develop surfaces of a given object  | 3 | 1 |   |   |   |   |   |   |   |   |
| E31 110 | GRAPHICS                    | CO 4  | Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions. | 3 |   |   |   |   |   |   |   | 1 |   |
|         |                             | CO 5  | Convert 3D views to orthographic views   | 3 |   |   |   |   |   |   |   | 2 |   |
|         |                             | CO 6  | Obtain multiview projections and solid models of objects using CAD tools   | 3 |   |   | 3 |   |   |   |   | 3 |   |
|         |                             | CO 1  | Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.                           | 3 |   |   |   | 3 | 2 | 2 |   |   |   |
|         |                             |       | Explain different types of buildings, building components, building materials and building construction                            | 3 | 2 |   |   | 3 |   | 3 |   |   |   |
|         |                             | CO 3  | Describe the importance, objectives and principles of surveying.   | 3 | 2 |   |   | 2 | 3 |   | 2 |   |   |
|         |                             | CO 4  | Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps   | 3 | 2 | 1 | 3 |   |   |   | 2 |   |   |
|         | BASICS OF CIVIL &           | CO 5  | Discuss the Materials, energy systems, water management and environment for green buildings.                                       | 3 | 2 |   | 3 |   |   |   | 2 |   |   |
| EST 120 | MECHANICAL<br>ENGINEERING   | CO 6  | Analyse thermodynamic cycles and calculate its efficiency  | 3 | 2 |   | 3 |   |   |   |   |   |   |
|         |                             | CO 7  | Illustrate the working and features of IC Engines  | 3 | 1 |   | 3 |   |   |   |   |   |   |
|         |                             | CO 8  | Explain the basic principles of Refrigeration and Air Conditioning   | 3 | 1 |   |   |   |   |   |   |   |   |
|         |                             | CO 9  | Describe the working of hydraulic machines   | 3 | 2 |   |   |   |   |   |   |   |   |
|         |                             | CO 10 | Explain the working of power transmission elements   | 3 | 1 |   |   |   |   |   |   |   |   |
|         |                             | CO 11 | Describe the basic manufacturing, metal joining and machining processes  | 3 |   |   |   |   |   |   |   |   |   |
|         | _                           | CO 1  | Apply fundamental concepts and circuit laws to solve simple DC electric circuits   | 3 | 1 |   |   |   |   |   |   |   | 2 |
|         |                             | CO 2  | Develop and solve models of magnetic circuits  | 3 | 1 |   |   |   |   |   |   |   | 2 |
| EST     | BASICS OF<br>ELECTRICAL AND | CO 3  | Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state                                   | 3 | 1 |   |   |   |   |   |   |   | 2 |
| 130     | ELECTRONICS<br>ENGINEERING  | CO 4  | Describe working of a voltage amplifier  | 2 |   |   |   |   |   |   |   |   |   |

|            |                               | CO 5 | Outline the principle of an electronic instrumentation system   | 2 |   |   |   |   |   |   |   |   |   | 2  |
|------------|-------------------------------|------|---|---|---|---|---|---|---|---|---|---|---|----|
|            |                               | CO 6 | Explain the principle of radio and cellular communication   | 2 |   |   |   |   |   |   |   |   |   | 2  |
|            |                               | CO 1 | Define and Identify different life skills required in personal and professional life  |   |   |   |   |   | 2 | 1 | 2 | 2 | 1 | 3  |
|            |                               |      | Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.  |   |   |   |   |   |   | - | 3 | _ |   | 2. |
| HUN        | A TED GAM A G                 |      | Explain the basic mechanics of effective communication and demonstrate these through  |   |   |   |   |   |   |   |   |   |   |    |
| 101        | LIFE SKILLS                   |      | presentations.  Take part in group discussions  |   |   |   |   |   | 1 |   | 1 | 3 |   |    |
|            |                               | CO 4 |   |   |   |   |   |   |   |   |   | 3 |   | 1  |
|            |                               | CO 5 | Use appropriate thinking and problem solving techniques to solve new problems   |   | 3 |   | 2 | 1 |   |   |   |   |   |    |
|            |                               | CO 6 | Understand the basics of teamwork and leadership  |   |   |   |   |   | 1 |   | 3 |   |   |    |
|            |                               | CO 1 | Compute the derivatives and line integrals of vector functions and learn their applications   | 3 | 3 | 3 | 3 | 2 | 1 |   | 1 | 2 |   | 2  |
|            | VECTOR CALCULUS.              | CO 2 | Evaluate surface and volume integrals and learn their inter-relations and applications  | 3 | 3 | 3 | 3 | 2 | 1 |   | 1 | 2 |   | 2  |
| MAT 102    | DIFFERENTIAL<br>EQUATIONS AND |      | Solve homogeneous and non-homogeneous linear differential equation with constant coefficients   | 3 | 3 | 3 |   | 2 | 1 |   | 1 | 2 |   | 2  |
|            | TRANSFORMS                    |      | Compute Laplace transform and apply them to solve ODEs arising in engineering   |   |   |   | 3 |   | 1 |   |   |   |   | _  |
|            |                               | CO 4 | Determine the Fourier transforms of functions and apply them to solve problems arising in   | 3 | 3 | 3 | 3 | 2 | 1 |   | 1 | 2 |   | 2  |
|            |                               | CO 5 | engineering   | 3 | 3 | 3 | 3 | 2 | 1 |   | 1 | 2 |   | 2  |
|            |                               | CO 1 | Develop vocabulary and language skills relevant to engineering as a profession  |   |   |   |   |   |   |   |   | 3 |   | 2  |
|            |                               | CO 2 | Analyze, interpret and effectively summarize a variety of textual content   |   |   |   |   |   |   |   |   | 1 |   | 3  |
| HUN        | PROFESSIONAL                  | CO 3 | Create effective technical presentations  |   |   |   |   |   | 1 |   | 1 | 3 |   |    |
| 102        | COMMUNICATION                 |      | Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus  |   |   |   |   |   |   |   |   | 3 |   | 1  |
|            |                               |      | Identify drawbacks in listening patterns and apply listening techniques for specific needs  |   |   |   |   |   |   |   | _ |   |   | 1  |
|            |                               | CO 5 | Create professional and technical documents that are clear and adhering to all the  |   | 1 |   |   |   |   |   | 2 | 3 |   |    |
|            |                               | CO 6 | necessary conventions   | 1 |   |   |   |   | 1 |   | 1 | 3 |   |    |
|            |                               | CO 1 | Analyze a computational problem and develop an algorithm/flowchart to find its solution   | 3 | 2 | 3 | 2 |   | 2 |   |   | 1 | 1 | 1  |
|            |                               | CO 2 | Arithmetic, Logical, Relational or Bitwise operators.   | 3 | 2 | 3 | 2 | 2 |   |   |   | 1 |   | 1  |
|            |                               | CO 3 | Write readable C programs with arrays, structure or union for storing the data to be processed  | 3 | 2 | 3 | 2 | 2 |   |   |   | 1 |   | 1  |
| EST<br>102 | PROGRAMING IN C               | CO 4 | Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem | 3 | 2 | 3 | 2 | 2 |   |   |   | 1 | 1 | 1  |

|            |                            | CO 5 | Write readable C programs which use pointers for array processing and parameter passing   | 3 | 2 |  | 2 |   |   |   | 1 |   | 1 |
|------------|----------------------------|------|---|---|---|--|---|---|---|---|---|---|---|
|            |                            | CO 6 | Develop readable C programs with files for reading input and storing output   | 3 | 2 |  | 2 |   |   |   | 1 |   | 1 |
|            |                            | CO 1 | Develop analytical/experimental skills and impart prerequisite hands on experience for engineering laboratories   |   |   |  | 3 |   | 1 | 2 |   |   | 1 |
|            |                            | CO 2 | Understand the need for precise measurement practices for data recording  |   |   |  | 3 |   | 1 | 2 |   |   | 1 |
| PHL<br>120 | ENGINEERING<br>PHYSICS LAB | CO 3 | Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations  |   |   |  | 3 |   | 1 | 2 |   |   | 1 |
| 120        | 11110100 212               | CO 4 | Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics   |   |   |  | 3 |   | 1 | 2 |   |   | 1 |
|            |                            | CO 5 | Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results   |   |   |  | 3 |   | 1 | 2 |   |   | 1 |
|            |                            | CO 1 | Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses   | 3 |   |  | 2 |   |   |   |   |   |   |
|            |                            | CO 2 | Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs   | 3 |   |  | 3 |   |   |   |   |   |   |
| CYL        | ENGINEERING                | CO 3 | Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds  | 3 |   |  | 3 |   |   |   |   |   |   |
| 120        | CHEMISTRY LAB              | CO 4 | Acquire the ability to understand, explain and use instrumental techniques for chemical analysis  | 3 |   |  | 3 |   |   |   |   |   |   |
|            |                            | CO 5 | Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments   | 3 |   |  | 1 |   |   |   |   |   |   |
|            |                            | CO 6 | Function as a member of a team, communicate effectively and engage in further learning.  Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum | 3 |   |  | 1 |   |   |   |   |   |   |
|            |                            | CO 1 | Name different devices and tools used for civil engineering measurements  | 1 |   |  | 1 | 1 |   | 2 | 2 |   |   |
|            |                            | CO 2 | Explain the use of various tools and devices for various field measurements   | 1 |   |  | 1 | 1 |   | 2 | 2 |   |   |
|            |                            | CO 3 | Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work                | 1 |   |  | 1 | 1 | 2 | 2 | 2 | 1 |   |
| ESL 120    | CIVIL & MECHANICAL         | CO 4 | Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.  | 1 |   |  | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
|            | WORKSHOP                   | CO 5 | Compare different techniques and devices used in civil engineering measurements   | 1 |   |  | 1 | 1 |   | 2 | 2 |   | 1 |
|            |                            | CO 6 | Identify Basic Mechanical workshop operations in accordance with the material and objects   | 1 |   |  |   |   |   |   |   |   |   |
|            |                            | CO 7 | Apply appropriate Tools and Instruments with respect to the mechanical workshop trades  | 2 |   |  |   |   |   |   |   |   |   |
|            |                            | CO 8 | Apply appropriate safety measures with respect to the mechanical workshop trades  | 2 |   |  |   |   |   |   |   |   |   |
|            |                            | CO 1 | Demonstrate safety measures against electric shocks   |   |   |  |   | 3 |   |   |   |   | 1 |

|         |              | 1 (()) | Identify the tools used for electrical wiring, electrical accessories, wires, cables, batteries and standard symbols                                 | 2 |  |   |   |   |   |   | 1 |   |
|---------|--------------|--------|--|---|--|---|---|---|---|---|---|---|
|         | ELECTRICAL & |        | Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings | 2 |  | 1 |   | 1 | 1 | 2 | 2 | 2 |
| ESL 130 |              | CO 4   | Identify and test various electronic components  | 3 |  |   |   |   |   |   |   | 2 |
|         | WORKSHOI     | CO 5   | Draw circuit schematics with EDA tools   | 3 |  |   | 2 |   |   |   |   | 2 |
|         |              | CO 6   | Assemble and test electronic circuits on boards  | 3 |  |   | 2 |   |   |   |   | 1 |
|         |              | CO 7   | Work in a team with good interpersonal skills  |   |  |   |   |   |   | 3 | 2 | 2 |

| Course code | Course Name                | Course outcomes  | PO1                                     | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------------|----------------------------|--|---|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
|             |                            | CO 1 Check the validity of predicates in Propositional and Quatruth tables, deductive reasoning and inference theory on  |   | 2   | 2   | 2   |     |     |     |     |     |      |      |      |
|             | DISCRETE                   | Solve counting problems by applying the elementary counting Product, Permutation, Combination, Binomial The Principle of Inclusion and Exclusion                                     | • •                                     | 2   | 2   | 2   |     |     |     |     |     |      |      |      |
| MAT203      | MATHEMATICAL<br>STRUCTURES | CO 3 Classify binary relations into various types and apply the them in the application of Partially Ordered Sets and Latti  |   | 2   | 2   | 2   |     | 1   |     |     |     |      |      | 1    |
|             |                            | Explain Generating Functions and solve First Order and Selections with Constant Coefficients   | Second Order Linear Recurrence 2        | 2   | 2   | 2   |     | 1   |     |     |     |      |      | 1    |
|             |                            | CO 6 Illustrate the abstract algebraic systems - Semigroups, Moand Isomorphism of Monoids and Groups   | onoids, Groups, Homomorphism 2          | 2   | 2   | 2   |     | 1   |     |     |     |      |      | 1    |
|             |                            | CO 1 Design an algorithm for a computational task and calcula that algorithm   | te the time/space complexities of 3     | 3   | 2   | 2   |     | 1   |     |     |     |      |      | 2    |
|             |                            | Identify the suitable data structure (array or linked list) to required to be processed to solve a given computational palgorithm to find the solution of the computational problem. | roblem and write an 2                   | 2   | 3   | 2   |     | 1   |     |     |     |      |      | 1    |
| CST201      | DATA STRUCTURES            | Write an algorithm to find the solution of a computational appropriate data structure (binary tree/graph) to represent   |   | 2   | 3   | 2   |     | 2   |     |     |     |      |      | 1    |
|             |                            | Store a given dataset using an appropriate Hash Function the given set   | to enable efficient access of data in 3 | 1   | 2   | 3   |     | 1   |     | ·   |     |      |      | 2    |

|         |  | CO 5 | Select appropriate sorting algorithms to be used in specific circumstances  | 3 | 2 | 3 | 3 |   | 1 |   |  |   | 2 |
|---------|--|------|---|---|---|---|---|---|---|---|--|---|---|
|         |  | CO 6 | Design and implement Data Structures for solving real world problems efficiently  | 3 | 2 | 3 | 2 |   | 2 |   |  |   | 2 |
|         |  | CO 1 | Illustrate decimal, binary, octal, hexadecimal and BCD number systems, perform conversions among them and do the operations - complementation, addition, subtraction, multiplication and division on binary numbers | 3 | 2 |   |   |   |   |   |  |   | 2 |
|         | LOGIC SYSTEM                                 | CO 2 | Simplify a given Boolean Function and design a combinational circuit to implement the simplified function using Digital Logic Gates   | 3 | 2 | 1 | 2 |   | 2 |   |  |   | 2 |
| CST 203 | DESIGN                                       | CO 3 | Design combinational circuits - Adders, Code Convertors, Decoders, Magnitude Comparators, Parity Generator/Checker and design the Programmable Logic Devices - ROM and PLA.   | 3 | 2 | 3 | 2 |   | 2 |   |  |   | 2 |
|         |  | CO 4 | Design sequential circuits - Registers, Counters and Shift Registers  | 2 | 1 | 3 | 1 |   | 1 |   |  |   | 1 |
|         |  | CO 5 | Use algorithms to perform addition and subtraction on binary, BCD and floating point numbers  | 2 | 2 | 2 |   |   |   |   |  |   | 2 |
|         |  | CO 1 | Write Java programs using the object oriented concepts - classes, objects, constructors, data hiding, inheritance and polymorphism  | 1 | 1 | 3 |   |   |   |   |  |   |   |
|         | ODJECT ODJENTED                              | CO 2 | Utilise datatypes, operators, control statements, built in packages & interfaces, Input/ Output Streams and Files in Java to develop programs   | 2 | 2 | 2 |   |   |   |   |  |   |   |
| CST205  | OBJECT ORIENTED<br>PROGRAMMING USING<br>JAVA | CO 3 | Illustrate how robust programs can be written in Java using exception handling mechanism  | 2 | 3 | 3 |   |   |   |   |  |   |   |
|         | JAVA   | CO 4 | Write application programs in Java using multithreading and database connectivity   | 3 | 2 | 2 |   |   |   |   |  |   |   |
|         |  | CO 5 | Write Graphical User Interface based application programs by utilising event handling features and Swing in Java  | 1 | 2 | 2 |   | 2 |   |   |  | 3 |   |
|         |  | CO 1 | Understand the steps involved in the design process   | 1 | 3 | 3 |   |   |   |   |  |   | 2 |
|         |  | CO 2 | Apply design thinking while learning and practicing engineering.  | 1 | 2 | 3 |   |   |   |   |  |   | 2 |
| EST 200 | DESIGN AND<br>ENGINEERING                    | CO 3 | Understand the various design communication mechanisms  | 1 | 3 | 3 |   |   |   |   |  |   | 2 |
|         |  | CO 4 | Understand fundamental design engineering concepts.   | 1 | 2 | 2 |   |   |   |   |  |   | 2 |
|         |  | CO 5 | Apply expediency, economics and sustainability in Design Engineering.   | 2 | 2 | 2 |   |   |   |   |  |   | 2 |
|         |  | CO 1 | Perceive the relevance and concept of sustainability and associated global initiatives  |   |   |   |   |   | 2 | 3 |  |   | 2 |
|         |  | CO 2 | Expound on the different types of environmental pollution problems and their sustainable solutions  |   |   |   |   |   | 2 | 3 |  |   | 2 |
| MCN201  | SUSTAINABLE<br>ENGINEERING                   | CO 3 | Be abreast of environmental regulations and standards   |   |   |   |   |   | 2 | 3 |  |   | 2 |
|         |  | CO 4 | Outline concepts of conventional and non-conventional energy  |   |   |   |   |   | 2 | 3 |  |   | 2 |
|         |  | CO 5 | Demonstrate sustainable practices using engineering knowledge   |   |   |   |   |   | 2 | 3 |  |   | 2 |

|         |  | CO 1 | Design and implement time/space efficient program using arrays to provide necessary functionalities meeting a given set of user requirements           | 3 | 2 | 3 | 3 | 2 | 1 | 1 | 2 |
|---------|--|------|--|---|---|---|---|---|---|---|---|
|         |  | CO 2 | Design and Implement time/space efficient program to sort a list of records based on a given key in the record   | 3 | 2 | 3 | 2 |   | 1 | 1 | 2 |
|         | DATA STRUCTURES  | CO 3 | Design and implement an efficient data structure to represent given data   | 2 | 2 | 3 | 2 |   | 1 | 1 | 2 |
| CSL201  | LAB  | CO 4 | Design and implement a time/space efficient program to convert an arithmetic expression from one notation to another                                   | 2 | 2 | 3 | 2 |   | 1 | 1 | 2 |
|         |  | CO 5 | Design and implement a program using linked lists to simulate Memory Allocation and Garbage Collection   | 1 | 1 | 2 |   |   | 1 | 1 | 1 |
|         |  | CO 6 | Design and implement time/space efficient program using trees and graphs to provide necessary functionalities meeting a given set of user requirements | 1 | 1 | 2 |   |   | 1 | 1 | 1 |
|         |  | CO 1 | Implement the Object Oriented concepts - constructors, inheritance, method overloading & overriding and polymorphism in Java .                         | 3 | 3 | 3 |   |   | 2 |   | 2 |
|         | ODJECT ODJENTED  | CO 2 | Implement programs in Java which use datatypes, operators, control statements, built in packages & interfaces, Input/Output streams and Files          | 3 | 3 | 3 |   |   | 2 |   | 2 |
| CSL 203 | OBJECT ORIENTED<br>PROGRAMMING USING<br>JAVA (IN JAVA) | CO 3 | Implement robust application programs in Java using exception handling   | 3 | 3 | 3 |   |   | 2 |   | 2 |
|         | 321,71 (11, 321, 771)                                  | CO 4 | Implement application programs in Java using multithreading and database connectivity  | 3 | 3 | 3 |   |   | 2 |   | 2 |
|         |  | CO 5 | Implement Graphical User Interface based application programs by utilizing event handling features and Swing in Java                                   | 3 | 3 | 3 |   |   | 2 |   | 2 |

| Course code | Course Name                    |      | Course outcomes   | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------------|--------------------------------|------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
|             |                                | CO 1 | Make use of the concepts, rules and results about linear equations, matrix algebra, vector spaces, eigen values & orthagonality & diagonalization to solve computational problems                                   | 3   | 3   | 3   | 3   |     | 2   |     |     |     |      |      | 2    |
| MAT 216     | MATHEMATICAL<br>FOUNDATION FOR | (()) | Perform calculus operations on functions of several variables and matrices including partial derivatives and gradiants  | 3   | 3   | 3   | 3   |     | 2   |     |     |     |      |      | 2    |
| MAT 210     | MACHINE LEARNING               | CO 3 | Utilize the concepts, rules and results about probability, random variables, additive & multiplications rules, conditional probability distributions and Bayes' theorem to find solutions of computational problems | 3   | 3   | 3   | 3   |     | 2   |     |     |     |      |      | 2    |
|             |                                | CO 4 | Train machine learning models using unconstrained and constrained optimiztion methods.  | 3   | 3   | 3   | 3   |     | 2   |     |     |     |      |      | 2    |
|             |                                |      | Recognize and express the relevance of basic components, I/O organization and pipelining schemes in a digital computer  | 1   | 1   | 1   | 1   | ·   |     |     |     |     |      |      | 1    |

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|----------------------|---|---|--|---|---|--|--|---|--|--|--|---|---|---|
|                      | CO 2  | Explain the types of memory systems and mapping functions used in memory systems  | 2  | 2   | 2   | 2  |  |   |  |  |  | 2   |   | 2   |
| COMPUTER             | CO 3  | Demonstrate the control signals required for the execution of a given instruction   | 2  | 2   | 2   | 2  |  |   |  |  |  | 2   |   | 2   |
| ARCHITECTURE         | CO 4  | Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it   | 2  | 2   | 2   | 2  |  |   |  |  |  | 2   |   | 2   |
|                      | CO 5  | Explain the implementation aspects of arithmetic algorithms in a digital computer   | 2  | 2   | 2   |  |  |   |  |  |  | 2   |   | 1   |
|                      | CO 6  | Develop the control logic for a given arithmetic problem  | 2  | 2   | 2   | 2  |  |   |  |  |  |   |   | 2   |
|                      | CO 1  | Summarize and exemplify fundamental nature and characteristics of database systems  | 2  | 2   | 2   |  |  |   |  |  |  |   |   | 1   |
|                      | CO 2  | Model real word scenarios given as informal descriptions, using Entity Relationship diagrams.   | 2.   |   | 2   | 2.   |  |   |  |  |  |   |   | 1   |
| DATABASE             |   |   | 2  |   | 2   | 2  |  |   |  |  |  |   |   | 1   |
| MANAGEMANT<br>SYSTEM | CO 4  | Demonstrate the features of indexing and hashing in database applications   |  |   |   |  |  |   |  |  |  | 2.  |   | 1   |
|                      | CO 5  | Discuss and compare the aspects of Concurrency Control and Recovery in Database systems   |  |   |   |  |  |   |  |  |  | 2   |   | 1   |
|                      | CO 6  |   | 1  | 2   | 2   |  | 3                                      |   |  |  |  | 2   |   | 1   |
|                      | CO 1  | Explain the relevance, structure and functions of Operating Systems in computing devices  | 2  | 2   | 2   |  |  |   |  | 2                                      |  | 2   |   | 2   |
|                      | CO 2  |   | 2  | 2   | 2   |  |  |   |  | 2                                      |  | 2   |   | 2   |
| OPERATING            | CO 3  | Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors | 2  | 2   | 2   | 2  |  |   |  | 2                                      |  | 2   |   | 2   |
| SYSTEMS              | CO 4  |   | 2  | 2   | 1   | 2  |  |   |  | 2                                      |  | 2   |   | 2   |
|                      | CO 5  | Explain the memory management algorithms in Operating Systems   | 2  | 2   | 2   | 2  |  |   |  | 2                                      |  | 2   |   | 2   |
|                      |   |   | 2  | 2   | 1   | 2  |  |   |  | 2                                      |  | 2   |   | 2   |
|                      | CO 1  | Understand the core values that shape the ethical behaviour of a professional.  |  |   |   |  |  |   |  | 2                                      |  |   | 2   |   |
|                      | CO 2  | Adopt a good character and follow an ethical life.  |  |   |   |  |  |   |  | 2                                      |  |   | 2   |   |
| Professional Ethics  | CO 3  | Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.                                     |  |   |   |  |  |   |  | 3                                      |  |   | 2   |   |
|                      | CO 4  | 9   |  |   |   |  |  |   |  | 3                                      |  |   | 2   |   |
|                      | CO 5  | Apply the knowledge of human values and social values to contemporary ethical values and global issues.   |  |   |   |  |  |   |  | 3                                      |  |   | 2   |   |
|                      | CO 1  | Explain the background of the present constitution of India and features  |  |   |   |  |  |   |  |  |  |   |   |   |
|                      | DATABASE MANAGEMANT SYSTEM  OPERATING SYSTEMS | COMPUTER ORGANIZATION AND ARCHITECTURE  | ORGANIZATION AND ARCHITECTURE  CO 4 Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it  CO 5 Explain the implementation aspects of arithmetic algorithms in a digital computer  CO 6 Develop the control logic for a given arithmetic problem  CO 1 Summarize and exemplify fundamental nature and characteristics of database systems  CO 2 Model real word scenarios given as informal descriptions, using Entity Relationship diagrams.  CO 3 Model and design solutions for efficiently representing and querying data using relational model  CO 4 Demonstrate the features of indexing and hashing in database applications  CO 5 Discuss and compare the aspects of Concurrency Control and Recovery in Database systems  CO 6 Explain various types of NoSQL databases  CO 1 Explain the relevance, structure and functions of Operating Systems in computing devices  Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems.  CO 2 Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors  CO 4 Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems  CO 5 Explain the security aspects and algorithms in Operating Systems  CO 6 Explain the security aspects and algorithms for file and storage management in Operating Systems  CO 1 Understand the core values that shape the ethical behaviour of a professional.  CO 2 Adopt a good character and follow an ethical life.  CO 3 Solve moral and ethical problems through exploration and assessment by established experiments.  Apply the knowledge of human values and social values to contemporary ethical values and global issues. | COMPUTER ORGANIZATION AND ARCHITECTURE  CO 3 Demonstrate the control signals required for the execution of a given instruction 2  CO 4 Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it 2  CO 5 Explain the implementation aspects of arithmetic algorithms in a digital computer 2  CO 6 Develop the control logic for a given arithmetic problem 2  CO 1 Summarize and exemplify fundamental nature and characteristics of database systems 2  Model real word scenarios given as informal descriptions, using Entity Relationship diagrams.  CO 3 Model and design solutions for efficiently representing and querying data using relational model 1  CO 4 Demonstrate the features of indexing and hashing in database applications 2  CO 5 Discuss and compare the aspects of Concurrency Control and Recovery in Database systems 2  CO 6 Explain various types of NoSQL databases 1  CO 1 Explain the relevance, structure and functions of Operating Systems in computing devices 1  CO 2 Illustrate the concepts of process management and process scheduling mechanisms employed in Operating Systems.  CO 3 Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems 2  CO 4 Explain the memory management algorithms in Operating Systems 2  CO 5 Explain the security aspects and algorithms for file and storage management in Operating Systems 2  CO 6 Develop the control logic for a given arithmetic algorithms in Operating Systems 2  CO 1 Understand the core values that shape the ethical behaviour of a professional.  CO 2 Adopt a good character and follow an ethical life.  CO 3 Explain the fole and responsibility in technological development by keeping personal ethics and legal ethics.  CO 4 Solve moral and ethical problems through exploration and assessment by established experiments.  Apply the knowledge of human values and social values to contemporary ethical values and global issues. | COMPUTER ORGANIZATION AND ARCHITECTURE  ORGANIZATION AND ARCHITECTURE  CO 3 Demonstrate the control signals required for the execution of a given instruction  CO 4 Illustrate the design of Arithmetic Logic Unit and explain the usage of registers in it  CO 5 Explain the implementation aspects of arithmetic algorithms in a digital computer  CO 6 Develop the control logic for a given arithmetic problem  CO 1 Summarize and exemplify fundamental nature and characteristics of database systems  CO 2 Model real word scenarios given as informal descriptions, using Entity Relationship diagrams.  CO 3 Model and design solutions for efficiently representing and querying data using relational model  CO 4 Demonstrate the features of indexing and hashing in database applications  CO 5 Discuss and compare the aspects of Concurrency Control and Recovery in Database systems  CO 6 Explain various types of NoSQL databases  CO 7 Explain the relevance, structure and functions of Operating Systems in computing devices  CO 8 Illustrate the concepts of process management and process scheduling mechanisms  CO 9 Explain process synchronization in Operating Systems and illustrate process synchronization mechanisms using Mutex Locks, Semaphores and Monitors  CO 4 Explain any one method for detection, prevention, avoidance and recovery for managing deadlocks in Operating Systems  CO 5 Explain the memory management algorithms in Operating Systems  CO 6 Explain the security aspects and algorithms for file and storage management in Operating Systems  CO 1 Understand the core values that shape the ethical behaviour of a professional.  CO 2 Adopt a good character and follow an ethical life.  CO 3 Solve moral and ethical problems through exploration and assessment by established experiments.  Apply the knowledge of human values and social values to contemporary ethical values and global issues. | COMPUTER ORGANIZATION AND ARCHITECTURE  CO 3 Demonstrate the control signals required for the execution of a given instruction 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | COMPUTER ORGANIZATION AND ARCHITECTURE | COMPUTER ORGANIZATION AND ARCHITECTURE   CO   Demonstrate the control signals required for the execution of a given instruction   2   2   2   2   2   2   2   2   2 | COMPUTER ORGANIZATION AND ARCHITECTURE    CO 3   Demonstrate the control signals required for the execution of a given instruction   2 | COMPUTER ORGANIZATION AND ARCHITECTURE | COMPUTER ORGANIZATION AND ARCHITECTURE | COMPUTER ORGANIZATION AND ARCHITECTURE   CO 3   Demonstrate the control signals required for the execution of a given instruction   2   2   2   2   2   2   2   2   2 | COMPUTER ORGANIZATION AND ARCHITECTURE   CO 3   Demonstrate the control signals required for the execution of a given instruction   2   2   2   2   2   2   3   3   2   2 | COMPUTER ORGANIZATION AND AND ARCHITECTURE   CO 3 Demonstrate the control signals required for the execution of a given instruction   2 |

|            |                           |          |   |   |   |   |   |   |   |   |   |   |   | , |   |
|------------|---------------------------|----------|---|---|---|---|---|---|---|---|---|---|---|---|---|
|            |                           | CO 2     | Utilize the fundamental rights and duties.  |   |   |   |   |   | 3 | 3 | 3 |   | 3 |   |   |
| MCN202     | CONSTITUTION OF           | CO 3     | Understand the working of the union executive, parliament and judiciary.  |   |   |   |   |   | 3 | 2 | 3 |   | 3 |   |   |
| MCN202     | INDIA                     | CO 4     | Understand the working of the state executive, legislature and judiciary.   |   |   |   |   |   | 3 | 2 | 3 |   | 3 |   |   |
|            |                           | CO 5     | Utilize the special provisions and statutory institutions.  |   |   |   |   |   | 3 | 2 | 3 |   | 3 |   |   |
|            |                           | CO 6     | Show national and patriotic spirit as responsible citizens of the country   |   |   |   |   |   | 3 | 3 | 3 |   | 2 |   |   |
|            |                           | CO 1     | Design database schema for a given real world problem-domain using standarddesign and mo                                    | 3 | 3 | 2 |   | 3 |   |   | 3 |   | 2 |   | 2 |
|            |                           | CO 2     | Construct queries using SQL for database creation, interaction, modification, andupdation.                                  | 3 | 3 | 2 |   | 3 |   |   | 3 |   | 2 |   | 2 |
| AH. 202    | DATABASE<br>MANAGEMANT    | CO 3     | Design and implement triggers and cursors.  | 3 | 3 | 2 | 2 | 3 |   |   | 3 |   | 2 |   | 2 |
| AIL 202    | MANAGEMAN I<br>SYSTEM LAB | CO 4     | Implement procedures, functions, and control structures using PL/SQL.   | 3 | 3 | 2 | 2 | 3 |   |   | 3 |   | 2 |   | 2 |
|            |                           | CO 5     | Perform CRUD operations in NoSQL Databases.   | 3 | 2 | 2 |   | 3 |   |   | 3 |   | 2 |   | 2 |
|            |                           | CO 6     | Develop database applications using front-end tools and back-end DBMS.  | 3 | 2 | 2 | 2 | 3 | 3 |   | 3 | 2 | 2 | 2 | 2 |
|            |                           | CO 1     | Illustrate the use of systems calls in Operating Systems.   | 2 | 2 | 2 |   |   |   |   | 2 |   | 2 |   | 2 |
|            |                           | CO 2     | Implement Process Creation and Inter Process Communication in Operating Systems   | 3 | 2 | 2 |   |   |   |   | 2 |   | 2 |   | 2 |
| CIGIT 2006 | OPERATING                 |          | Implement Fist Come First Served, Shortest Job First, Round Robin and Prioritybased CPU Scheduling Algorithms               | 2 | 2 | 2 | 2 |   |   |   | 2 |   | 2 |   | 2 |
| CST 206    | SYSTEMS LAB               | 1 ('() 1 | Illustrate the performance of First In First Out, Least Recently Used and Least Frequently Used Page Replacement Algorithms | 2 | 2 | 2 | 2 |   |   |   | 2 |   | 2 |   | 2 |
|            |                           | CO 5     | Implement modules for Deadlock Detection and Deadlock Avoidance in Operating Systems  | 2 | 3 | 2 | 2 |   |   |   | 2 |   | 2 |   | 2 |
|            |                           | CO 6     | Implement modules for Storage Management and Disk Scheduling in Operating Systems   | 2 | 2 | 2 | 2 |   |   |   | 2 |   | 2 |   | 2 |

| Course code | Course Name                     | Course outcomes   | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------------|---------------------------------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| CST 301     | FORMAL LANUAGES<br>AND AUTOMATA | Classify a given formal language into Regular, Context-Free, Context CO 1 Sensitive, Recursive or Recursively Enumerable.                                     | 3   | 2   | 2   |     |     |     |     |     |     |      | 3    | 3    |
|             | THEORY                          | Explain a formal representation of a given regular language as a finite state automaton, CO 2 regular grammar, regular expression and Myhill-Nerode relation. | 3   | 2   | 2   | 2   |     |     |     |     |     |      | 3    | 3    |

|         |                                  |      | Design a Pushdown Automaton and a Context-Free Grammar for a given  |   |   |   |   |   |   |   |   |   |   |
|---------|----------------------------------|------|---|---|---|---|---|---|---|---|---|---|---|
|         |                                  | CO 3 | context-free language.  | 3 | 2 | 2 | 2 |   |   |   |   | 3 | 3 |
|         |                                  | CO 4 | Design Turing machines as language acceptors or transducers.  | 3 | 2 | 2 | 2 |   |   |   |   | 3 | 3 |
|         |                                  | CO 5 | Explain the notion of decidability.   | 3 | 2 | 3 | 2 |   |   |   |   | 3 | 3 |
|         |                                  | CO 1 | Explain the features of computer networks, protocols, and network design models   | 3 | 2 |   |   |   |   |   |   | 3 | 3 |
|         |                                  |      | Describe the fundamental characteristics of the physical layer and identify the usage in network communication  | 3 | 3 | 2 |   |   |   |   |   | 3 | 3 |
| CST303  | COMPUTER                         | CO 3 | Explain the design issues of data link layer, link layer protocols, bridges and switches  | 3 | 2 | 1 |   |   |   |   |   | 3 | 3 |
| C51303  | NETWORKS                         | CO 4 | Illustrate wired LAN protocols (IEEE 802.3) and wireless LAN protocols (IEEE 802.11)  | 3 | 2 | 1 |   |   |   |   |   | 2 | 3 |
|         |                                  | CO5  | Select appropriate routing algorithms, congestion control techniques, and Quality of Service requirements for a network   | 3 | 2 | 1 | 1 |   |   |   |   | 3 | 3 |
|         |                                  |      | Illustrate the functions and protocols of the network layer, transport layer, and application layer in inter-networking   | 3 | 2 | 1 |   |   | 2 |   |   | 3 | 3 |
|         |                                  | CO 1 | Illustrate Machine Learning concepts and basics of supervised learning concepts.  | 3 | 3 | 3 | 1 |   |   |   |   |   | 1 |
|         | INTRODUCTION<br>TO               | CO 2 | Describe dimensionality reduction techniques and supervised learning concepts   | 1 | 1 | 3 | 1 | 1 |   |   |   |   | 1 |
| AMT 305 | MACHINE<br>LEARNING              |      | Solve real life problems using appropriate machine learning models and evaluate the performance measures and Illustrate the concepts of Multilayer neural network | 1 | 1 | 3 | 3 |   |   |   |   |   | 1 |
|         | LEARNING                         | CO 4 | Illustrate basics of parameter estimation models and the working of classifier SVM classifier model   | 1 | 2 | 1 | 1 |   |   |   |   |   | 1 |
|         |                                  | CO 5 | Describe unsupervised learning concepts   | 2 | 1 | 1 | 1 |   |   |   |   |   | 1 |
|         |                                  | CO 1 | Explain the fundamental concepts of intelligent systems and their architecture.   | 2 |   |   |   |   |   |   |   |   |   |
|         | NITRODUCTION TO                  | CO 2 | Illustrate uninformed and informed search techniques for problem solving in intelligent systems.  | 2 | 2 |   |   |   |   |   |   |   | 1 |
| AIT 307 | INTRODUCTION TO<br>ARTIFICIAL    | CO 3 | Solve Constraint Satisfaction Problems using search techniques.   | 2 | 2 | 2 | 2 | 2 |   |   |   |   | 1 |
|         | INTELLIGENCE                     |      | Represent AI domain knowledge using logic systems and use inference techniques for reasoning in intelligent systems.  | 2 | 2 | 2 | 2 | 2 |   |   |   |   | 1 |
|         |                                  | CO 5 | Illustrate different types of learning techniques used in intelligent systems   | 2 | 2 | 2 |   |   | 2 |   |   |   | 1 |
|         |                                  | CO 1 | Demonstrate Traditional and Agile Software Development approaches   | 3 | 3 | 3 | 3 |   | 3 |   | 3 |   |   |
|         |                                  | CO 2 | Prepare Software Requirement Specification and Software Design for a given problem.   | 3 | 3 | 3 | 3 |   | 3 |   | 3 |   |   |
| CST 309 | MANAGEMENT OF<br>SOFTWARE SYSTEM | CO 3 | Justify the significance of design patterns and licensing terms in software development, prepare testing, maintenance and DevOps strategies for a project         | 3 | 3 | 3 | 3 |   |   | 3 | 3 |   |   |

|         | · ·                                   |      |   |   |   |   |   |   |   |   |   |   |   |   |
|---------|---------------------------------------|------|---|---|---|---|---|---|---|---|---|---|---|---|
|         |                                       |      | Make use of software project management concepts while planning, estimation, scheduling, tracking and change management of a project, with a traditional/agile framework. | 3 | 3 | 3 | 3 |   | 3 |   |   | 3 | 3 |   |
|         |                                       | CO 5 | Utilize SQA practices, Process Improvement techniques and Technology advancements in cloud based software models and containers & microservices                           | 3 | 3 | 3 | 3 |   | 3 |   |   |   |   |   |
|         |                                       |      | Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle                 |   | 2 |   |   |   | 2 |   |   |   | 2 | 2 |
|         |                                       | CO 2 | Distinguish between different hazard types and vulnerability types and do vulnerability assessment  | 2 | 3 | 2 |   | 2 | 2 | 3 |   |   | 3 | 2 |
| MCN 301 | DISASTER                              |      | Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk   | 2 | 3 | 2 | 2 | 2 | 2 | 3 |   |   | 3 | 2 |
| MCN 301 | MANAGEMENT                            |      | Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community                       | 3 | 3 | 3 |   | 2 | 2 | 3 |   |   |   | 2 |
|         |                                       | (()) | Identify factors that determine the nature of disaster response and discuss the various disaster response actions   | 3 | 3 |   |   | 2 | 2 | 3 |   |   |   | 2 |
|         |                                       | CO 6 | Explain the various legislations and best practices for disaster management and risk reduction at national and international level  | 3 |   |   |   |   | 2 | 3 | 3 |   |   | 2 |
|         |                                       | CO 1 | Develop applications in Python programming  | 3 | 3 | 3 |   |   |   |   |   |   |   | 1 |
|         | DYTHON AND                            |      | Implement machine learning algorithms using packages and libraries in Python for various applications   | 3 | 3 | 3 |   |   |   |   |   |   |   | 1 |
| AML 311 | PYTHON AND<br>MACHINE LEARNING<br>LAB |      | Implement python programs for supervised learning methods through Neural network, Regression and classification   | 3 | 3 | 3 |   |   |   |   |   |   |   | 1 |
|         | E/AB                                  | CO 4 | Implement clustering algorithms   | 3 | 3 | 3 | 3 |   |   |   |   |   |   | 1 |
|         |                                       | CO 5 | Apply dimensionality reduction as a dataset preprocessing step  | 3 | 3 | 3 | 3 |   |   |   | 1 |   |   | 1 |
|         |                                       | CO 1 | State the basics of learning problems with hypothesis and version spaces  | 3 | 3 | 3 | 3 | 3 |   |   | 1 |   |   | 1 |
|         |                                       | CO 2 | Demonstrate real-world problems as state space problems, optimization problems or constrain   | 3 | 3 | 3 | 3 | 3 |   |   | 1 |   |   | 1 |
| AIL333  | AI ALGORITHMS LAB                     | CO 3 | Simulate given problem scenario and analyze its performance.  | 3 | 3 | 3 | 3 | 3 |   |   | 1 |   |   | 1 |
|         |                                       | CO 4 | Develop programming solutions for given problem scenario.   | 3 | 3 | 3 | 3 | 3 | 3 |   | 1 |   |   | 1 |
|         |                                       | CO 5 | Design and develop an expert system by using appropriate tools and techniques.  | 3 | 3 | 3 | 3 | 3 |   |   | 1 |   | _ | 1 |

| Course code | Course Name |      | Course outcomes   | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------------|-------------|------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
|             |             | CO 1 | Summarize basic concepts and learning methods for NLP           | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      | 1    |
|             |             | CO 2 | Demonstrate the relevance of preprocessing methods on text data | 3   | 3   | 3   | 3   |     |     |     |     |     |      |      | 1    |

|         | CONCEPTS IN                          | CO 3 | Compare different language modelling techniques  | 1 | 2 | 2 | 1 |   |   |   |  |   | 1 |
|---------|--------------------------------------|------|--|---|---|---|---|---|---|---|--|---|---|
| AMT302  | NATURAL<br>LANGUAGE                  | CO 4 | Make use of NLP techniques in Text Classification and Information Retrieval  | 1 | 2 | 2 |   |   |   |   |  |   | 1 |
|         | PROCESSING                           | CO 5 | Explain Information Extraction, Relation Detection, QA Systems and Machine Translation   | 1 | 2 | 2 |   |   |   |   |  |   | 1 |
|         |                                      | CO 1 | Understand the concepts of manipulator and mobile robotics   | 3 |   |   |   | 1 | 2 |   |  |   | 3 |
|         |                                      | CO 2 | Choose the suitable sensors, actuators and control for robot design  | 2 | 1 |   |   | 1 |   |   |  |   | 1 |
| AIT304  | ROBOTICS AND INTELLIGENT SYSTEM      | CO 3 | Developing kinematic model of mobile robot and understand robotic vision intelligence.   | 1 | 1 |   | 1 | 2 | 2 |   |  |   | 1 |
|         |                                      | CO 4 | Discover the localization and mapping methods in robotics  | 2 |   |   | 1 | 2 | 1 |   |  |   | 1 |
|         |                                      | CO 5 | Plan the path and navigation of robot by applying artificial intelligence algorithm.   | 3 |   |   | 2 | 1 | 1 |   |  |   | 2 |
|         |                                      | CO 1 | Analyze any given algorithm and express its time and space complexities in asymptotic notations.   | 1 | 1 | 1 | 1 |   |   |   |  |   | 2 |
|         |                                      | CO 2 | Derive recurrence equations and solve it using Iteration, Recurrence Tree, Substitution and Master's Method to compute time complexity of algorithms.  | 2 | 2 | 3 | 3 |   |   |   |  |   | 2 |
|         | ALGORITHM                            | CO 3 | Illustrate Graph traversal algorithms & applications and Advanced Data structures like AVL trees and Disjoint set operations.                          | 2 | 2 | 1 | 2 |   |   |   |  |   | 1 |
| CST 306 | ANALYSIS AND<br>DESIGN               | CO 4 | Demonstrate Divide-and-conquer, Greedy Strategy, Dynamic programming, Branch-and<br>Bound and Backtracking algorithm design techniques                 | 2 | 2 | 2 | 2 |   |   |   |  |   | 2 |
|         |                                      | CO5  | Classify a problem as computationally tractable or intractable, and discuss strategies to address intractability                                       | 2 | 2 |   |   |   |   |   |  |   |   |
|         |                                      | CO 6 | Identify the suitable design strategy to solve a given problem.  | 2 | 2 | 2 | 2 |   |   |   |  |   | 2 |
|         |                                      | CO 1 | Comprehend the concepts of Machine Learning  | 2 | 1 |   |   |   |   |   |  |   | 2 |
|         |                                      | CO 2 | Comprehend the concepts and applications of data structures  | 2 | 2 |   |   |   |   |   |  |   | 2 |
| CMT308  | COMPREHENSIVE<br>COURSE WORK         | CO 3 | Comprehend the concepts, functions and algorithms in Operating System  | 2 | 2 |   |   |   |   |   |  |   | 2 |
|         |                                      | CO4  | Comprehend the concepts of Artificial Intelligence   | 2 | 1 |   |   |   |   |   |  |   | 2 |
|         |                                      | CO5  | Comprehend the fundamental principles of database design and manipulation  | 2 | 2 |   |   |   |   |   |  |   | 2 |
|         |                                      | CO 1 | Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare | 2 |   |   |   |   |   |   |  | 1 |   |
|         |                                      | CO 2 | Take appropriate decisions regarding volume of output and to evaluate the social cost of production.   | 2 | 2 |   |   | 2 | 2 | 3 |  | 1 |   |
| HUT 300 | Industrial Economics & Foreign Trade | CO 3 | Determine the functional requirement of a firm under various competitive conditions.   | 2 | 2 | 1 |   |   |   |   |  | 1 |   |

|         |                        |        | Examine the overall performance of the economy, and the regulation of economicfluctuations and its impact on various sections in the society.  | 2 | 2 | 1 |   |   | 1 |   |   |   |   | 1 |   |
|---------|------------------------|--------|--|---|---|---|---|---|---|---|---|---|---|---|---|
|         |                        | (() 5  | Determine the impact of changes in global economic policies on the business opportunities of a firm  | 2 | 2 | 1 | 2 |   |   |   |   |   |   | 1 |   |
|         |                        | CO 1   | Summarize the basic concepts and the learning rules of ANN   | 3 | 2 | 2 |   |   |   |   |   |   |   |   | 3 |
|         | ARTIFICIAL<br>NEURAL   | CO 2   | Utilize the fundamental learning algorithms namely, Mc-Culloch Pitts, Hebb Perceptron and Adaline to solve real world problems   | 3 | 2 | 2 | 2 | 2 |   |   |   |   |   |   | 3 |
| AIT 353 | NETWORKS<br>TECHNIQUES | CO 3   | Implement Back propagation learning algorithm, Generic Radial Basis Function network.  | 3 | 2 | 2 | 2 | 2 |   |   |   |   |   |   | 3 |
|         | TECHNIQUES             | CO4    | Demonstrate Self Organizing Maps and Adaptive Resonance Theory   | 3 | 0 | 0 | 2 | 2 |   |   |   |   |   |   | 3 |
|         |                        | CO 5   | Implement training algorithms for pattern association  | 3 | 2 | 3 | 2 | 2 |   |   |   |   |   |   | 3 |
|         |                        | CO 1   | Apply the concept of natural language processing (NLP) using Natural Language Toolkit (NLTK)   | 3 | 3 | 3 |   |   |   |   |   |   |   |   | 1 |
| AML332  | NATURAL<br>LANGUAGE    | 1 (()) | Build text corpora with tokenization, Stemming, Lemmatization and apply visualization techniques   | 3 | 3 | 3 |   |   |   |   |   |   |   |   | 1 |
| AML332  | PROCESSING<br>LAB      | CO 3   | Evaluate the classifiers and choose the best classifier  | 3 | 3 | 3 |   |   |   |   |   |   |   |   | 1 |
|         |                        | CO 4   | Create Artificial Intelligence applications for text data  | 3 | 3 | 3 |   |   |   |   |   |   |   |   | 1 |
|         |                        | CO 1   | Identify technically and economically feasible problems  | 3 | 3 | 3 | 2 | 3 |   | 3 | 3 | 3 | 3 | 2 | 2 |
|         |                        |        | Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes  | 3 | 2 | 3 | 2 | 3 | 2 | 3 |   | 3 | 3 | 2 | 2 |
| CSD 334 | MINI PROJECT           | CO 3   | Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 |
|         |                        | CO4    | Prepare technical report and deliver presentation  | 3 | 3 | 3 | 2 | 3 | 2 |   |   | 3 | 3 | 2 | 3 |
|         |                        | CO5    | Apply engineering and management principles to achieve the goal of the project   | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 3 |

| Course code | Course Name                  |         | Course outcomes  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------------|------------------------------|---------|--|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
|             |                              | CO 1    | Illustrate the basic concepts of neural networks, deep learning and its practical issues                           | 3   | 3   | 2   | 2   |     |     |     |     |     |      |      | 3    |
|             |                              | I (CO 2 | Outline the standard regularization and optimization techniques for the effective training of deep neural networks | 3   | 2   | 2   | 3   |     |     |     |     |     |      |      | 3    |
| AIT401      | FOUNDATIONS OF DEEP LEARNING | CO 3    | Build convolutional Neural Network (CNN) models for different use cases.   | 3   | 3   | 3   | 2   | 2   |     |     |     | ·   |      |      | 3    |

|         |                                    | CO 4 | Apply the concepts of Recurrent Neural Network (RNN), Long Short Term Memory(LSTM), Gated Recurrent Unit (GRU)                   | 3 | 3 | 2 | 1 | 2 |   |   |   |   |   |   | 3 |
|---------|------------------------------------|------|--|---|---|---|---|---|---|---|---|---|---|---|---|
|         |                                    | CO 5 | Explain the concepts of auto encoder, generative models  | 3 | 2 | 1 | 2 |   |   |   |   |   |   |   | 3 |
|         |                                    | CO 1 | Describe the theories of accident causation and preventive measures of industrial accidents.                                     | 2 | 2 |   |   |   | 2 | 2 | 2 |   |   |   | 1 |
|         |                                    | CO 2 | Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping.      | 2 | 1 | 2 |   | 1 | 1 | 1 | 1 |   |   |   | 1 |
| MCN 401 | INDUSTRIAL SAFETY<br>ENGINEERING   | CO 3 | Explain different issues in construction industries.   | 2 | 2 | 2 |   | 1 | 1 | 1 | 1 | 1 | 1 |   | 1 |
|         |                                    | CO 4 | Describe various hazards associated with different machines and mechanical material handlin                                      | 2 | 2 | 2 |   | 1 | 1 | 1 | 1 | 1 | 1 |   | 1 |
|         |                                    | CO 5 | Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards. | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |   | 1 |
|         |                                    | CO 1 | Explain the various cloud computing models and services.   | 2 |   |   |   |   |   |   |   |   |   |   | 2 |
|         |                                    | CO 2 | Demonstrate the significance of implementing virtualization techniques.  | 2 | 2 | 2 |   |   |   |   |   |   |   |   | 2 |
| CST 423 | CLOUD COMPUTING                    | CO 3 | Explain different cloud enabling technologies and compare private cloud platforms  | 2 |   |   |   |   |   |   |   |   |   |   | 2 |
| CS1 423 | CLOUD COMPUTING                    | CO 4 | Apply appropriate cloud programming methods to solve big data problems.  | 2 | 2 | 2 | 2 | 2 |   |   |   |   |   |   | 2 |
|         |                                    | CO5  | Describe the need for security mechanisms in cloud   | 2 | 2 |   |   |   |   |   |   |   |   |   | 2 |
|         |                                    | CO 6 | Compare the different popular cloud computing platforms  | 2 |   |   |   | 2 |   |   |   |   |   |   | 2 |
|         |                                    | CO 1 | Explain interaction between subsystems of earth that give rise to hazards and their potential for disasters                      | 2 | 1 |   | 2 | 1 | 2 | 3 | 1 |   | 1 | 1 | 3 |
|         |                                    | CO 2 | Explain the evolving concepts and thoughts of management of hazards and disasters  | 2 | 1 |   | 2 | 1 | 2 | 3 | 1 |   | 1 | 1 | 3 |
| CET445  | NATURAL DISASTER<br>AND MITIGATION | CO 3 | Analyse the causes behind natural disasters and evaluate their magnitude and impacts   | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 3 |
|         |                                    | CO 4 | Create management plans for hazards and disasters, and understand the roles of agencies involved.                                | 2 | 1 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 3 |
|         |                                    | CO5  | Explain the concept of sustainable development and EIA and their role in mitigating disasters                                    | 2 | 2 | 3 | 2 | 1 | 3 | 3 | 2 | 1 | 2 | 2 | 3 |
|         |                                    | CO 1 | Identify academic documents from the literature which are related to her/his areas of interest                                   | 2 | 2 | 1 | 1 |   | 2 | 1 |   |   |   |   | 3 |
|         |                                    | CO 2 | Read and apprehend an academic document from the literature which is related to her/ his areas of interest                       | 3 | 3 | 2 | 3 |   | 2 | 1 |   |   |   |   | 3 |
| ECQ413  | SEMINAR                            | CO 3 | Prepare a presentation about an academic document  | 3 | 2 |   |   | 3 |   |   | 1 |   | 2 |   | 3 |
|         |                                    | CO 4 | Give a presentation about an academic document   | 3 |   |   |   | 2 |   |   | 1 |   | 3 |   | 3 |
|         |                                    | CO 5 | Prepare a technical report   | 3 | 3 | 3 | 3 | 2 | 2 |   | 2 |   | 3 |   | 3 |

|        |                   | CO 1 | Model and solve real world problems by applying knowledge across domains  | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 |
|--------|-------------------|------|---|---|---|---|---|---|---|---|---|---|---|---|---|
|        |                   | (()) | Develop products, processes or technologies for sustainable and socially relevant applications                        | 2 | 2 | 2 | - | 1 | 3 | 3 | 1 | 1 | - | 1 | 3 |
| ECD415 | PROJECT PHASE I   | (()) | Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks |   |   |   |   |   |   |   | 3 | 2 | 2 | 1 |   |
| ECD415 | PROJECT PHASET    | CO 4 | Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms       |   |   |   |   | 2 |   | 3 | 2 | 2 | 3 | 2 |   |
|        |                   | CO 5 | Identify technology/research gaps and propose innovative/creative solutions   | 2 | 3 | 3 | 1 | 2 |   |   |   |   |   | 1 |   |
|        |                   | CO 6 | Organize and communicate technical and scientific findings effectively in written and oral forms                      |   |   |   |   | 2 |   | 2 | 2 | 3 | 1 | 1 |   |
|        |                   | CO 1 | Implement advanced machine learning concepts using python   | 3 | 2 | 2 | 2 | 1 |   |   | 2 |   | 1 |   | 2 |
|        |                   | CO 2 | Apply basic data pre-processing and tuning techniques   | 3 | 3 | 3 | 2 | 3 |   |   | 3 |   | 2 |   | 2 |
| AIL411 | DEEP LEARNING LAB | CO 3 | Experiment behaviour of neural networks and CNN on dataset  | 2 | 3 | 1 | 3 | 2 | 2 |   | 1 |   | 2 |   | 2 |
|        |                   | CO 4 | Design and Implement sequence modelling schemes   | 3 | 3 | 2 | 1 | 3 | 2 |   | 3 |   | 1 |   | 2 |
|        |                   | CO 5 | Implement auto encoders on standard datasets and analyse the performance  | 2 | 3 | 3 | 2 | 2 | 3 |   | 2 |   | 3 |   | 2 |

| Course code | Course Name        |      | Course outcomes   | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|-------------|--------------------|------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
|             |                    | CO 1 | Outline the fundamentals of IoT and its underlying physical and logical architecture  | 2   | 2   | 2   |     |     |     |     |     |     |      |      | 2    |
|             |                    | CO 2 | Explain the hardware architectures for IoT  | 2   | 2   | 2   |     |     |     |     |     |     |      |      | 2    |
| CMT402      | INTRODUCTION TO    | CO 3 | Outline the Network architectures for IoT   | 2   | 2   | 2   |     |     |     |     |     |     |      |      | 2    |
| CW11402     | INTERNET OF THINGS | CO 4 | Implement data analytics on the IoT platforms   | 2   | 2   | 2   | 2   | 2   |     |     |     |     |      |      | 2    |
|             |                    | CO 5 | Appreciate the security considerations in IoT   | 2   | 2   | 2   |     | 2   |     |     |     |     |      |      | 2    |
|             |                    | CO 6 | Implement IoT applications using the available hardware and software.                 | 2   | 2   | 2   | 2   | 2   | 2   |     |     |     |      |      | 2    |
|             |                    | CO 1 | Describe soft computing techniques and the basic models of Artificial Neural networks | 3   | 2   | 2   |     |     |     |     |     |     |      |      | 3    |

|         |                                 | CO 2 | Solve practical problems using neural networks   | 3 | 2 | 2 | 2 |   |   |   |   |   |   |   | 3 |
|---------|---------------------------------|------|--|---|---|---|---|---|---|---|---|---|---|---|---|
| CST444  | SOFT COMPUTING                  | CO 3 | Illustrate the operations, models and applications of fuzzy logic  | 3 | 2 | 2 | 2 |   |   |   |   |   |   |   | 3 |
|         |                                 | CO 4 | Illustrate the concepts of genetic algorithm   | 3 | 2 | 2 | 2 |   |   |   |   |   |   |   | 3 |
|         |                                 | CO 5 | Describe the concepts of multi objective optimization techniques models and the need for using hybrid soft computing approches             | 3 | 2 | 3 |   |   |   |   |   |   |   |   | 3 |
|         |                                 | CO 1 | Employ the key process of data mining and data warehousing concepts in application domain  | 3 | 1 |   |   |   |   |   |   |   |   |   | 1 |
|         |                                 |      | Make use of appropriate preprocessing techniques to convert raw data into suitable format for practical data mining tasks                  | 3 | 2 | 1 | 1 | 2 |   |   |   |   |   |   | 1 |
| CST466  | DATA MINING                     | CO 3 | Illustrate the use of classification and clustering algorithms in various application domains  | 3 | 2 | 2 | 2 | 2 |   |   |   |   |   |   | 1 |
|         |                                 | CO 4 | Comprehend the use of association rule mining techniques   | 3 | 2 | 2 | 2 | 1 |   |   |   |   |   |   | 1 |
|         |                                 | CO 5 | Explain advanced data mining concepts and their applications in emerging domains   | 3 | 1 |   |   |   |   |   |   |   |   |   | 1 |
|         |                                 | CO 1 | Explain the concepts of image formation and the basis of digital image processing.   | 3 | 3 |   |   |   |   |   |   |   |   |   | 3 |
|         |                                 | CO 2 | Demonstrate the role of image transforms in representing, highlighting, and modifying image features                                       | 3 | 3 |   |   | 3 |   |   |   |   |   |   | 3 |
| CST 438 | IMAGE PROCESSING<br>TECHNIQUES  | CO 3 | Solve image enhancement problems using spatial and frequency domain techniques.  | 3 | 3 | 3 |   |   |   |   |   |   |   |   | 3 |
|         |                                 | CO 4 | Make use of the concept of image restoration and image segmentation techniques in real-world   | 3 | 3 | 3 | 3 | 3 | 3 |   |   |   |   |   | 3 |
|         |                                 | CO 5 | Interpret morphological operations, image representation, and description techniques.  | 3 | 3 |   |   |   |   |   |   |   |   |   | 3 |
|         | COMPREHENSIVE                   | CO 1 | The objective of this Course viva is to ensure the basic knowledge of each student in the most fundamental core courses in the curriculum. | 3 | 1 | 3 |   | 1 | 3 | 1 | 2 | 3 | 2 |   | 2 |
| ECT404  | COMPREHENSIVE<br>COURSE<br>VIVA | CO 2 | The viva voce shall be conducted based on the core subjects studied from third to eighth semester  | 3 | 3 | 3 | 1 |   | 3 | 1 |   | 2 |   | 2 | 2 |
|         | VIVA                            | CO 3 | helps the learner to become competent in placement tests and other competitive examinations.   | 3 | 2 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 2 | 1 | 2 |
|         |                                 | CO 1 | Model and solve real world problems by applying knowledge across domains   | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 2 |
|         |                                 | CO 2 | Develop products, processes or technologies for sustainable and socially relevant applications   | 2 | 2 | 2 |   | 1 | 3 | 3 | 1 | 1 |   | 1 | 1 |
| ECD416  | PROJECT PHASE II                | CO 3 | Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks                      |   |   |   |   |   |   |   |   | 3 | 2 | 2 | 1 |
| ECD410  | I KOJEC I PRASE II              | CO 4 | Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms                            |   |   |   |   | 2 |   |   | 3 | 2 | 2 | 3 | 2 |
|         |                                 | CO 5 | Identify technology/research gaps and propose innovative/creative solutions  | 2 | 3 | 3 | 1 | 2 |   |   |   |   |   |   | 1 |
|         |                                 | CO 6 | Organize and communicate technical and scientific findings effectively in written and oral forms   |   |   |   |   | 2 |   |   | 2 | 2 | 3 | 1 | 1 |