Table: Structure of B.E. Program

S. No.	Courses		Credits							Actual Credits
		Total Credits	I&II	III	IV	V	VI	VII	VIII	
1.	Basic Science Courses (BSC)	20	17	4						21
2.	Engineering Science Courses (ESC)	30	19	5			5			29
3.	Humanities, Social Science and Management Courses (HSMC)	10	4		3	3				10
4.	Professional Core Courses (PCC)	60		11	19	10	10	7	7	64
5.	Professional Elective Courses (PEC)	18				4	4	3	4	15
6.	Open Elective Courses (OEC)	14				3	3	4	4	14
7.	Seminar	2						2		2
8.	Project	10						3	7	10
9.	Internships in industry	8		2		2		3		7
10.	Mandatory Courses (MC)	NC								-
	Total Credits	172	40	22	22	22	22	22	22	172

B.E II Year (Semester-III) Computer Science & Engineering
Course Structure & Evaluation Scheme

S. No.	Subject Category	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Sessional			ESE		
							CT	TA	Total			
	THEORYSUBJECT											
1	PCC	BCS303	Software Engineering	3	0	0	30	10	40	60	100	3
2	PCC	BCS302	Data Structures	3	0	0	30	10	40	60	100	3
3	ESC	BEC301	Digital Electronics	3	1	0	30	10	40	60	100	4
4	MC	MC302	Human values & Professional Ethics	2	0	0	30	10	40	60	100	0
5	BSC	BSC301	Mathematics-III	3	1	0	30	10	40	60	100	4
6	PCC	BCS301	Database Management System	3	0	0	30	10	40	60	100	3
	PRACTICALS											
1	PCC	BCS352	Data Structure Lab	0	0	2	20	20	40	60	100	1
2	ESC	BEC351	Digital Electronics Lab	0	0	2	20	20	40	60	100	1
3	PCC	BCS351	Database Management System Lab	0	0	2	20	20	40	60	100	1
4	PROJECT	BCS353	Mini project/ Internship Assessment	0	0	-	-	-	100	0	100	2
			TOTAL	**17**	**3**	**6**			**460**	**540**	**1000**	**22**

Hours per week = 17 (L) +3 (T) +6(P) = 26 Hours
L-Lecture, P- Practical, CT-Class Test, TA-Teacher's Assessment, ESE-End Semester Examination

B.E II Year (Semester-IV) Computer Science & Engineering
Course Structure & Evaluation Scheme

S. No.	Subject Category	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
							Sessional			ESE		
				L	T	P	CT	TA	Total			
	THEORYSUBJECT											
1	PCC	BCS403	Design and Analysis of Algorithms	3	1	0	30	10	40	60	100	4
2	PCC	BCS401	Computer Organization	3	1	0	30	10	40	60	100	4
3	PCC	BCS402	OOPs using JAVA	3	0	0	30	10	40	60	100	4
4	PCC	BCS404	Discrete Mathematics	3	1	0	30	10	40	60	100	4
5	HSMC	BHSM401	Industrial Management	3	0	0	30	10	40	60	100	3
6	MC	MC401	Environment and Ecology	2	0	0	30	10	40	60	100	0
	PRACTICALS											
1	PCC	BCS451	OOPs using java Lab	0	0	4	20	20	40	60	100	2
2	PCC	BCS452	Design and Analysis of Algorithms lab	0	0	2	20	20	40	60	100	1
			TOTAL	**17**	**3**	**06**			**360**	**540**	**900**	**22**

Hours per week = 17 (L) +03 (T) +06 (P) = 26 Hours

L-Lecture, P- Practical, CT-Class Test, TA-Teacher's Assessment, ESE-End Semester Examination

B.E III Year (Semester-V) Computer Science & Engineering
Course Structure & Evaluation Scheme

S. No.	Subject category	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Sessional Assessment			ESE		
							CT	TA	Total			
	THEORYSUBJECT											
1	PCC	BCS501	Computer Network	3	0	0	30	10	40	60	100	3
2	PCC	BCS504	Theory of Computation	3	0	0	30	10	40	60	100	3
3	PEC	DE-CS501-503	Departmental Elective-1	3	0	0	30	10	`40	60	100	3
4	OEC	OE-CS 501-503	**Open Elective I**	3	0	0	30	10	40	60	100	3
5	PCC	BCS503	Operating System	3	0	0	30	10	40	60	100	3
6	HSMC	BHSM501	Economics for Industry	3	0	0	30	10	40	60	100	3
	PRACTICALS											
1	PCC	PCC551	Operating System Lab	0	0	2	20	20	40	60	100	1
2	PEC	DE-CS501-503	Departmental Elective-1	0	0	2	20	20	`40	60	100	1
3	Internship	BCS552	Internship Assessment	0	0	-	-	-	100	-	100	2
			TOTAL	**18**	**0**	**6**			**420**	**480**	**900**	**22**

Hours per week = 18 (L) +0 (T) +06(P) = 24 Hours

B.E III Year (Semester-VI) Computer Science & Engineering
Course Structure & Evaluation Scheme

S. No.	Subject category	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Sessional Assessment			ESE		
							CT	TA	Total			
		THEORYSUBJECT										
1	PCC	BCS602	Compiler Design	3	1	0	30	10	40	60	100	4
2	PCC	BCS601	Artificial Intelligence	3	1	0	30	10	40	60	100	4
3	ESC	BEC602	Microprocessor & microcontroller	3	0	0	30	10	40	60	100	4
4	OEC	OE-CS601-604	**Open Elective II**	3	0	0	30	10	40	60	100	3
5	PEC	DE-CS601-603	**Departmental Elective 2**	3	1	0	30	10	40	60	100	4
6	MC	MC601	Occupational Health and Safety	2	0	0	30	10	40	60	100	0
		PRACTICALS										
1	PCC	BCS652	Compiler Design	0	0	2	20	20	40	60	100	1
1	PCC	BCS651	Artificial Intelligence Lab	0	0	2	20	20	40	60	100	1
2	ESC	BEC651	Microprocessor & Microcontroller Lab	0	0	2	20	20	40	60	100	1.
			TOTAL	17	4	06			360	540	900	22

Hours per week = 17 (L) +04 (T) +06 (P) = 27Hours

B.E IV Year (Semester-VII) Computer Science & Engineering
Course Structure & Evaluation Scheme

S.No.	Subject category	Subject Code	Name of theSubject	Periods			EvaluationScheme				Subject Total	Credit
				L	T	P	Sessional Assessment			ESE		
							CT	TA	Total			
		THEORY										
1	PCC	BCS701	Soft Computing	3	0	0	30	10	40	60	100	3
2	OEC	OE-CS701-703	**Open Elective III**	3	0	0	30	10	40	60	100	4
3	PCC	BCS702	Digital Image Processing	3	1	0	30	10	40	60	100	3
4	PEC	DE-CS701-703	**Departmental Elective III**	3	0	0	30	10	40	60	100	3
		PRACTICAL										
1	PCC	BCS751	Soft Computing Lab	0	0	2	20	20	40	60	100	1
2	Internship	BCS753	Internships	0	0	-	20	20	40	60	100	3
3	seminar	BCS754	Seminar	0	0	2	20	20	40	60	100	2
4	Project	BCS752	Minor Project	0	0	6	-	-	100	-	100	3
			TOTAL	12	01	12			380	420	800	22

Hours per week = 12 (L) +1 (T) +12 (P) = 25 Hours

B.E IV Year (Semester-VIII) Computer Science & Engineering
Course Structure & Evaluation Scheme

S. No.	Subject Category	Subject Code	Name of the Subject	Periods			Evaluation Scheme				Subject Total	Credit
				L	T	P	Sessional Assessment			ESE		
							CT	TA	Total			
		THEORYSUBJECT										
1	PCC	BCS801	Cryptography and Network Security	3	1	0	30	10	40	60	100	4
2	PEC	DE-CS801-803	**Departmental Elective-IV**	3	1	0	30	10	40	60	100	4
3	OEC	OECS801-803	**Open Elective IV**	3	0	0	30	10	40	60	100	4
4	PCC	BCS802	**Advance Database Management System**	3	0	0	30	10	40	60	100	3
		PRACTICALS										
1	PROJECT	BCS851	Major Project	0	0	14	-	-	150	150	300	7
			TOTAL	**12**	**2**	**16**	**140**	**60**	**350**	**450**	**800**	**22**

Hours per week = 12 (L) +2 (T) +16 (P) = 30Hours

BCS-301	**Database Management System**	**3L-T-2P**	**CREDIT -4**

Course Outcomes:

1. For a given query write relational algebra expressions for that query and optimize the developed expressions
2. For a given specification of the requirement design the databases using E-R method and normalization.
3. For a given specification construct the SQL queries for Open source and Commercial DBMS MYSQL, ORACLE, and DB2.
4. For a given query optimize its execution using Query optimization algorithms.
5. For a given transaction-processing system, determine the transaction atomicity, consistency, isolation, and durability.
6. Implement the isolation property, including locking, time stamping based on concurrency control and Serializability of scheduling.

BCS302	**Data Structure**	**3L-T-2P**	**CREDIT -3**

Course Outcomes:

1. To review the concepts of fundamental data structures to be used in programming. To understand various searching algorithms.
2. To understand the various operations on different types of data structures such as stacks, queues and linked lists. To apply and analyze various data structures on different applications.
3. To understand, analyze and compare various sorting algorithms. To understand the concept of hashing and its techniques.
4. To understand the various types of tree structures and their implementation. To evaluate various tree structures. To be able to apply tree structures on various problems.
5. To understand and implement various types of graphs**.** To study and implement various shortest path algorithms on graphs.
6.

BCS303	**Software Engineering**	**3L-T-P**	**CREDIT -3**

BEC 301	**Digital Electronics**	**3L-1T-2P**	**CREDIT -4**

MC 302	**Human values and Professional Ethics**	**2L-0T-0P**	**No CREDIT**

Course Outcome :

On completion of this course, the students will be able to:

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society

2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Distinguish between ethical and unethical practices, and start working over the strategy to actualize a harmonious environment wherever they work.

BSC 301	**Mathematics-III**	**3L-1T-0P**	**CREDIT -4**

Course Outcomes:

Upon successful completion of this course, students will be able to:

1. Solve the Fourier Transform of function.
2. Compute poles & zeros.
3. Evaluate the real & complex integrals with the help of Cauchy's Residue Theorem.
4. Utilize curve fitting techniques for data representations and computation in engineering analysis.
5. Employee the principle of linear regression and correlation, translate real- world problems into probability models, use Binomial, Poisson & Normal Distribution to solve statistical problems.

BCS 403	**Design and Analysis of Algorithms**	**3L-1T-4P**	**CREDIT -4**

Course Outcomes:

1. Gain insight about design and analysis of standard searching and sorting algorithms. Learn various algorithm Analysis techniques.
2. Able to compare between different data structures i.e., trees, heaps etc. also, pick an appropriate data structure for a design situation.
3. Learn divide and conquer, Greedyparadigms and understand and analyze when an algorithmic design situation calls for them.
4. Developing and analyzing the solutions for the problems using Dynamic programming, backtracking and Branch and bound approaches..
5. Understand NP completeness and difference between NP-Hard & NP-complete problems..

BHSM 401	**Industrial Management**	**3L-0T-0P**	**CREDIT -3**

BCS-401	**Computer Organization**	**3L-1T-0P**	**CREDIT -4**

Course outcomes:

1. Draw the functional block diagram of a single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

2. Write assembly language program for specified microprocessor for computing 16 bit multiplication, division and I/O device interface (ADC, Control circuit, serial port communication).
3. Write a flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
4. Given a CPU organization and instruction, design a memory module and analyze its operation by interfacing with the CPU.
5. Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.

BCS 402	**Object oriented programming using java**	**3L-1T-4P**	**CREDIT -4**

BCS403	**Discrete Mathematics**	**3L-1T-0P**	**CREDIT -4**

Course Outcomes:

At the end of this course, students will be able to:

1. Understand the basic principles of sets and operation in sets. Demonstrate and understanding of relations and functions and be able to determine their properties. Determine when a function is 1-1 and "onto".
2. Use the theory, methods and techniques of the course to solve problems about groups, rings and fields.
3. Write an argument using logical notation and determine if the argument is or is not valid.
4. Apply counting principle to determine probabilities.
5. Demonstrate different traversal methods for trees and graphs.

MC-401	**Environmental &Ecology**	**2L-0T-0P**	**Non-Credit**
BCS501	**Computer Network**	**3L-T-P**	**CREDIT -3**

Course outcome expected:

By end of this course the student should be able to

CO1: To Study the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model. To understand the fundamentals and basics of Physical layer, and to apply them in real time applications.

CO2: to study and evaluate medium access layer protocols. To learn data link layer concepts, design issues, and protocols and to Demonstrate knowledge of various error detection, correction and flow control techniques in data link layer.

CO3: To classify the routing protocols, analyze how to assign the IP addresses for the given network and to evaluate different congestion control methods.

CO4: To understand, analyze and evaluate a number of Transport layer and presentation layer services, and protocols.

CO5: To understand the functions of Application layer paradigms and Protocols.

BCS502	Theory of Computation	3L-T-P	CREDIT -3

Course outcome expected:
By end of this course the student should be able to
CO1: To use basic concepts of formal languages of finite automata techniques
CO2: To Design Finite Automata's for different Regular Expressions and Languages
CO3: To Construct context free grammar for various languages
CO4: To solve various problems of applying normal form techniques, push down automata and Turing Machines
CO5: To understand the concept of recursively enumerable language.

BCS-503	Operating System	3L-T-P	CREDIT -3

Course outcome expected:
By end of this course the student should be able to
CO1: Analyze the structure of OS and basic architectural components involved in OS design
CO2: Analyze and design the applications to run in parallel either using process or thread models of different OS
CO3: Analyze the various device and resource management techniques for timesharing and distributed systems
CO4: Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system
CO5: Interpret the mechanisms adopted for file sharing in distributed Applications
CO6: Conceptualize the components involved in designing a contemporary OS

BCS-551	Operating System lab	L-T-2P	CREDIT -1

Course outcome expected:
By end of this course the student should be able to
CO1. Experiment with Unix commands and shell programming
CO2. Build 'C' program for process and file system management using system calls
CO3. Choose the best CPU scheduling algorithm for a given problem instance
CO4. Identify the performance of various page replacement algorithms
CO5. Develop algorithm for deadlock avoidance, detection and file allocation strategies.

BHSM501	Economics for industry	3L-0T-0P	CREDIT -3

Course outcome:
At the end of the course, the students will be able to
CO1. Define the main concepts and describe the models and methods in economic analysis
CO2. Explain economic events in individual markets and the aggregate economy using basic theory and tools
CO3. Apply supply and demand analysis to relevant economic issues
CO4. Explain how individual decisions and actions as a member of society affect the economy locally, nationally and internationally
CO5. Distinguish between perfect competition and imperfect competition and explain the welfare loss in non-competitive markets

BCS601	Artificial Intelligence	3L-1T-P	CREDIT -4

Course outcome expected:

By end of this course the student should be able to
CO1: To Demonstrate knowledge of the building blocks of AI as presented in terms of intelligent agents. Apply concept of Natural Language processing to problems leading to understanding of cognitive computing.
CO2: To Analyze and formalize the problem as a state space, graph, design heuristics and select amongst different search or game based techniques to solve them.
CO3: Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing.
CO4: To study and apply the basic issues of knowledge representation and Logic and blind and heuristic search, as well as an understanding of other topics such as chaining, resolution, etc. that play an important role in AI programs.
CO5: To understand various machine learning techniques and models.

BEC-651	Artificial Intelligence Lab	L-T-2P	CREDIT-1

Course outcome expected:
By end of this course the student should be able to
CO1. To implements basic concepts of prolog.
CO2. To performs some mathematical concepts like factorial, Fibonacci using prolog.
CO3. To demonstrate various AI problems like water-jug, 4 queen's problem, etc
CO4. To implement search problems like Algorithm.

BCS 602	Compiler Design	3L-1T-P	CREDIT -4

Course outcome expected:
By end of this course the student should be able to
CO1: Identify all essential steps for automatically converting source code into object code.(Understand)
CO2: Generate the low-level code for calling functions/methods in modern languages. (Apply)
CO3: Discuss opportunities for optimization introduced by naïve translation and approaches for achieving optimization such as instruction selection, instruction scheduling , register allocation, and peephole optimization.(Apply)
CO4: Interpret benefits and limitations of automatic memory management. (Understand)
CO5: Explain advantages, disadvantages and difficulties of just in time and dynamic recompilation. (Understand)

BCS652	Compiler Design Lab	0L-0T-2P	CREDIT -1

Course outcome expected:
By end of this course the student should be able to
C01. By this laboratory, students will understand the practical approach of how a compiler works.

CO2. This will enable him to work in the development phase of new computer languages in industry.

C03 Student will learn is the Lexical Analyser's Basic Mechanism?

CO4 Generate machine code from the intermediate code forms

CO5 student will learn the ability to design and analyze a compiler

BEC-602	Microprocessor & Microcontroller	3L-1T-0P	CREDIT-4

Course outcome expected:
By end of this course the student should be able to
CO1. Recall and apply a basic concept of digital fundamentals to microprocessor based personal computer system and Recall the memory types and understand the interfacing of memory with microprocessor.

2. Understand the internal architecture and organization of 8085 & 8086.
CO2 .1. Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.
2. Analyze assembly language programs; select appropriate assemble into machine a cross assembler utility of a microprocessor and microcontroller.
CO3. Discuss how the different peripherals are interfaced with microprocessor like 8255,8253/54,8237,8279,etc.
CO4. 1.To analyze the concepts of memory interfacing for faster execution of instructions and improves the speed of operations & hence performance of microprocessors.
2.To Understand the basic knowledge of advanced processor and Analyze the internal architecture of 80286,80486 and Pentium processor.
CO5 1. Analyze the internal architecture and real time control of 8051.
2. Analyze the internal architecture of ARM Processors.

BEC-651	**Microprocessor & Microcontroller lab**	**0L-0T-2P**	**CREDIT-1**

Course outcome expected:
By end of this course the student should be able to
CO1. Do basic assembly language programming of 8085.
CO2. Do advance assembly language programming of 8086.
CO3. Do basic assembly language programming of 8085 for interfacing of peripherals.
CO4. Do advance assembly language programming of 8086 for interfacing of peripherals.

MC601	**Occupational Health and Safety**	**2L-0T-P**	**NO CREDIT**

Course outcome expected:
By end of this course the student should be able to
CO1 Identify the diseases associated with occupation.
CO2 Manage safety in industries by suggesting safety measures.
CO3 Identify the accidental causes & apply the preventions.
CO4 Identify Fire Explosion & apply PPE.
CO5 Identify & apply Hazards & Risk identification, Assessment and control techniques.

BCS701	**Soft Computing**	**3L-0T-0P**	**CREDIT -3**

Course outcome expected:
By the end of the course the students should be able to:
CO1: To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations. Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
CO2: Apply perceprtron and backprogation technique for classification.
CO3: Understand the concepts of crisp fuzzy sets.
CO4: knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic and apply fuzzification and defuzzinfication.
CO5: Analyze the genetic algorithms and their applications. Apply genetic algorithms to combinatorial optimization problems

BCS751	Soft Computing LAB	0L-0T-2P	CREDIT -1

Course outcome expected:

By the end of the course the students should be able to:

CO1: Learn McCulloch-pits

CO2: Execute Hebb's Net and Perceptron Training Algorithm

CO3: Learn and execute logic gates and Genetic Algorithm

BCS702	Digital Image Processing	3L-1T-P	CREDIT -4

Course Outcomes Expected:

By the end of the course the students should be able to:

CO1: Review the fundamental concepts of a digital image processing system.

CO2 : Analyze images in the frequency domain using various transforms.

CO3 : Evaluate the techniques for image enhancement and image restoration.

CO4 : Categorize various compression techniques.

CO5: Interpret Image compression standards.

CO6 : Interpret image segmentation and representation techniques.

BCS801	Cryptography and Network Security	3L-1T-0P	CREDIT -4

Course Outcomes

By the end of the course the students should be able to:

CO1 Illustrate the concepts of Network Security and Compare Various Symmetric and Asymmetric Cryptographic methods used for Network Security.

CO2 Classify various Algorithms to be used at various TCP/IP Layers & to operate Digital Signature in Real World Situation

CO3 Summarize different Authentication Techniques & Describe programs like PGP & S/MIME

CO4 Implement IP Security Architecture &Transport Layer Security to identify the vulnerability of the Internet systems and recognize the mechanisms of the attacks, and apply them to design and evaluate counter-measure tools

CO5 Implement Firewall design principles and identify various intrusion detection systems and be able to achieve highest system security

BCS802	AdvanceDatabase management system	3L-0T-0P	CREDIT -3

Course outcome expected:

By the end of the course the students should be able to:

CO1: Exposure to fundamentals of DBMS and its importance.

CO2: Exposure for students to write complex queries including full outer joins, self-join, sub queries, and set theoretic queries, Cursor Management, Triggers, Transaction Processing & Locking using concept of Concurrency control.

CO3 Understand the importance of Functional Dependency and Functional Decomposition and apply normalization techniques.

CO4: Apply transaction management techniques to database.

CO5: Apply concurrency control methods on database

DECS 501	Data Compression	3L-0T-0P	CREDIT -3

Course outcome expected:

By end of this course the student should be able to

C01 Students will able to understand important of data compression
Co2 Student will be able to learn application different type of compression
CO3 Student is able to select methods and techniques appropriate for the task
CO4 Student is able to develop the methods and tools for the given task
CO5.student will learn different type of Distortion criteria

DECS-551	Data Compression Lab	L-T-2P	CREDIT -1

Course outcome expected:
By end of this course the student should be able to
CO1. Students will able to understand important of data compression
CO2. Student will be able to develop a reasonably sophisticated data compression application
CO3 Student is able to select methods and techniques appropriate for the task
CO4. Student is able to develop the methods and tools for the given task

DECS-502	Computer Graphics	3L-T-P	CREDIT -3

Course outcome expected:
By end of this course the student should be able to
CO1:-To know the foundations of computer graphics.
CO2:-To comprehend the concept of geometric, mathematical and algorithmic concepts necessary for programming computer graphics
CO3:-To understand the comprehension of windows, clipping and view-ports object representation in relation to images displayed on screen.
CO4:- To apply the concept of 3D transformation for the creation of objects
CO5:-To understand the basics of curves and surfaces and to recognize the software utilized in constructing computer graphics applications

DECS 552	Computer Graphics lab	0L-0T-2P	CREDIT -1

Course outcome expected:
By end of this course the student should be able to
CO1. To implement the line and circle drawing algorithm
CO2. To implement the translation, rotation, scaling, reflection and sharing.
CO3. Execute scan line polygon filling
CO4 Implement basic transformations on objects
CO5 Implement clipping algorithm on lines

DECS 503	DATA MINING AND DATA WAREHOUSING	3L-T-P	CREDIT -3

Course outcome expected:
By end of this course the student should be able to
CO1 Be familiar with mathematical foundations of data mining tools.

CO2 Understand and implement classical models and algorithms in data warehouses and data mining

CO3 Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.

CO4 Master data mining techniques in various applications like social, scientific and environmental context.

CO5 Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

DECS 553	**DATA MINING AND DATA WAREHOUSING LAB**	**L-T-2P**	**CREDIT -1**

Course outcome expected:
By end of this course the student should be able to
CO1. To evaluate the different models of OLAP and data preprocessing.
CO2. To enlist various algorithms used in information analysis of Data Mining Techniques.
CO3 To demonstrate the knowledge retrieved through solving problems

DECS 601	**Advance Computer architecture**	**3L-1T-P**	**CREDIT -4**

Course outcome expected:
By end of this course the student should be able to
CO1 Understand the Concept of Parallel Processing and its applications
CO2 Implement the Hardware for Arithmetic Operations
CO3 Analyze the performance of different scalar Computers
CO4 Develop the Pipelining Concept for a given set of Instructions
CO5 Distinguish the performance of pipelining and non pipelining environment in a processor

DECS 602	**Mobile computing**	**3L-1T-P**	**CREDIT -4**

Course outcome expected:
By end of this course the student should be able to
CO1: Understand and identify the GSM, CDMS and GPES for mobile computing
CO2: Understand the concept of wireless technology and WAP architecture .The ability to develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.
CO3: To learn the concept of database management concept .Understanding of the characteristics and limitations of mobile hardware devices including their user-interface modalities
CO4: Analyze QOS over wire and wireless channels
CO5: Able to promote the awareness of the life-long learning, business ethics, professional ethics and current marketing scenarios.

DECS 603	**PARALLEL AND DISTRIBUTED COMPUTING**	**3L-1T-P**	**CREDIT -4**

Course outcome expected:
By end of this course the student should be able to
CO 1: Develop programs with distributed parallelism, parallel debugging included;
CO 2: Construct parallel algorithms, i.e. identify parallelism in a given algorithm and implement **it;**
CO 3: Analyse properties such as efficiency, speedup etc., of parallel algorithms;
CO 4: Analyse performance of parallel algorithms**.**
CO 5: Understand different parallel and distributed paradigms and algorithms

DE-CS701	**Department Elective III**	**3L-0T-0P**	**CREDIT -3**

COURSE OUTCOME EXPECTED
CO1: Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems..

CO2: Become aware of the architecture of the ATOM processor and its programming aspects (assembly Level)
CO3: Become aware of interrupts, hyper threading and software optimization.
CO4: Design real time embedded systems using the concepts of RTOS.
CO5: Analyze various examples of embedded systems based on ATOM processor.

OE-CS702	Department Elective III	3L-0T-0P	CREDIT -3

COURSE OUTCOME EXPECTED
CO1 : Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO2 : Students will be able to write a well formed / valid XML document.
CO3 : Students will be able to connect a java program to a DBMS and perform insert, update and delete operations on DBMS table.
CO4 : Students will be able to write a server side java application called Servlet to catch form data sent from client, process it and store it on database.
CO5 : Students will be able to write a server side java application called JSP to catch form data sent from client and store it on database.

DE-CS703	Department Elective III	3L-0T-0P	CREDIT -3

COURSE OUTCOME :
At the end of this course student will:
CO1: Apply essential Android Programming concepts.
CO2: Develop various Android applications related to layouts & rich uses interactive interfaces
CO3: Develop Android applications related to mobile related server-less database like SQLITE

DE-CS801	Department Elective IV	3L-1T-0P	CREDIT -4

COURSE OUTCOME EXPECTED
By the end of the course the students should be able to:
CO1: Gain knowledge about basic concepts of Machine Learning
CO2: Identify machine learning techniques suitable for a given problem
CO3: Solve the problems using various machine learning techniques
CO4: Apply Dimensionality reduction techniques.
CO5: Design application using machine learning techniques

DEEP LEARNING
Course outcome expected

DE-CS802	Department Elective IV	3L-1T-0P	CREDIT -4

By the end of the course the students should be able to:
CO1.To understand the theory behind deep learning methods such as Convolutional Neural Networks, Autoencoders and Boltzmann Machines,
CO2.To have a grasp of the open issues and trends in deep learning research,
CO3 To have a feeling of when to use or avoid deep learning methods

DE-CS803	Department Elective IV	3L-1T-0P	CREDIT -4

COURSE OUTCOME EXPECTED
By the end of the course the students should be able to:
CO1: Summarize the concepts of automata and compiler

CO2: Learn the concepts of parsing and Normal forms of grammar.
CO3: Illustrate the concepts of semantic and pragmatic approach.
CO4: Learn the basic concepts of Speech processing
CO5: Analysis the concepts of pattern comparison technique and normalization.

OECS501	OPERATION RESEARCH	3L-T-P	CREDIT-3

Course outcome expected:
By end of this course the student should be able to
CO1 Express objective function and resource constraint in LP model in term of decision variable and parameters.
CO**2.** Construct the initial transportation table for a trans-shipment problem and to solve a profit maximization transportation problem using suitable changes in the transportation algorithm.
CO3. Appreciate application of integer LP problem in several areas of managerial decision- making and to use linear programming approach to compute the value of the game when dominance rule do not apply.
CO4. Derive replacement policy for items whose running cost increases with time and to use various selective inventory control techniques to classify inventory items into broad categories.
CO5.Derive relationship among variety of performance measures using Probability Distributions and Dynamic Programming are used for Optimization.

OECS 502	GRAPH THEORY	3L-T-0P	CREDIT -3

Course outcome expected:
By end of this course the student should be able to
After the course the student will have a strong background of the graph theory which has diverse applications in the area of computer science, biology, chemistry, physics & engineering.

OECS 503	COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES	3L-T-P	CREDIT -3

Course outcome expected:
By end of this course the student should be able to
CO1. Analyse the asymptotic performance of algorithms.
CO2. Write rigorous correctness proofs for algorithms.
CO3. Demonstrate a familiarity with major algorithms and data structures.
CO4. Apply important algorithmic design paradigms and methods of analysis.
CO5. Synthesize efficient algorithms in common engineering design situations

OECS 601	Modeling And System simulation	3L-0T-P	CREDIT -3

Course outcome expected:
By end of this course the student should be able to
CO1: Understand the basics of simulation modeling and replicating the practical situations in organizations.
CO2: Realize Concepts in Discrete-Event Simulation and analyze and develop a number of simulation software.
CO3: understand and simulate various statistical and mathematical models
CO4: Generate random numbers and random variates using different techniques.
CO5: Analyze simulation data using input modelling as well as Understand Verification and Validation of simulation model.

OECS602	Internet Of Thing	3L-0T-0P	CREDIT-3

Course outcome expected:
By end of this course the student should be able to

CO1: To understand the fundamental concepts of IoT and apply them.
CO2: To know the different hardware's used to embed them with IoT for the development of embedded applications.
CO3: To learn the networking and communication aspects in IoT and analysis of different protocol used in IoT.
CO4: Design and develop an application of IOT using ardunio platform.
CO5: To comprehend the challenges faced for the development of an IoT application.

OE-CS 701	**Data science**	**3L-0T-0P**	**CREDIT -4**

Course outcomes Expected
By the end of the course the students should be able to:
CO1.Describe what Data Science is and the skill sets needed to be a data scientist. • Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as foundations for statistical modeling. Fit a model to data.
CO2. Use R to carry out basic statistical modeling and analysis.
CO3. Explain the significance of exploratory data analysis (EDA) in data science. Apply basic tools (plots, graphs, summary statistics) to carry out EDA.
CO4. Describe the Data Science Process and how its components interact
CO5 Use APIs and other tools to scrap the Web and collect data. And Apply EDA and the Data Science process in a case study.

OE-CS702	**Open Elective III**	**3L-0T-0P**	**CREDIT -4**

COURSE OUTCOME EXPECTED:
By the end of the course the students should be able to:
CO1:- To know the fundamental concepts of big data and analytics.
CO2:- To understand the different way to classify the given data using different techniques.
CO3:- To explore tools and practices for working with big data
CO4:- To learn about stream computing.
CO5:- To know about the research that requires the integration of large amounts of data.

OE-CS801	**Open Elective IV**	**3L-0T-0P**	**CREDIT -4**

Course outcome expected:
By the end of the course the students should be able to:
CO1: To explore of blockchain and its architecture.

CO2: Understand the consensus, Consensus protocols for Permissioned Blockchains.

CO3: understand the Hyperledger Fabric and its implementation.

CO4: Applies blockchain concept in Financial Software and Systems, trade/supply chain (use cases).

CO5: Applies blockchain concept for Government(use case).

Computer Vision

OE-CS802	**Open Elective IV**	**3L-0T-0P**	**CREDIT -4**

Course outcome expected:
By the end of the course the students should be able to:
CO1: To explore fundamental image processing techniques required for computer vision

CO2: Understand Image formation process and Generate 3D model from images.

CO3: Perform feature extraction and motion estimation on the images.

CO4: To perform shape analysis and perform segmentation.

CO5: Perform Object Analysis and do processing.