

# Department of Computer Sc. & Engineering

## Program Specific Outcomes (PSOs)

**PSO1:** To accustom themselves to the rapidly changing sustainable environment by applying their fundamental concepts and methodology of computer systems in terms of software and hardware.

**PSO2:** To apply fundamental concepts and methodology of computer systems to establish themselves as the successful entrepreneur.

**PSO3:** To establish themselves as the software developer and innovator by understanding the software development lifecycle and methodologies of software systems.

Based upon Course Outcome from each semester, POs and PSOs can be achieved which helps to attain PEO after 4years of graduation.

## Program Outcomes (POs)

**Engineering Graduates will be able to:**

- 1. Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge and research methods. including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear

instructions.

11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

## Course Outcomes(COs)

### Curriculum for Autonomy

### Curriculum under 2018-19 Regulations

## Department of Computer Science & Engineering *Curriculum*

### *Structure & Syllabus*

*(Effective from 2018-19 admission batch)*

**Under Autonomy (GR A: ECE, EE, EIE, BME; GR B: CSE, IT, ME, CE, FT)**

1 <sup>st</sup> Semester									
Sl No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points	
				L	T	P	Total		
<b>A. THEORY</b>									
1 BS M 101 Mathematics -I 3 1 0 4 4									
2	BS	CH 101/ PH 101	Chemistry (Gr. A) / Physics- I (Gr. B)	3	0	0	3	3	
3	ES	EE 101/ EC 101	Basic Electrical Engineering (Gr. A) /Basic Electronics Engineering (Gr. B)	3	0	0	3	3	
4	HS	HU 101	English	2	0	0	2	2	
<b>Total of Theory</b>							<b>12</b>	<b>12</b>	
<b>B. PRACTICAL</b>									
5	BS	CH 191/ PH191	Chemistry Lab (Gr. A) / Physics- I Lab (Gr. B)	0	0	3	3	1.5	

6	ES	EE 191/ EC 191	Basic Electrical Engineering Lab (Gr. A) /Basic Electronics Engineering Lab (Gr. B)	0	0	3	3	1.5
7	ES	ME 191/ ME 192	Engineering Graphics & Design (Gr A) / Workshop/Manufacturing Practices (Gr-B)	0	0	3	3	1.5
8	PROJ	PR 191	PROJECT-IA	0	0	1	1	0.5
9	PROJ	PR 192	PROJECT-IB	0	0	1	1	0.5
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
10	MC	MC 181	Induction Program	0	0	0	0	
<b>Total of Theory, Practical &amp; Mandatory Activities/Courses</b>							<b>22</b>	<b>17.5</b>

**Course Name: Mathematics-I**

**Course Code: M 101**

**Contact: 3:1:0**

**Total Contact Hours: 48**

**Credits: 4**

**Course Outcomes:**

CO1 Recall the distinctive characteristics of matrix algebra and calculus. CO2 Understand the theoretical working of matrix algebra and calculus. CO3 Apply the principles of matrix algebra and calculus to address problems in their disciplines.

CO4 Examine the nature of system using the concept of matrix algebra and calculus.

**Course Name: Physics –I**

**Course Code: PH 101**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes:**

CO1 Describe various types mechanical resonance and its electrical equivalence. CO2 Explain basic principles of Laser, Optical fibers and various types of semiconductors CO3 Apply superposition to explain interference and diffraction as well as apply wave mechanics to attainment of Heisenberg's uncertainty principle.

CO4 Analyze importance of light as a carrier of information and examine different crystallographic structures according to their co-ordination number and packing factors. CO5 Justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics.

**Course Name: Basic Electronics Engineering Course Code: EC101**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes:**

CO1 Students able to describe the fundamentals of Semiconductors.

CO2 Students able to explain V-I characteristics of P-N Junction Diode, zener diode, working of diode rectifier, clipper, clamper, and regulator circuit.

CO3 Students able to analyze characteristics of Bipolar junction transistor (BJT) under CE, CB, CC mode of operation and it's biasing therein

CO4 Students able to illustrate the operations of JFET, MOSFET and the CS, CD, CG configuration using JFET

CO5 Students able to determine parameters due to effect of feedback in amplifier CO6 Students able to construct inverting amplifier circuit, non-inverting amplifier circuit, adder circuit, integrator and differentiator circuit using Operational Amplifier IC.

**Course Name: English**

**Course Code: HU101**

**Contact: 2:0:0**

**Total Contact Hours: 24**

**Credits: 2**

**Course Outcomes**

CO1 Know about and employ communication in a globalized workplace scenario. CO2 Understand and apply functional grammar, reading skills and sub-skills.

CO3 Acquire a working knowledge of writing strategies, formats and templates of professional writing. CO4 Apply and make use of the modalities of intercultural communication.

**Course Name: Physics I Lab**

**Course Code: PH 191**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcomes**

CO1 Demonstrate experiments allied to their theoretical concepts

CO2 Conduct experiments using LASER, Optical fiber, Torsional pendulum, Spectrometer CO3 Participate as an individual, and as a member or leader in groups in laboratory sessions actively CO4 Analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiments.

**Course Name: Basic Electronics Engineering Lab**

**Course Code: EC 191**

**Contact: 0:0:3**

**Credit: 1.5**

**Course Outcomes**

CO1 Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.

CO2 Analyze the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.

CO3 Determination of input-offset voltage, input bias current and Slew rate, Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.

CO4 Able to know the application of Diode, BJT & OPAMP.

**Course Name: Workshop/Manufacturing Practices**

**Course Code: ME 192**

**Contact: 0:0:3**

**Credit: 1.5**

**Course Outcomes**

CO1 Fabricate components with their own hands.

CO2 Get practical knowledge of the dimensional accuracies and tolerances applicable for different manufacturing processes.

CO3 Produce small devices of their interest for project or research purpose.

**2<sup>nd</sup> Semester**

SI No	Course Type	Course Code	Theory	Credit Hours /Week				CreditPoint
				L	T	P	Total	
<b>A. THEORY</b>								
1	BS	M 201	Mathematics -II	3	1	0	4	4
2	BS	CH 201/ PH 201	Chemistry - (Gr. B) / Physics – I (Gr. A)	3	0	0	3	3
3	ES	EE 201/ ECEC 201	Basic Electrical Engineering (Gr. B) /Basic Electronics Engineering (Gr. A)	3	0	0	3	3
4	ES	CS 201	Programming for Problem Solving	3	0	0	3	3
5	ES	ME 201	Engineering Mechanics	3	0	0	3	3
<b>Total of Theory</b>							<b>16</b>	<b>16</b>
<b>B. PRACTICAL</b>								
6	ES	CS291	Programming for Problem Solving Lab	0	0	3	3	1.5
7	BS	CH 291/ PH 291	Chemistry Lab (Gr. B) /Physics - I Lab (Gr. A)	0	0	3	3	1.5
8	ES	EE 291/ EC 291	Basic Electrical Engineering Lab (Gr. B) /Basic Electronics Engineering Lab (Gr. A)	0	0	3	3	1.5
9	ES	ME 291/ ME 292	Engineering Graphics & Design (Gr B) / Workshop/Manufacturing Practice (Gr-A)	0	0	3	3	1.5
10	HS	HU 291	Language Lab	0	0	2	2	1
11	PROJ	PR 291	Project-II	0	0	1	1	0.5
12	PROJ *	PR 292	Innovative activities-I	0	0	0	0	0.5
<b>C. MANDATORY ACTIVITIES / COURSES</b>								

13	MC	MC 281	NSS/ Physical Activities/Meditation & Yoga/Photography/ Nature Club	0	0	0	3	
<b>Total of Theory, Practical &amp; Mandatory Activities/Courses</b>							<b>34</b>	<b>24</b>

**Course Name: Mathematics - II**

**Course Code: M 201**

**Contact: 3:1:0**

**Total Contact Hours: 48**

**Credit: 4**

**Course Outcomes**

After completion of the course students are able to

CO1 Use mathematical tools to evaluate multiple integrals and vector integrals

CO2 Apply effective mathematical tools for the solutions of ordinary differential equations that model physical processes.

CO3 Recall the properties of Laplace Transform to evaluate multiple integrals and their usage CO4:

Understand the concept of Laplace transform to solve ordinary differential equations.

**Course Name: Chemistry**

**Course Code: CH201**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 Able to describe the fundamental properties of atoms & molecules, atomic structure and the periodicity of elements in the periodic table

CO2 Able to apply fundamental concepts of thermodynamics in different engineering applications. CO3 Able to apply the knowledge of water quality parameters, corrosion control & polymers to different industries.

CO4 Able to determine the structure of organic molecules using different spectroscopic techniques. CO5

Capable to evaluate theoretical and practical aspects relating to the transfer of the production of chemical products from laboratories to the industrial scale, in accordance with environmental considerations.

**Course Name: Basic Electrical Engineering Course Code: EE201**

**Contact: 3:0:0**

**Total Contact hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 To understand Basic Electrical circuits, Power distribution and Safety measures. CO2 To analyze an apply DC network theorems.

CO3 To analyze and apply concept of AC circuits of single-phase and three-phase.

CO4 To analyze and apply concepts of AC fundamentals in solving AC network problems. CO5 To understand basic principles of Transformers and Rotating Machines.

**Course Name: Programming for Problem Solving Course**

**Code: CS 201**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 Understand and differentiate among different programming languages for problem solving. CO2 Describe the way of execution and debug programs in C language.

CO3 Define, select, and compare data types, loops, functions to solve mathematical and scientific problem.

CO4 Understand the dynamic behavior of memory by the use of pointers.

CO5 Design and develop modular programs using control structure, selection structure and file.

**Course Name: Engineering Mechanics**

**Course Code: ME 201**

**Contacts: 3:0:0**  
**Total Contact Hours: 36**  
**Credits: 3**

**Course Outcomes**

CO1 To understand representation of force, moments for drawing free-body diagrams and analyze friction-based systems in static condition

CO2 To locate the centroid of an area and calculate the moment of inertia of a section. CO3 Apply of conservation of momentum & energy principle for particle dynamics and rigid body kinetics CO4 Understand and apply the concept of virtual work, rigid body dynamics and systems under vibration.

**Course Name: Programming for Problem Solving Lab**

**Course Code: CS291**

**Contacts: 0:0:3**

**Credits: 1.5**

**Course Outcomes:**

At the end of the course students are able to understand

CO1 Learn the concept of DOS system commands and editor.

CO2 To formulate the algorithms for simple problems and to translate given algorithms to a working and correct program.

CO3 To be able to identify and correct syntax errors / logical errors as reported during compilation time and run time.

CO4 To be able to write iterative as well as recursive programs.

CO5 Learn the concept of programs with Arrays, Pointers, Structures, Union and Files.

**Course Name: Chemistry Lab**

**Course Code: CH 291**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcomes**

CO1 Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.

CO2 Able to analyse and determine the composition of liquid and solid samples working as an individual and also as a team member

CO3 Able to analyse different parameters of water considering environmental issues

CO4 Able to synthesize drug and polymer materials.

CO5 Capable to design innovative experiments applying the fundamentals of chemistry

**Course Name: Basic Electrical Engineering Laboratory**

**Course Code: EE291**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcomes**

CO1 Identify and use common electrical components.

CO2 To develop electrical networks by physical connection of various components and analyze the circuit behavior.

CO3 Apply and analyze the basic characteristics of transformers and electrical machines.

**Course Name: Engineering Graphics & Design**

**Course Code: ME 291**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcomes**

CO1 Get introduced with Engineering Graphics and visual aspects of design.

CO2 Know and use common drafting tools with the knowledge of drafting standards.

CO3 Apply computer aided drafting techniques to represent line, surface or solid models in different Engineering viewpoints.

CO4 Produce part models; carry out assembly operation and show working procedure of a designed project work using animation.

**Course Name: Lang. Lab. and Seminar Presentation**

**Course Code: HU 291**

**Contact: 0:0:2**

**Credit: 1**

**Course Outcomes**

CO1 Able to understand advanced skills of Technical Communication in English through Language Laboratory. CO2 Able to apply listening, speaking, reading and writing skills in societal and professional life.

CO3: Able to demonstrate the skills necessary to be a competent Interpersonal communicator.

CO4 Able to analyze communication behaviours.

CO5 Able to adapt to multifarious socio-economical and professional arenas with the help of effective communication and interpersonal skills.

**Course Name: NSS/Physical Activities/ Meditation & Yoga/ Photography/Nature Club Course Code:**

**MC 281 Contact: 0:0:3**

**Course Outcomes**

CO1 To increase student awareness about the weaker and unprivileged sections of society CO2 To expose students to environmental issues and ecological concerns

CO3 To make students self-aware about their participatory role in sustaining society and the environment.

3 <sup>rd</sup> Semester									
SL No	Type	Code	THEORY	Contact Hours/Week				Credits Points	
				L	T	P	Total		
<b>A. THEORY</b>									
1	BS	M(CSE)301	Mathematics-III	3	1	0	4	4	
2	BS	PH301	Physics-II	3	0	0	3	3	
3	PC	CS301	Digital Electronics and Computer Organization	3	0	0	3	3	
4	PC	CS302	Data Structures	3	0	0	3	3	
5	ES	CS 303	Circuit Theory and Network	2	0	0	2	2	
<b>Total of Theory</b>								<b>15</b>	<b>15</b>
<b>B. PRACTICAL</b>									
6	BS	PH391	Physics-II Lab	0	0	3	3	1.5	
7	PC	CS391	Digital Electronics and Computer Organization Lab	0	0	3	3	1.5	
8	PC	CS392	Data Structures Lab	0	0	3	3	1.5	
9	PC	CS393	Programming with C++	1	0	2	3	1.5	



10	PROJ	PR 391	Project-III	0	0	2	2	1
11	PROJ*	PR 392	Innovative activities-II	0	0	0	1	
<u>C. MANDATORY ACTIVITIES / COURSES</u>								
12	MC	MC 381 Behavioural and Interpersonal Skills		0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							33	

**Course Name: Mathematics - III**

**Course Code: M(CSE) 301**

**Contact: 3:1:0**

**Total Contact Hours: 48**

**Credits: 4**

**Course Outcome**

On successful completion of the learning sessions of the course, the learner will be able to:

CO1 Recall the distinctive characteristics of probability distribution, algebraic structure, number theory, recurrence relation, propositional logic and graph theory.

CO2 Demonstrate the theoretical working of probability distribution, algebraic structure, number theory, recurrence relation, propositional logic and graph theory.

CO3 Compute the probability of real-world uncertain phenomena by identifying probability distribution that fits the phenomena.

CO4 Formulate different counting problems and solve the recurrence relation using underlying concept. CO5 Construct the shortest path and minimal spanning tree from a given graph using the algorithms of graph theory.

**Course Name: Physics-II**

**Course Code: PH 301**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

After completion of this course student will be able to

CO1 explain electromagnetic wave propagation using fundamentals of electrostatics, magnetostatics and electromagnetic theory.

CO2 apply Schrödinger equation in variety of atomic scale problems including nanomaterials. CO3 analyze the importance of superposition principle of quantum mechanics in conceptualization of Quantum bits.

CO4 justify the importance of Fermi energy level in turning electronic properties of various semiconductors.

**Course Name: Digital Electronics and Computer Organization**

**Course Code: CS301**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

CO1 To realize basic gate operations and laws Boolean algebra.

CO 2 To understand basic structure of digital computer, stored program concept and different arithmetic and control unit operations.

CO3 To understand basic structure of different combinational circuits- multiplexer, decoder, encoder etc. CO4 To perform different operations with sequential circuits. CO5: To understand memory and I/O operations.

**Course Name: Data Structures**

**Course Code: CS302**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

CO1 To differentiate how the choices of data structure & algorithm methods impact the performance of program. CO2 To solve problems based upon different data structure & also write programs. CO3: To identify appropriate data structure & algorithmic methods in solving problem.

CO4 To discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing

CO5 To compare and contrast the benefits of dynamic and static data structures implementations.

**Course Name: Circuit Theory and Network**

**Course Code: CS303**

**Contact Hours: 2:0:0**

**Total Contact Hours: 24**

**Credits: 2**

**Course Outcomes**

At the end of the course, students are able to:

CO1 Understand Kirchhoff's Laws and Networks theorem for simple circuit analyses CO2 Apply Laplace Transform for steady state and transient analysis

CO3 Analyze the response of Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals. CO4: Understand two port network parameters through solving related numerical problems CO5: Analyze various types of network topology matrices by using graph theory as applied to electrical network analysis.

**Course Name: PHYSICS-II Lab**

**Course Code: PH 391**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcome**

At the end of the course students' will be able to

CO1 demonstrate experiments allied to their theoretical concepts

CO2 conduct experiments using semiconductors, dielectric and ferroelectrics CO3: classify various types of magnetic materials

CO4 participate as an individual, and as a member or leader in groups in laboratory sessions actively CO5 analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiments.

**Course Name: Digital Electronics and Computer Organization Lab**

**Course Code: CS391**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcome**

CO1 To design basic gate operations.

CO2 To design different combinational circuits- adder, subtractor, multiplexer, decoder, encoder etc. CO3 To design different sequential circuits-flip flops.

CO4 To design memory and I/O operations. CO5: To design RAM architecture.

**Course Code: Data Structures Lab**

**Course Code: CS392**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcomes**

CO1 Choose appropriate data structure as applied to specified problem definition.

CO2 Handle operations like searching, insertion, deletion, traversing mechanism on various data structures.

CO3 Have practical knowledge on the applications of data structures.

CO4 Able to store, manipulate and arrange data in an efficient manner.

CO5 Able to implement queue and stack using arrays and linked list. Implementation of queue, binary tree and binary search tree.

**Course Name: Programming with C++ Lab**

**Course Code: CS393**

**Contact: 1:0:2**

**Credits: 1.5**

**Course Outcomes**

CO1 To demonstrate a thorough understanding of modular programming by designing programs that requires the use of programmer-defined functions.

CO2 To demonstrate a thorough understanding of arrays by designing and implementing programs that search and sort arrays.

CO3 To demonstrate a thorough understanding of the object-oriented programming concepts of encapsulation, data abstraction and composition by designing and implementing classes including the use of overloaded functions and constructors.

CO4 To demonstrate a thorough understanding of the concept of pointers and dynamic memory allocation, the implementation of programmer-defined functions and classes by writing code, performing unit testing and debugging of multiple complex programs.

CO5 To demonstrate an understanding of the differences between C and C++ in the areas of strings, pass by reference/passing pointers, and structs by designing and implementing programs that use C strings, C++ strings, C language structs and classes

**Course Name: Behavioral & Interpersonal Skills**

**Course Code: MC-381**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Course Outcome**

CO1 It will equip the student to handle workplace interpersonal communication in an effective manner. CO2 To enable students with strong oral and written interpersonal communication skills. CO3 To prepare students to critically analyze workplace situations and take appropriate decisions. CO4 To make students campus ready through proper behavioral and interpersonal grooming. CO5 Integration of enhanced skill set to design and frame team-based Project Report and Presentation.

<b>4<sup>th</sup> Semester</b>									
Sl. No	Course Code	Paper Code	Theory	Contact Hours /Week				Credits Points	
				L	T	P	Total		
<b>A. THEORY</b>									
1	ES	M(CSE)401	Numerical Methods and Statistics	3	0	0	3	3	
2	HS	HU 402	Economics for Engineers	2	0	0	2	2	
3	PC	CS401	Computer Architecture	3	0	0	3	3	
4	PC	CS402	Design and Analysis of Algorithms	3	0	0	3	3	
5	PC	CS403	Formal Language and Automata Theory	3	0	0	3	3	
<b>Total of Theory</b>							<b>14</b>	<b>14</b>	
<b>B. PRACTICAL</b>									
6	ES	M(CSE)491	Numerical Methods and Statistics Lab	0	0	3	3	1.5	
7	PC	CS491	Computer Architecture Lab	0	0	3	3	1.5	

8	PC	CS492	Algorithms Lab	0	0	3	3	1.5
9	PROJ	PR 491	Project-IV	0	0	2	2	1
10	PROJ*	PR 492	Innovative activities-III	0	0	0	0	0.5
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
11	MC	MC4 01	Constitution of India	3	0	0	3	
<b>Total of Theory, Practical &amp; Mandatory Activities/Courses</b>							<b>28</b>	<b>20</b>

**Course Name: Numerical Methods and Statistics**

**Course Code: M (CSE) 401**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

On successful completion of the learning sessions of the course, the learner will be able to:

CO1 Recall the distinctive principles of numerical analysis and the associated error measures.

CO2 Understand the theoretical workings of numerical techniques.

CO3 Apply numerical methods used to obtain approximate solutions to intractable mathematical problems such as interpolation, integration, the solution of linear and nonlinear equations, and the solution of ordinary differential equations. CO4 Select appropriate numerical methods to apply to various types of problems in engineering and science in consideration of the mathematical operations involved, accuracy requirements, and available computational resources.

CO5 Interpret complex statistical findings using the understanding of inferential statistics

Course Name: Economics for Engineers

**Course Code: HU402**

**Contact: 2:0:0**

**Total Contact Hours: 24**

**Credits: 2**

**Course Outcome**

CO1 Apply the appropriate engineering economics analysis method(s) for problem solving: present worth, annual cost, rate-of-return, payback, break-even, benefit-cost ratio.

CO2 Evaluate the cost effectiveness of individual engineering projects using the methods learned and draw inferences for the investment decisions.

CO3 Compare the life cycle cost of multiple projects using the methods learned, and make a quantitative decision between alternate facilities and/or systems.

CO4 Evaluate the profit of a firm, carry out the break even analysis and employ this tool to make production decision. CO5 Discuss and solve advanced economic engineering analysis problems including taxation and inflation.

**Course Name: Computer Architecture**

**Course Code: CS401**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

CO1 To implement pipelining concepts and parallelism techniques with a prior knowledge of stored program methods. CO2 To evaluate the performance of each type of memory in the hierarchy and their mapping techniques. CO3 To analyze the SIMD and MIMD architecture and their interconnection techniques.

**Course Name: Design & Analysis of Algorithm**

**Course Code: CS402**

**Contact: 3:0:0**

**Total Contact hour: 36**

**Credits: 3**

**Course Outcome**

CO1 To understand the concepts of time and space complexity, worst case, average case and best-case complexities and the big-O notation

CO2 To apply design principles and concepts to algorithm design.

CO3 To understand the mathematical foundation in analysis of algorithms. CO4: To understand different algorithmic design strategies.

CO5 To analyze the efficiency of algorithms using time and space complexity theory.

**Course Name: Formal Language and Automata Theory**

**Course Code: CS 403**

**Contacts: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

CO1 To acquire the knowledge of the basics of state machines with or without output and its different classifications CO2 To understand synchronous sequential circuits as the foundation of digital system.

CO3 To apply techniques of designing grammars and recognizers for several programming languages. CO4

To analyze Turing's Hypothesis as a foreword to algorithms.

CO5 To perceive the power and limitation of a computer and take decisions on computability.

**Course Name: Numerical Methods and Statistics (Lab)**

**Course Code: M (CSE) 491 Contact: 0:0:3**

**Credits: 1.5**

**Course Outcome**

On successful completion of the learning sessions of the course, the learner will be able to:

CO1 Understand the theoretical workings of numerical techniques with the help of C/ Matlab CO2 Execute basic command and scripts in a mathematical programming language

CO3 Apply the programming skills to solve the problems using multiple numerical approaches. CO4 Analyze if the results are reasonable, and then interpret and clearly communicate the results.

**Course Name: Computer Architecture Lab**

**Course Code: CS491**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcome**

CO1 To design the basic gates

CO2 To verify the truth table

CO3 To design circuit using Xilinx tools

**Course Name: Constitution of India**

**Course Code: MC401**

**Contact: 3:0:0**

**Total Contact Hours: 32**

**Course Outcome**

Student will be able to:

CO1 Develop human values, create awareness about law ratification and significance of Constitution

CO2 Comprehend the Fundamental Rights and Fundamental Duties of the Indian Citizen to implant morality, social values and their social responsibilities.

CO3 Create understanding of their Surroundings, Society, Social problems and their suitable solutions. CO4

Familiarize with distribution of powers and functions of Local Self Government.

CO5 Realize the National Emergency, Financial Emergency and their impact on Economy of the country.

**5<sup>th</sup> Semester**

Sl. No.	Course Code	Paper Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
1	PC	CS501	Computer Graphics	3	0	0	3	3
2	PC	CS502	Operating System	3	0	0	3	3
3	PC	CS503	Data Base Management System	3	0	0	3	3
4	OE	CS504	A. Object Oriented Programming using Java	3	0	0	3	3
			B. Multimedia Technology					
			C. Communication Engineering					
5	PE	CS505	A. Operations Research	3	0	0	3	3
			B. Computational Geometry					
			C. Distributed Algorithms					
Total of Theory							15	15
6	PC	CS591	Computer Graphics Lab	0	0	3	3	1.5
7	PC	CS592	Operating System Lab	0	0	3	3	1.5
8	PC	CS 593	Data Base Management System Lab	0	0	3	3	1.5
9	OE	CS594	A. Object Oriented Programming Lab	0	0	3	3	1.5
			B. Multimedia Technology Lab					
			C. Communication Engineering Lab					
10	PROJ	PR 591	Project-V	0	0	2	2	1
11	PROJ*	PR 592	Innovative activities-IV	0	0	0	0	0.5

<b>C. MANDATORY ACTIVITIES / COURSES</b>								
12	MC	MC 501	Environmental Science	3	0	0	3	
<b>Total of Theory, Practical &amp; Mandatory Activities/Courses</b>							<b>32</b>	<b>22.5</b>

**Course Name: Computer Graphics**

**Course Code: CS501**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 To explain the foundations of computer graphics and different display technology and devices. CO2 To develop the concept of geometric, mathematical, and algorithmic approach necessary for programming computer graphics.

CO3 To implement clipping with the comprehension of windows, viewports in relation to images display on screen. CO4 To analyze and compare different hidden surface illumination methods.

**Course Name: Operating System**

**Course Code: CS502**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 Describe how computing resources (such as CPU, memory and I/O) are managed by the operating system. CO2 Analyze kernel and user mode in an operating system.

CO3 Solve different CPU scheduling problem to achieve specific scheduling criteria.

CO4 Apply the knowledge of process management, synchronization, deadlock to solve basic problems. CO5 Evaluate and report appropriate design choices when solving real-world problems.

**Course Name: DATABASE MANAGEMENT SYSTEM**

**Course Code: CS503**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

On completion of the course students will be able to

CO1 Apply the knowledge of Entity Relationship (E-R) diagram for an application.

CO2 Create a normalized relational database model.

CO3 Analyze real world queries to generate reports from it.

CO4 Determine whether the transaction satisfies the ACID properties.

CO5 Create and maintain the database of an organization.

**Course Name: Object Oriented Programming using Java**

**Course Code: CS504A**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 Design the process of interaction between Objects, classes & methods w.r.t. Object Oriented Programming. CO2 Acquire a basic knowledge of Object Orientation with different properties as well as different features of Java. CO3 Analyze various activities of different string handling functions with various I/O operations. CO4 Discuss basic code reusability feature w.r.t. Inheritance, Package, and Interface.

CO5 Implement Exception handling, Multithreading and Applet (Web program in java) programming concept in Java.

**Course Name: Multimedia Technology**

**Course Code: CS504B**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

**CO1** To understand different media, representations of different multimedia data and data formats. **CO2** To analyze various compression techniques.

**CO3** To evaluate and create various audio and video file formats.

**CO4** To describe optical storage media along with different coding technique for solving real life multimedia application.

**Course Name: Communication Engineering**

**Course Code: CS 504C**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

On completion of the course students will be able to

**CO1** Apply the fundamental concepts of engineering principles in design issues in various communication systems. **CO2** Apply the basic concepts for analyzing the modulation techniques including amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) that are widely used in analogue communication systems in the time and frequency domains.

**CO3** Demonstrate the concepts of sampling, Pulse Modulation techniques and their comparison. **CO4** Illustrate various types of coherent and non-coherent digital modulation techniques, analyze immunity parameters and calculate their error probabilities.

**Course Name: Operations Research**

**Course Code: CS 505A**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

On successful completion of the learning sessions of the course, the learner will be able to:

**CO1** Recall the distinctive characteristics of different types of decision-making problem to formulate and solve a real world problem a prototype of mathematical problem.

**CO2** Understand the theoretical workings of appropriate decision-making approaches and tools to identify the optimal strategy in competitive world.

**CO3** Apply the principles of different Methods/Model of Operations Research to solve practical problems.

**Course Name: Computational Geometry**

**Course Code: CS505B**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes:**

**CO1** To analyze randomized algorithms for small domain problems.

**CO2** To use line-point duality to develop efficient algorithms.

**CO3** To apply geometric techniques to real-world problems in graphics.

**CO4** To solve linear programs geometrically.

**Course Name: Distributed Algorithms**

**Paper Code: CS505C**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 2**



**Course Outcomes:**

**CO1** To acquire a basic concept of different models and organizational structure of distributed algorithm. To understand different models of synchronous, asynchronous allocation techniques in the light of implementation in network and memories.

**CO2** To analyze basic idealization of synchronous, asynchronous, and shared allocation techniques. **CO3** To explain the concepts of shared storage, data links and agreement mechanisms along with its failure detection technique for algorithms.

**CO4** To develop partial and distributed algorithms in time-based proof of protocols and methods along with its perspective in modern computing era.

**Course Name: Computer Graphics Lab**

**Course Code: CS591**

**Contacts: 0:0:3**

**Credits: 1.5**

**Course Outcomes:**

**CO1** To draw Geometric primitives.

**CO2** To execute scan line polygon filling.

**CO3** To implement basic transformations on objects.

**CO4** To implement clipping algorithm on lines.

**Course Name: Operating Systems Lab**

**Course Code: CS 592**

**Contacts: 0:0:3**

**Credits: 1.5**

**Course Outcomes:**

**CO1** To Analyze different aspects of Linux.

**CO2** To Create or design different scripts using shell programming.

**CO3** To implement process, thread, semaphore concept of operating system.

**CO4** Create shared memory with the implementation of reading from, write into shared memory.

**Course Name: DATABASE MANAGEMENT SYSTEM LAB**

**Course Code: CS593**

**Contacts: 0:0:3**

**Total Contact Hours: 36**

**Credits: 1.5**

**Course Outcomes**

On completion of the course students will be able to

**CO1** Understand the basic concepts regarding database, know about query processing and techniques involved in query optimization and understand the concepts of database transaction and related database facilities including concurrency control, backup, and recovery.

**CO2** Understand the introductory concepts of some advanced topics in data management like distributed databases, data warehousing, deductive databases and be aware of some advanced databases like partial multimedia and mobile databases.

**CO3** Differentiate between DBMS and advanced DBMS and use of advanced database concepts and become proficient in creating database queries.

**CO4** Analyze database system concepts and apply normalization to the database.

**CO5** Apply and create different transaction processing and concurrency control applications.

**Course Name: Object Oriented Programming Lab**

**Course Code: CS594A**

**Contact: 0:0:3**

**Credits: 1.5**

**Course Outcomes**

**CO1** Create the procedure of communication between Objects, classes & methods.

**CO2** Understand the elementary facts of Object Orientation with various characteristics as well as several aspects of Java.

**CO3** Analyze distinct features of different string handling functions with various I/O operations. **CO4** Discuss simple Code Reusability notion w.r.t. Inheritance, Package and Interface.

**CO5** Apply Exception handling, Multithreading and Applet (Web program in java) programming concept in Java.

**Course Name: Multimedia Technology Lab**

**Course Code: CS594B**

**Contacts: 0:0:3**

**Credits: 1.5**

**Course Outcomes**

**CO1** To understand about various latest interactive multimedia devices, the basic concepts about images and image format. **CO2** To Apply and analyze data compression techniques, image compression techniques like JPEG, video compression techniques like MPEG, and the basic concepts about animation.

**CO3** To evaluate and develop an interactive multimedia presentation by using multimedia devices and identify theoretical and practical aspects in designing multimedia applications are surrounding the emergence of multimedia technology. **CO4** To analyze the effects of scale and use on both presentation and lower-level requirements along with feedback evaluation in response to an objective set of criteria for multimedia design.

**Course Name: Communication Engineering Lab**

**Course Code: CS 594C**

**Contacts: 0:0:3**

**Credits: 1.5**

**Course outcomes**

On completion of the course students will be able to

**CO1** Analyze the concept of analog and digital communication techniques and their applications. **CO2**

Demonstrate to the practical methods of the use of generating and demodulating communication signals. **CO3** Distinguish the significance of signal constellation and spectral width.

**CO4** Develop insight into the relations between the input and output signals in various stages of a transmitter and a receiver.

**Course Name: ENVIRONMENTAL SCIENCE**

**Course Code: MC 501**

**Credits: 0**

**Total Lectures: 36**

**Course Outcomes**

**CO1** To understand the natural environment and its relationships with human activities.

**CO2** To apply the fundamental knowledge of science and engineering to assess environmental and health risk.

**CO3** To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations. **CO4** Acquire skills for scientific problem-solving related to air, water, noise & land pollution.

6 <sup>th</sup> Semester								
Sl. No.	Course Code	Paper Code	Theory	Contact Hours /Week				C P
				L	T	P	Total	
1	PC	CS601	Computer Networks	3	0	0	3	3
2	PC	CS602	Microprocessors and Microcontrollers	2	1	0	3	3
3	PC	CS603	Software Engineering	3	0	0	3	3
4	PE	CS604	A. Compiler Design	3	0	0	3	3

			B. Computer Vision					
			C. Simulation and modeling					
5	OE	CS605	A. Pattern Recognition	3	0	0	3	
			B. Distributed Operating System					
			C. Distributed Database					
6	OE	CS606	A. Data Warehousing and Data Mining	3	0	0	3	
			B. Digital Image Processing					
			C. E-commerce and ERP					
Total of Theory							18	
7	PC	CS691	Computer Networks Lab	0	0	3	3	1
8	PC	CS692	Microprocessors and Microcontrollers Lab	0	0	3	3	1
9	PC	CS693	Software Engineering Lab	0	0	3	3	1
10	PROJ	PR 691	Project-VI	0	0	2	2	
11	PROJ*	PR 692	Innovative activities V	0	0	0	0	0
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
12	MC	MC 681	Technical Lecture Presentation & Group Discussion-I	3	0	0	3	
<b>Total of Theory, Practical &amp; Mandatory Activities/Courses</b>							<b>32</b>	<b>2</b>

**Course Name: Computer Networks**

**Course Code: CS601**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

CO1 To understand OSI and TCP/IP models.

CO2 To analyze MAC layer protocols and LAN technologies.

CO3 To design applications using internet protocols.

CO4 To implement routing and congestion control algorithms.

CO5 To develop application layer protocols and understand socket programming

**Course Name: Microprocessors & Microcontrollers**

**Course Code: CS602**

**Contact: 2:1:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 To acquire the knowledge of hardware details of 8085 and 8086 microprocessor AND 8051 microcontroller with the related signals and their implications.

CO2 To develop skill in assembly Language programming of 8085

CO3 To understand the concept and techniques of designing and implementing interfacing of microprocessor with memory and peripheral chips involving system design.

CO4 To analyze the performance of computers and its architecture to real-life applications

**Course Name: Software Engineering**

**Course Code: CS603**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits:3**

**Course Outcomes**

CO1 To analyze, elicit and specify software requirements through a productive working relationship with various stakeholders of the project.

CO2 To design applicable solutions in one or more application domains using software engineering approaches that integrates ethical, social, legal and economic concerns.

CO3 To develop the code from the design and effectively apply relevant standards and perform testing, and quality management and practice.

CO4 To identify modern engineering tools necessary for software project management, time management and software reuse, and an ability to engage in life-long learning.

**Course Name: Compiler Design**

**Course Code: CS604A**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 To illustrate the basic concept of compilers and discuss on the components as well as the strengths and weaknesses of various phases of designing a compiler.

CO2 To explain the role of finite automata in compiler design.

CO3 To design and analyze algorithms for syntactic or parsing techniques and semantic analysis of the process of designing compilers.

CO4 To formulate the theories of creating simple compilers using C programming languages.

**Course Name: Computer Vision**

**Course Code: CS604B**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 To understand the Image formation process

CO2 To understand the 3D vision techniques

CO3 To extract the features form an image and accordingly analyze the Image

CO4 To develop applications using the Computer Vision Techniques

CO5 To understand the basics of video processing, motion computation and 3D vision and geometry

**Course Name: Simulation and Modeling**

**Course Code: CS604C**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

On completion of the course students will be able to

CO1 Student will be able to summarize the issues in Modeling and Simulation and to explain the System Dynamics & Probability concepts in Simulation.

CO2 Student will be able to solve the Simulation of Queuing Systems

CO3 Student will be able to analyzethe Simulation output.

CO4 Student will be able to identify the application area of Modeling and Simulation, and apply them.

**Course Name: Pattern Recognition**

**Course Code: CS605A**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

After the completion of four years of B.Tech, students will be able to:

CO1 Explain and compare a variety of pattern classification methods.

CO2 Analyze different clustering and classification problem and solve using different pattern recognition technique.

CO3 Apply performance evaluation methods for pattern recognition, and can do comparisons of techniques

CO4 Apply pattern recognition techniques to real-world problems such as document analysis and

recognition. CO5 Implement simple pattern classifiers, classifier combinations, and structural pattern recognizers.

**Course Name: Distributed Operating system**

**Course Code: CS605B**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

CO1 To understandings outline the potential benefits of distributed systems and major security issues associated with distributed system.

CO2 To understand and analyze Distributed Computing techniques, Synchronous and Processes and Apply Shared Data access and Files concepts.

CO3 To understand Distributed File Systems and Distributed Shared Memory

CO4 To apply standard design principles in the construction of these systems.

**Course Name: Distributed Database**

**Course Code: CS605C**

**Contact: 3:0:0**

**Contact Hours: 36**

**Credits: 3**

**Course Outcome**

On completion of the course students will be able to

CO1 Describe database management system internals, understand and describe internal algorithms in detail.

CO2 Identify and be able to use recent and advanced database techniques (e.g. in concurrency control, buffer

management, and recovery

CO3 Decide on configuration issues related to database operation and performance. Identify which parameters are suitable and what are its implications

CO4 Analyze and optimize transactional code, identifying causes of possible anomalies and correct them. CO5 Decide on optimization issues given a known database workload, by manipulating indexes, choosing more adequate data types, and modifying queries

**Course Name: Data Warehousing & Data Mining**

**Course Code: CS606A**

**Contact: 3:0:0**

**Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

On completion of the course students will be able to

CO1 Student will be able to summarize the issues in Data mining.

CO2 Student will be able to explain and give examples of Data warehousing.

CO3 Student will be able to solve Business problems and can apply the Data mining in real applications in industry.

CO4 Student will also be able to implement the classical algorithms in data mining and data warehousing.

**Course Name: Digital Image Processing**

**Course Code: CS606B**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcomes**

CO1 To acquire the knowledge of basic preprocessing techniques in monochrome and color images. CO2 To develop skill in concepts of image enhancement like linear and non linear spatial filters using MATLAB. CO3 To understand the concept and techniques of simple image processing projects using different methods of restoration.

CO4 To acquire the knowledge of the various segmentation algorithms for practical applications. CO5 To analyze the performance of Lossless and Lossy compression techniques in images.

**Course Name: E-commerce and ERP**

**Course Code: CS606C**

**Contact: 3:0:0**

**Total Contact Hours: 36**

**Credits: 3**

**Course Outcome**

On completion of the course students will be able to

CO1 To define and differentiate various types of Ecommerce.

CO2 To define and describe E-business and its Models.

CO3 To describe Hardware and Software Technologies for Ecommerce.

CO4 To understand the basic concepts of ERP and identify different technologies used in ERP. CO5 To apply different tools used in ERP.

**Course Name: Computer Networks Lab**

**Course Code: CS691**

**Contact: 0:0:3**

**Credit Point: 1.5**

**Course Outcomes:**

CO1 Demonstrate the socket program using TCP & UDP.

CO2 Develop simple applications using TCP & UDP.

CO3 Develop the code for Data link layer protocol simulation.

CO4 Examine the performances of Routing protocol.

CO5 Experiment with congestion control algorithm using network simulator

**Course Name: Microprocessors & Microcontrollers Lab****Course Code: CS692****Contact: 0:0:3****Credits: 1.5****Course Outcomes:**

CO1 To understand and apply the fundamentals of assembly level programming of microprocessors and microcontroller.

CO2 To work with standard microprocessor real time interfaces including GPIO, serial ports, digital-to-analog converters, and analog-to-digital converters.

CO3 To troubleshoot interactions between software and hardware.

CO4 To analyze abstract problems and apply a combination of hardware and software to address the problem.

**Course Name: Software Engineering Lab****Course Code: CS693****Contact: 0:0:3****Credits: 1.5****Course Outcomes**

CO1 To handle software development models through rational method.

CO2 To prepare SRS document, design document, project management related document. CO3 To develop function oriented and object-oriented software design using tools like rational rose. CO4

To apply various testing techniques through test cases.

7 <sup>th</sup> Semester								
SI No	Course Code	Paper Code	Theory	Contact Hours/Week				Credit points
				L	T	P	Total	
<b>A.Theory</b>								
1	HS	HU701	Values & Ethics in Profession	2	0	0	2	2
2	OE	CS701	A. Artificial Intelligence	3	0	0	3	3
			B. Robotics					
			C. Data Analytics					
3	PE	CS702	A. Soft Computing	3	0	0	3	3
			B. Natural Language Processing					
			C. Web Technology					
4	PE	CS703	A. Cloud Computing	3	0	0	3	3
			B. Sensor Network and IOT					
			C. Cryptography and Network Security					
<b>Total No of Theory</b>							11	11
<b>B. PRACTICAL</b>								
5	OE	CS791	A. Artificial Intelligence Lab	0	0	3	3	1.5
			B. Robotics Lab					

			C. Data Analytics Lab					
6	PE	CS792	A. Soft Computing Lab	0	0	3	3	1.5
			B. Natural Language Processing Lab					
			C. Web Technology Lab					
7	PROJ	PR 791	Project-VII	0	0	0	6	3
8	PROJ*	PR 792	Innovative activities-VI	0	0	0	0	0.5
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
9	MC	MC 781	Social Awareness	0	0	3	3	
<b>Total of Theory, Practical &amp; Mandatory Activities/Courses</b>							26	17.5

**Paper Name: Values and Ethics in Profession**

**Paper Code: HU702**

**Contact: L-T-P= 2-0-0**

**Credit: 2**

**Course Outcomes:**

CO1 To understand the core values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values.

CO2 To understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories.

CO3 To understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.

CO4 To aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.

CO5 To acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives .

**Name of the Paper: Artificial Intelligence**

**Paper Code: CS701A**

**Contact (Periods/Week):=3L/Week**

**Credit Point: 3**

**No. of Lectures: 36**

**Course Outcomes:**

On completion of the course students will be able to

CO1 To know the fundamental concepts of Artificial Intelligence such as knowledge representation, problem solving and expert systems.

CO2 To know the use of AI to solve communication problems using Natural Language Processing CO3 To develop knowledge of decision making and learning methods.

CO4 To develop new facts from existing knowledge base using resolution and unification. CO5 To demonstrate the way of writing Facts and Rules in order to solve some problems based on rules and to develop systems for question-answer

**Paper Name: ROBOTICS**

**Code: CS701B**

**Contacts: 3L**



**Credits: 3**

**Allotted hours: 35L**

**Course Outcomes:**

After the successful completion of this course, the student will be able to:

CO1 To describe and explain the microcontrollers used in robots

CO2. To design the software and build the prototype of robots

CO3. To apply localization and mapping aspects of mobile robotics.

CO4. To demonstrate self-learning capability.

**Name of the Paper: Data Analytics**

**Paper Code: CS701C**

**Contact (Periods/Week):=3L/Week**

**Credit Point: 3**

**No. of Lectures: 36**

**Course Outcomes:**

CO1 To understand the basic terminologies of data definition and the different analysis techniques. CO2 To identify the analysis techniques to appropriately apply in problems.

CO3 To know the fundamental of data different analysis techniques.

CO4 To apply the learned techniques in different real-life projects.

**Paper Name: Soft Computing**

**Code: CS 702A**

**Contacts: 3L**

**Credits: 3**

**Allotted hours: 36L**

**Course Outcomes:**

CO1 To acquire the knowledge of soft computing and hard computing.

CO2 To develop skill in soft computing methodology.

CO3 To understand the concept and techniques of designing and implementing of soft computing methods in real world problem.

CO4 To acquire the knowledge of the fuzzy Neural network and Genetic Language.

CO5 To analyze and optimized the problem of real-life applications.

**Name of the Paper: Natural Language Processing**

**Paper Code: CS702B**

**Contact (Periods/Week):3L/Week**

**Credit Point: 3**

**No. of Lectures: 35**

**Course Outcomes:**

On completion of the course students will be able to

CO1 To gain knowledge of the fundamental concept of NLP, Regular Expression, Finite State Automata along with the concept and application of word tokenization, normalization, sentence segmentation, word extraction, spell checking in the context of NLP.

CO2 To understand the concept of Morphology such as Inflectional and Derivational Morphology and different morphological parsing techniques including FSTs.

CO3 To acquire the concepts related to language modeling with introduction to N-grams, chain rule, smoothing, Witten Bell discounting, backoff, deleted interpolation, spelling and word prediction and their evaluation along with the concept of Markov chain, HMM, Forward and Viterbi algorithm, POS tagging.

CO4 To develop the concept of different text classification techniques, sentiment analysis, concepts related to CFG in the context of NLP, concept of lexical semantics, lexical dictionary such as WordNet, lexical computational semantics, distributional word similarity and concepts related to the field of Information Retrieval in the context of NLP.

**Name of the Paper: Web Technology**

**Paper Code: CS702C**

**Contact (Periods/Week): 3L/Week**

**Credit Point: 3**

**No. of Lectures: 35**

**Course Outcomes:**

CO1 To understand the notions of World Wide Web(www), Internet, HTTP Protocol, Web Browsers, Client-Server, etc.

CO2 To develop interactive web pages using HTML, DHTML and CSS

CO3 To procure the knowledge of different information interchange formats like XML. CO4 To design web applications using scripting languages like JavaScript, CGI, PHP

CO5 To acquire the server-side programming concepts using servlet, JSP and .Net framework.

**Paper Name: Cloud Computing**

**Code: CS703A**

**Contacts: 3:0:0**

**Credits: 3**

**Total Contact hours: 36L**

**Course Outcomes:**

CO1 To articulate the business model concepts, architecture and infrastructure of cloud computing, including cloud service models and deployment models.

CO2 To apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.

CO3 To explore some important cloud computing driven commercial systems such as Google Apps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.

CO4 To analyze the core issues of cloud computing such as security, privacy, interoperability, and its impact on cloud application.

**Course Name: Sensor Network and IOT**

**Course Code: CS703B**

**Contact: 3L/Week**

**Total Contact Hours: 35**

**Credit Point: 3**

**Course Outcomes:**

CO1 To analyze basic protocols in wireless sensor network.

CO2 To understand the concepts of Internet of Things.

CO3 To recognize the M2M communication protocols.

CO4 To design IoT applications in different domain on embedded platform and be able to analyze their performance.

**Name of the Paper: Cryptography and Network Security**

**Paper Code: CS703C**

**Contact (Periods/Week): 3L/Week**

**Credit Point: 3**

**No. of Lectures: 36**

**Course Outcomes:**

CO1 To understand the basic concepts in cryptography.

CO2 To apply the deployment of different encryption techniques to secure messages in transit across data networks

CO3 To discuss various techniques used to assure Integrity and Authentication.

CO4 To analyze diverse security measures and issues in practice.

**Name of the Paper: Artificial Intelligence Lab**

**Course Code: CS791A**

**Course Outcomes:**

CO1 To learn the concept of simple programming using PROLOG/ LISP

CO2 To understand the concept of AI based programs using PROLOG/ LISP

CO3 To develop the capability to represent various real life problem domains using logic based techniques

**Name of the Paper: ROBOTICS LAB**

**Course Code: CS791B**

**Total Contact Hours: 3P**

**Credits: 1.5**

**Course Outcomes:**

After the completion of this course, the student should be able to:

- CO1 To understand the practical operation of robots and test their degree of freedoms.
- CO2 To analyze the gripper performance as per varying objectives.
- CO3 To carry out case studies with robots for practical applications.
- CO4 To evaluate the robot using simulation software.

**Name of the Paper: Data Analytics Lab**

**Paper Code: CS791C**

**Contact (Periods/Week): 3P/Week**

**Credit Point: 1.5**

**Course Outcomes:**

- CO1 To process big data using Hadoop framework.
- CO2 To build and apply linear and logistic regression models.
- CO3 To perform data analysis with machine learning methods.
- CO4 To perform graphical data analysis.
- CO5 To implement clustering techniques.

**Name of the Paper: Soft Computing Lab**

**Code: CS 792A**

**Contacts: 3P**

**Credits: 1.5**

**Course Outcomes:**

- CO1 To understand the concept and techniques of designing and implementing of soft computing methods in real world problem.
- CO2 To acquire the knowledge of the fuzzy Neural network and Genetic Language.
- CO3 To analyze and optimized the problem of real-life applications.

**Name of the Paper: Natural Language Processing Lab**

**Paper Code: CS792B**

**Contact (Periods/Week):3L/Week**

**Credit Point: 2**

**Course Outcomes:**

- CO1 To access text corpora and lexical resources and process of raw text.
- CO2 To write structured programs for categorizing and tagging of words, segmentation of sentences. CO3 To classify text and extract information from it.
- CO4 To analyze sentence structure, build feature-based grammar, meaning of sentences and to manage linguistic data.

**Name of the Paper: Web Technology Lab**

**Paper Code: CS792C**

**Contact (Periods/Week): 3P/Week**

**Credit Point: 2**

**Course Outcomes:**

- CO1 To develop interactive web pages using HTML, DHTML, CSS and image map.
- CO2 To procure the knowledge of information interchange formats like XML.
- CO3 To validate fields of web pages using scripting languages like JavaScript.
- CO4 To develop web applications using PHP and ASP.net.
- CO5 To acquire the server-side programming concepts using servlet, JSP.

8 <sup>th</sup> Semester							
Sl No	Course Code	Paper Code	Theory	Contact Hours/Week			Credit points
				L	T	P	Total
<b>A. Theory</b>							

1	HS	HU804	Principles of Management	2	0	0	2	2
2	PE	CS801	A. Mobile Computing	3	0	0	3	3
			B. Bio-informatics					
			C. Cyber Law and Security Policy					
			D. VLSI Design					
3	PE	CS802	A. Parallel Computing	3	0	0	3	3
			B. Machine Learning					
			C. Real Time Embedded System					
			D. Advanced Computer Architecture					
<b>Total No of Theory</b>							8	8
<b>B. PRACTICAL</b>								
4	PC	CS891	Design lab	0	0	2	2	1
5	PROJ	PR 891	Project-VIII	0	0	0	6	3
<b>C. MANDATORY ACTIVITIES / COURSES</b>								
6	MC	MC 801	Essence of Indian Knowledge Tradition	3	0	0	3	
<b>Total of Theory, Practical &amp;Mandatory Activities/Courses</b>							19	12

**Paper Name: Principles of Management**

**Paper Code: HU 804**

**Contact: L-T-P= 3-0-0**

**Credits: 3**

**Course Outcomes:**

**CO1** To develop ability to critically analyse and evaluate a variety of management practices in the contemporary context.

**CO2** To understand and apply a variety of management and organizational theories in practice. **CO3** To be able to mirror existing practices or to generate their own innovative management competencies required for today's complex and global workplace.

**CO4** To be able to critically reflect on ethical theories and social responsibility ideologies to create sustainable organizations.

**Name of the Paper: Mobile Computing**

**Paper Code: CS801A**

**Contact (Periods/Week):3L/Week**

**Credit Point: 3**

**No. of Lectures: 35**

**Course Outcomes:**

- CO1** To analyse the working of modern communication technologies.  
**CO2** To demonstrate the various routing algorithms for both infrastructures based and ad hoc networks. **CO3** To develop mobility and bandwidth management in cellular network.  
**CO4** To analyse and build an energy efficient and secure mobile computing environment using heterogeneous wireless technologies.  
**CO5** To identify the technical issues related to recent mobile computing environment.

**Name of the Paper: Bioinformatics**

**Paper Code: CS801B**

**Contact (Periods/Week): L-T-P=3-0-0**

**Credit Point: 3**

**No. of Lectures: 35**

**Course Outcomes:**

- CO1** To acquire the knowledge of Bioinformatics technologies with the related concept of DNA, RNA and their implications.  
**CO2** To develop idea in MOLECULAR BIOLOGY  
**CO3** To understand the concept and techniques of different types of Data Organization and Sequence Databases with different types of Analysis Tools for Sequence Data Banks.  
**CO4** To acquire the knowledge of the DNA SEQUENCE ANALYSIS  
**CO5** To analyse the performance of different types of Probabilistic models used in Computational Biology.

**Name of the Paper: Cyber law and Security Policy**

**Paper Code: CS801C**

**Contact (Periods/Week): 3L/Week**

**Credit Point: 3**

**No. of Lectures: 35**

**Course Outcomes:**

- CO1** To learn the social and intellectual property issues emerging from cyberspace.  
**CO2** To acquire in depth knowledge of information technology act, security policies, and legal framework of right to privacy, data security and data protection.  
**CO3** To develop the understanding of relationship between commerce and cyberspace.  
**CO4** To be familiar with network security threats and countermeasures.

**Course: VLSI Design**

**Course code: CS 801D**

**Contracts: 3L**

**Credits- 3**

**Total: 36L**

**Course Outcomes:**

- CO1** To describe scale of integration – SSI, MSI, LSI, VLSI, Moor's Law, scaling, short channel effect, VLSI design flow, FPGA architecture and construct gate level circuit with PAL & PLA concept  
**CO2** To analyze CMOS inverter voltage transfer characteristics with the parameters –VIL,VIH,VOL,VOH,Vth and based on the knowledge of digital circuit design methodology like – CMOS, Pass transistor,TG,DCVSL, dynamic logic,NORA, able to construct schematic of combinational, sequential circuit,SRAM, DRAM cell using MOSFET.  
**CO3** To calculate value of resistance of current source ,MOS diode , current of current mirror circuit , voltage of references (voltage divider , threshold voltage and band gap ), emulate resistance of switch capacitor circuit , gain of switch capacitor integrator and 1st order switch capacitor filter  
**CO4** To calculate the value of parameters to design CMOS differential amplifier and two stage OP-AMP. **CO5** To describe fabrication steps of IC and construct stick diagram & layout of CMOS inverter and basic gates based on lambda and micron design rules.  
**CO6** To calculate gate delay, dynamic power, short circuit power and leakage power and total power consumption across CMOS inverter circuit based on the derived expression of delay and power.

**Name of the Paper: Parallel Computing**

**Paper Code: CS802A**

**Contact (Periods/Week): 3L/Week**

**Credit Point: 3**

**No. of Lectures: 35**

**Course Outcomes:**

**CO1** To explain the range of requirements that modern parallel systems have to address. **CO2** To define the functionality that parallel systems architecture must deliver to meet some need. **CO3** To articulate design tradeoffs inherent in large-scale parallel architecture and algorithms design. **CO4** To demonstrate the potential run-time problems arising from the concurrent operation of many (possibly a dynamic number of) tasks in a parallel system. **CO5** To justify the presence of concurrency within the framework of a parallel system.

**Name of the Paper: Machine Learning**

**Paper Code: CS802B**

**Contact (Periods/Week): 3L/Week**

**Credit Point: 3**

**No. of Lectures: 35**

**Course Outcomes:**

**CO1** To have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.

**CO2** To have an understanding of the strengths and weaknesses of many popular machine learning approaches.

**CO3** To appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised, un-supervised learning and reinforcement learning.

**CO4** To design and implement various machine learning algorithms in a range of real-world applications.

**Course Name: Real Time Operating System and Embedded system**

**Course Code: CS802C**

**Total Contact Hours:36**

**Credit:3**

**Course Outcomes:**

**CO1** To describing the fundamental concepts of RTOS and Embedded System

**CO2** To developing programs for real time services, firmware and RTOS.

**CO3** To develop programs for multithreaded applications on Free RTOS.

**CO4** To design the Embedded System.

**Name of the Paper: Advanced Computer Architecture**

**Paper Code: CS802D**

**Contact (Periods/Week):3L/Week**

**Credit Point: 3**

**No. of Lectures: 35**

**Course Outcomes:**

**CO1** To acquire the knowledge of parallelism and pipelining.

**CO2** To develop knowledge of parallel processing.

**CO3** To combine the concept and design techniques of interconnection network.

**CO4** To acquire the knowledge of shared memory architecture.

**CO5** To describe the fundamentals of embedded system architecture.