ESTD. 1939

KARNATAK LAW SOCIETY'S
GOGTE INSTITUTE OF TECHNOLOGY
"JNANA GANGA" UDYAMBAG, BELAGAVI-590008,
KARNATAKA, INDIA.
Approved by AICTE & UGC
Permanently Affiliated and Autonomous Institution Under
Visvesvaraya Technological University, Belagavi
www.git.edu

ESTD. 1979

2018-19 Scheme

Department: Computer Science & Engineering

Programme: B.E. (Computer Science & Engineering)

3rd to 8th Semester Scheme of Teaching and Examination

3rd and 4th Semester Syllabus

INSTITUTION VISION

Gogte Institute of Technology shall stand out as an institution of excellence in technical education and in training individuals for outstanding caliber, character coupled with creativity and entrepreneurial skills.

MISSION

To train the students to become Quality Engineers with High Standards of Professionalism and Ethics who have Positive Attitude, a Perfect blend of Techno-Managerial Skills and Problem solving ability with an analytical and innovative mindset.

QUALITY POLICY

- Imparting value added technical education with state-of-the-art technology in a congenial, disciplined and a research oriented environment.
- Fostering cultural, ethical, moral and social values in the human resources of the institution.
- Reinforcing our bonds with the Parents, Industry, Alumni, and to seek their suggestions for innovating and excelling in every sphere of quality education.

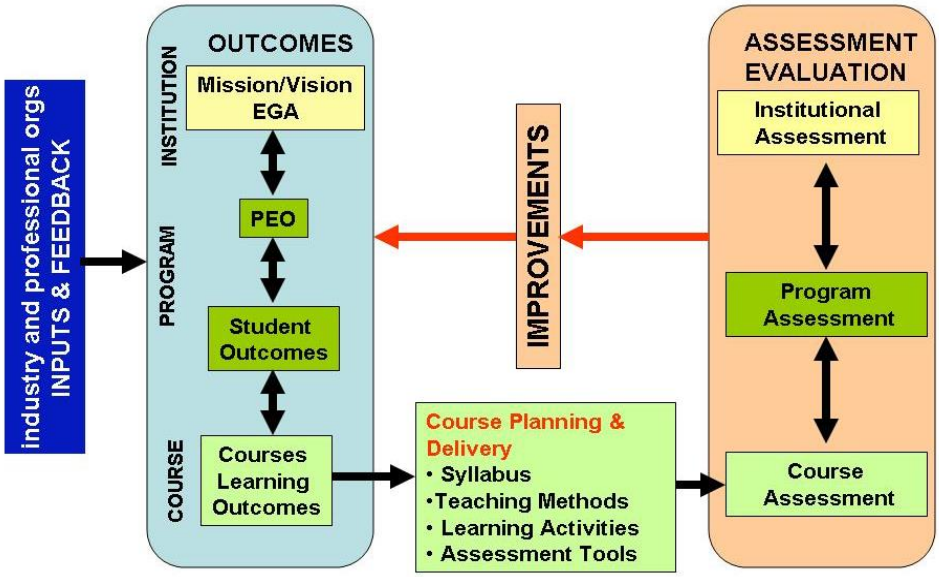
DEPARTMENT VISION

To be a center of excellence for education, research and entrepreneurship in Computer Science and Engineering in creating professionals who are competent to meet emerging challenges to benefit society.

MISSION

To impart and strengthen fundamental knowledge of students, enabling them to cultivate professional skills, entrepreneurial and research mindset with right attitude and aptitude.

OUTCOME BASED EDUCATION (OBE)



PROGRAM OUTCOMES (POs):

National Board of Accreditation (NBA) has framed the Program Outcomes (PO) based on twelve Graduate Attributes (GA). These POs are generic to engineering education and applies to all branches of Engineering.

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 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 lifelong learning in the broadest context of technological change.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

1. The graduates will acquire core competence in basic-science and engineering fundamentals necessary to identify, formulate, analyze, and solve complex engineering problems.
2. The graduates will acquire capabilities to succeed as Computer Science and Engineering professionals with an aptitude for higher education and entrepreneurship.
3. The graduates will have the curiosity and desire for lifelong learning, self-confidence and ability to adapt to changes.
4. The graduates will maintain high professionalism and ethical standards, effective oral and written communication skills and work as part of teams on multidisciplinary projects.

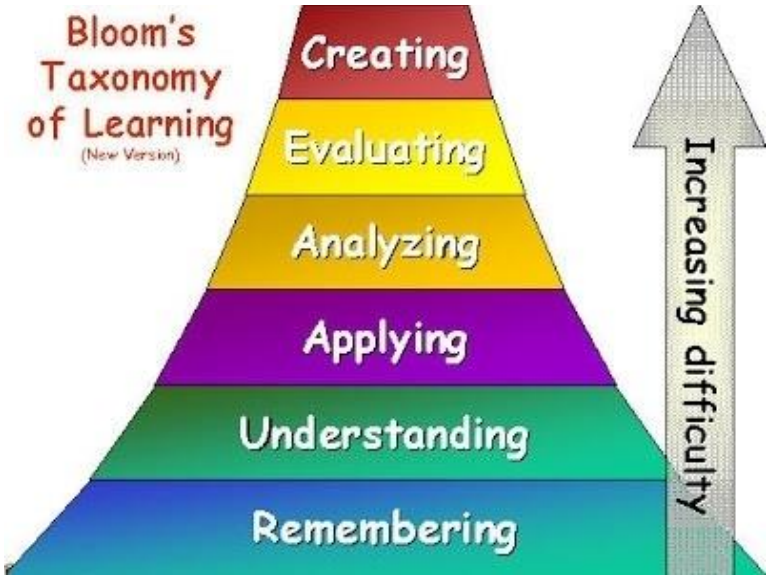
PROGRAM SPECIFIC OUTCOMES (PSOs):

1. **Problem solving skills:** Ability to identify and analyze problems of varying complexity and propose solutions by applying fundamental knowledge acquired in the field of Computer Science & Engineering.
2. **Project development skills:** Ability to apply design principles and demonstrate best practices of software development processes to solve real life problems.
3. **Carrier advancement:** Ability to demonstrate professional and leadership qualities required to pursue opportunities in Information Technology/self-employment/ higher studies.

BLOOM'S TAXONOMY OF LEARNING OBJECTIVES

Bloom's Taxonomy in its various forms represents the process of learning. It was developed in 1956 by Benjamin Bloom and modified during the 1990's by a new group of cognitive psychologists, led by Lorin Anderson (a former student of Bloom's) to make it relevant to the 21st century. The **revised taxonomy** given below emphasizes what a learner "Can Do".

Lower order thinking skills(LOTS)		
L1	Remembering	Retrieve relevant knowledge from memory.
L2	Understanding	Construct meaning from instructional material, including oral, written, and graphic communication.
L3	Applying	Carry out or use a procedure in a given situation – using learned knowledge.
Higher order thinking skills(HOTS)		
L4	Analyzing	Break down knowledge into its components and determine the relationships of the components to one another and then how they relate to an overall structure or task.
L5	Evaluating	Make judgments based on criteria and standards, using previously learned knowledge.
L6	Creating	Combining or reorganizing elements to form a coherent or functional whole or into a new pattern, structure or idea.



Scheme of Teaching and Examination- 3rdto 8th Semester B.E.

As per the guidelines of UGC CBCS the courses can be classified into:

(i) Core Courses (PC): This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirements of a program in a said discipline of study. These courses will have 4 credits per course.

(ii) Foundation Courses: The Foundation Courses are of two kinds:

Compulsory Foundation: These courses are the courses based upon the content that leads to Knowledge enhancement. These courses provide opportunities to improve technological knowledge before entering industry as well as preparing students for higher degrees in technological subjects. They are mandatory for all disciplines. These courses will have 4 credits per course.

The courses are: **Basic Science Courses (BS), Engineering Science Courses (ES)**.

Foundation Electives: These are value based courses aimed at man making education. The course is related to **Humanities and Social Science Courses (HS).**

(iii) Elective Courses: This is course, which can be chosen from the pool of papers. It may be supportive to the discipline/ providing extended scope/enabling an exposure to some other discipline / domain / nurturing student proficiency skills.

An elective may be **Discipline Centric (PE)** or **Open Elective (OE).**

(iv) Mandatory Non-Credit Courses (MNC): These courses are mandatory for students joining B.E Program and students have to successfully complete these courses before the completion of degree.

Semester wise distribution of credits for B.E program

Total credits for B.E Program: 175 credits

		Regular batch		Dip. Lateral entry	
	Semester	**Credits per Sem**	**Total credits**	**Credits per Sem**	**Total credits**
1st year	1	20	40	----	----
	2	20		----	
2nd year	3	24	48	24	48
	4	24		24	
3rd year	5	24	48	24	48
	6	24		24	
4th year	7	23	39	23	39
	8	16		16	
	Total	**175**	**175**	**135**	**135**

Credit definition:

Lecture (L):One Hour /week – 1 credit
Tutorial (T): Two hour /week – 1 credit
Practicals (P): Two hours /week – 1 credit;

Scheme of Teaching and Examination- 3rd to 8th Semester B.E.

Third Semester (Regular)									
S.No.	**Course Code**	**Course**		**Contact Hours**	**Total Contact Hours/ week**	**Total credits**	**Marks**		
				L – T – P			**CIE**	**SEE**	**Total**
1	18MATCS31	Statistical- Numerical – Fourier Techniques	BS	4 – 0 – 0	4	4	50	50	100
2	18CS32	Data Structures with C	PC	4 – 0 – 0	4	4	50	50	100
3	18CS33	Digital Electronics	PC	3 – 2 – 0	5	4	50	50	100
4	18CS34	Object Oriented Programming with Java	PC	3 – 0 – 0	3	3	50	50	100
5	18CS35	Computer Organization	PC	3 – 0 – 0	3	3	50	50	100
6	18CSL36	Web Programming (Integrated)	PC	2 – 0 – 2	4	3	25	25	50
7	18CSL37	Data Structures with C Laboratory	LAB	0 – 0 – 3	3	1.5	25	25	50
8	18CSL38	Object Oriented Programming with Java Laboratory	LAB	0 – 0 – 3	3	1.5	25	25	50
9	18CS39	Kannada	HS	2 – 0 – 0	2	MNC	25	-	25
		Total			**31**	**24**	**350**	**325**	**675**

Third Semester (Diploma)									
S.No.	**Course Code**	**Course**		**Contact Hours**	**Total Contact Hours/ week**	**Total credits**	**Marks**		
				L – T – P			**CIE**	**SEE**	**Total**
1	18DMATCS31	Calculus, Fourier Analysis and Linear Algebra	BS	4 – 0 – 0	4	4	50	50	100
2	18CS32	Data Structures with C	PC	4 – 0 – 0	4	4	50	50	100
3	18CS33	Digital Electronics	PC	3 – 2 – 0	5	4	50	50	100
4	18CS34	Object Oriented Programming with Java	PC	3 – 0 – 0	3	3	50	50	100
5	18CS35	Computer Organization	PC	3 – 0 – 0	3	3	50	50	100
6	18CSL36	Web Programming (Integrated)	PC	2 – 0 – 2	4	3	25	25	50
7	18CSL37	Data Structures with C Laboratory	LAB	0 – 0 – 3	3	1.5	25	25	50
8	18CSL38	Object Oriented Programming with Java Laboratory	LAB	0 – 0 – 3	3	1.5	25	25	50
9	18CS39	Kannada	HS	2 – 0 – 0	2	MNC	25	-	25
		Total			**31**	**24**	**350**	**325**	**675**

Fourth Semester (Regular)									
S.No.	**Course Code**	**Course**		**Contact Hours**	**Total Contact Hours/ week**	**Total credits**	**Marks**		
				L – T – P			**CIE**	**SEE**	**Total**
1	18MATCS41	Discrete Mathematical Structures and Graph Theory	BS	4 – 0 – 0	4	4	50	50	100
2	18CS42	Operating System	PC	4 – 0 – 0	4	4	50	50	100
3	18CS43	Database Management System	PC	4 – 0 – 0	4	4	50	50	100
4	18CS44	Design and Analysis of Algorithm	PC	3 – 0 – 0	3	3	50	50	100
5	18CS45	Software Engineering	PC	3 – 0 – 0	3	3	50	50	100
6	18CSL46	Python Programming (Integrated)	PC	2 – 0 – 2	4	3	25	25	50
7	18CSL47	Algorithms Laboratory	LAB	0 – 0 – 3	3	1.5	25	25	50
8	18CSL48	Database Applications Laboratory	LAB	0 – 0 – 3	3	1.5	25	25	50
9	18CS49	Environmental Science	HS	2 – 0 – 0	2	MNC	25	-	25
		Total			**30**	**24**	**350**	**325**	**675**

 # MNC: Mandatory Non-credit course. Pass in this course is mandatory for the award of degree.

Fourth Semester (Diploma)									
S.No.	**Course Code**	**Course**		**Contact Hours**	**Total Contact Hours/ week**	**Total credits**	**Marks**		
				L – T – P			**CIE**	**SEE**	**Total**
1	18DMATCS41	Graph Theory and Discrete Mathematical Structures	BS	4 – 0 – 0	4	4	50	50	100
2	18CS42	Operating System	PC	4 – 0 – 0	4	4	50	50	100
3	18CS43	Database Management System	PC	4 – 0 – 0	4	4	50	50	100
4	18CS44	Design and Analysis of Algorithm	PC	3 – 0 – 0	3	3	50	50	100
5	18CS45	Software Engineering	PC	3 – 0 – 0	3	3	50	50	100
6	18CSL46	Python Programming(Integrated)	PC	2 – 0 – 2	4	3	25	25	50
7	18CSL47	Algorithms Laboratory	LAB	0 – 0 – 3	3	1.5	25	25	50
8	18CSL48	Database Applications Laboratory	LAB	0 – 0 – 3	3	1.5	25	25	50
9	18CS49	Environmental Science	HS	2 – 0 – 0	2	MNC	25	-	25
		Total			**30**	**24**	**350**	**325**	**675**

 # MNC: Mandatory Non-credit course. Pass in this course is mandatory for the award of degree.

3rd and 4th Semester Syllabus

Statistical – Numerical – Fourier Techniques

(Common to all branches)

Course Code	18MATCS31	**Credits**	04
Course type	BS	**CIE Marks**	50
Hours/week: L-T-P	4 – 0 – 0	**SEE Marks**	50
Total Hours:	40	**SEE Duration**	3 Hours for 100 marks

Course Learning Objectives(CLO's)

Students should

1. Learn Numerical methods to solve Algebraic, Transcendental and Ordinary Differential Equations.
2. Understand the concept of Fourier series and apply when needed.
3. Get acquainted with Fourier Transforms and its properties.
4. Study the concept of Random variables and its applications.
5. Get acquainted with Joint Probability Distribution and Stochastic processes.

Pre-requisites :

1.Basic Differentiation and Integration
2. Basic Probability
3. Basic Statistics

Unit – I 8 Hours

Numerical solution of Algebraic and Transcendental equations:

Method of False position, Newton- Raphson method (with derivation), Fixed point iteration method (without derivation).

Numerical solution of Ordinary differential equations: Taylor's Series method, Euler and Modified Euler method, Fourth order Runge–Kutta method

Unit – II 8 Hours

Fourier Series: Periodic functions. Dirichlet's conditions, Fourier series, Half range Fourier sine and cosine series. Practical examples, Harmonic analysis.

Unit - III **8 Hours**

Fourier Transforms: Infinite Fourier Transform and Properties. Fourier Sine and Cosine Transforms Properties and Problems.

Unit - IV **8 Hours**

Probability: Random Variables (RV), Discrete and Continuous Random variables, (DRV,CRV) Probability Distribution Functions (PDF) and Cumulative Distribution Functions(CDF),

Expectations(Mean, Variance). Binomial, Poisson, Exponential and Normal Distributions. Practical examples.

Unit - V **8 Hours**

Joint PDF and Stochastic Processes: Discrete Joint PDF, Conditional Joint PDF, Expectations (Mean, Variance and Covariance).Definition and classification of stochastic processes. Discrete state and discrete parameter stochastic process, Unique fixed probability vector, Regular Stochastic Matrix, Transition probability, Markov chain.

Books

Text Books

1 B.S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012.

2. Erwin Kreyszig –Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition, 2006.

3. B. V. Ramana- Higher Engineering Mathematics, Tata McGraw-Hill Education Private Limited, Tenth reprint 2010 and onwards.

Reference Books:

1. P.N.Wartikar & J.N.Wartikar– Applied Mathematics (Volume I and II) Pune Vidyarthi Griha Prakashan, 7th Edition 1994.

2 Peter V. O' Neil – Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th Edition,

2011.

3 Glyn James – Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition,

2010.

Course Outcome (COs)

At the end of the course, the student will be able to		Bloom's Level
1.	**Use** Numerical methods and **Solve** Algebraic, Transcendental and Ordinary differential equations.	**[L2]**
2.	**Develop** frequency bond series from time bond functions using Fourier series.	**[L2]**
3.	**Understand** Fourier Transforms and its properties.	**[L2]**
4.	**Understand** the concept of Random variables, PDF, CDF and its applications	**[L2]**
5.	**Extend** the basic probability concept to Joint Probability Distribution, Stochastic processes.	**[L3]**
6.	**Apply** Joint Probability Distribution, Stochastic processes to solve relevant problems.	**[L3]**

	Program Outcome of this course (POs)	**PO No.**
1.	An ability to apply knowledge of Mathematics, science and Engineering.	**[PO1]**
2.	An ability to identify, formulate and solve engineering problems.	**[PO5]**
3.	An ability to use the techniques, skills and modern engineering tools necessary for engineering practice	**[PO11]**

	Course delivery methods		**Assessment methods**
1.	Black Board Teaching	1.	Internal Assessment
2.	Power Point Presentation	2.	Assignment
3.	**Scilab/Matlab/ R-Software/Geogebra**	3.	Quiz

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments /matlab/Scilab activity	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

DATA STRUCTURES WITH C (Theory)

Course Code	18CS32/18IS32	**Credits**	04
Course type	PC4	**CIE Marks**	50 marks
Hours/week: L-T-P	4– 0 – 0	**SEE Marks**	50 marks
Total Hours:	Lecture = 45Hrs; Tutorial = 0Hrs Total = 45Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To learn the fundamentals of data structure and realize their importance in designing variety of applications.
2. To illustrate the implementation of data structures such as stack, queue and linked list and to apply tem for the given problem.
3. To introduce non linear data structures like Binary Tree, Heap, AVL tree and their applications and also to provide insight of advanced searching techniques like Hashing.
4. To create and use appropriate data structures for solving real life problems.

Pre-requisites : Basic computer concepts & C programming.

Unit – I 09Hours

Pointers, Structures: Introduction to Pointers, Pointers and Arrays, Pointers to Pointers, **Pointers to functions**, Dynamic memory management in C (malloc(), calloc(), free() and realloc() functions). Introduction to Structures, Declaration, Initialization, Accessing Structures, Internal implementation of Structures, Union and its Definition.

Self-learning topics : Enumerations.

Unit – II 09Hours

Files, Linked lists:

Files in C: Text input output with respect to files in C, Basic file handling functions in C.

General linear lists: Basic operations, Implementation, List ADT. Complex implementations: circular linked lists, doubly linked lists.

Unit – III **09Hours**

Stacks & Queues:

Stacks: Basic Stack operations, Stack ADT,Stack linked list Implementation, Stack applications:Conversion of Expression (Infix to Postfix), Evaluation of Expressions.

Queues: Queues, Queue ADT, Circular Queues Linked list design, Queue applications.

Self-learning topics: : Implementation of stacks and queues using arrays

Unit – IV **09Hours**

Trees: Basictree concepts, Binary trees, Binary search tree ADT, general trees, Binary search tree (BST) concept, BST operations, BST Applications. AVL trees basic concepts.

Unit – V **09Hours**

Heaps and Hashing

Heap: Basic concepts, Heap implementation, Heap ADT, Heap applications

Hashing: Basic concept, Hashing methods, collision resolution.

Books

Text Books:

1. Richard.F.Gilberg, Behrouz.A. Forouzan, Data Structures: A Pseudocode Approach with C, Cengage Learning, 2nd edition 2007 and onwards
2. Horowitz, Sahni, Anderson-Freed, Fundamentals of Data Structures in C, Universities Press, 2nd Edition, 2007 and onwards.

Reference Books:

1. Yedidyah, Augenstein, Tannenbaum: Data Structures Using C and C++, Pearson Education, 2nd Edition and onwards.
2. ReemaThareja, Data structures using C, Oxford Higher Education, 1st edition, 2011 onwards

E-resourses

1. **NPTELcourse link** : https://nptel.ac.in/courses/106102064/
2. **SWAYAM course link:** https://swayam.gov.in/course/1407-programming-and-data-structures
3. **edx course link:** https://www.edx.org/course/data-structures-fundamentals

Course Outcome (COs)

At the end of the course, the student will be able to		Bloom's Level
1.	**Explore** the fundamental concepts of various data structures.	L1
2.	**Analyze** and represent various data structures.	L3
3.	**Design** algorithms for different data structures like Stack, Queue, List, Tree and Hashing.	L3
4.	**Develop** programs with suitable data structures based on requirements of real world applications.	L3

	Program Outcome of this course (POs)	**PO No.**
1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2.	**Problem analysis:** Identify, formulate, review research literature, andanalyze complex engineering problems reaching substantiated conclusionsusing first principles of mathematics, natural sciences, and engineeringsciences.	**2**
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.	**3**
4.	**Life-long learning:** Recognize the need for, have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	**12**

	Course delivery methods		**Assessment methods**
1.	Chalk and board	1.	Internal assessment
2.	PPT	2.	Assignment
3.	Video lectures	3.	Quiz

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50

Writing two IA tests is compulsory.

Minimum marks required to qualify for SEE : 20 out of 50 marks

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Digital Electronics (Theory)

Course Code	18CS33/18IS33	**Credits**	04
Course type	PC	**CIE Marks**	50 marks
Hours/week: L-T-P	3 – 2 – 0	**SEE Marks**	50 marks
Total Hours:	Lecture = 40Hrs; Tutorial = 08Hrs Total= 48Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. Introduce the basics of Minimizing Boolean functions by using various techniques like K-Map and Quine Mclusky methods and implement by using suitable Logic gates and MSI chips.
2. Discuss the combinational logic circuits like Full Adder, Subtractor, Magnitude Comparators, Code Converters etc. and implement by using logic gates/ ICs.
3. Present the working of sequential circuits like Flip- Flops, Registers, Counters, ADC/DAC and their applications.
4. Understand the concept of HDL programming and realize Boolean functions and data processing circuits.

Pre-requisites : Basic Electronics

Unit – I 08 Hours

Revision of Logic gates and Boolean algebra, Simplification of Boolean functions using Basic Logic gates, Universal Gates, SOP, POS form, K-Map Simplification (up to 4 variables), Don't-care Condition, Quine McClusky method to generate Prime Implicants, Prime Implicants chart, problem solving with multiple methods.

Tutorial: Implementation of SOP/POS Boolean function using Universal gates.

Unit – II 08 Hours

Data Processing Circuits: Multiplexers, De-multiplexers, Decoder, Encoders and implementation of Boolean functions using multiplexer and Decoders, Parity Generators and Checkers using XOR gates Magnitude Comparators (1 bit and 2 bit), PLA, PAL, Adder / Subtracter.

Tutorial: Implementation of Boolean functions using Multiplexer/Decoder, Realization of Adder/Substracter using logic gates.

Unit – III **08 Hours**

Clocks and Flip Flops: Clock waveforms, TTL clock, RS Flip Flops, Gated flip-flops, Edge triggered RS Flip-Flops, Edge triggered D Flip-Flops, and Edge triggered JK Flip-Flops, JK master slave Flip Flops, various representations of Flip Flops.

Tutorial: Implementation of flip flops using logic gates.

Unit – IV **08 Hours**

Analysis of Sequential Circuits: Conversion of flip flops: A synthesis example, Types of Shift Register, SISO, SIPO, PISO and PIPO, Applications of Shift Registers as Ring Counter, Johnson Counter, Serial Adder.

Counters: Asynchronous counters (4 bit), Synchronous Counters (4 bit), Changing the counter Modulus, Decade counter (using IC 7490).

Tutorial: Application of IC 7490, Design and implementation of MOD-N counter

Unit – V **08 Hours**

DAC, ADC and Introduction to HDL: Variable, Resistor Networks, Binary Ladders, D/A converters, D/A Resolution and Accuracy, A/D converters: Simultaneous Conversion, Successive Approximation and Counter type, A/D Resolution and Accuracy.

Introduction to HDL: Types of Model, Syntax for Data Flow model.

Tutorial: Simple programs for SOP equation, Multiplexer, Decoder and Adder using Verilog.

Books

Text Books:

1. Donald P Leach, Albert Paul Malvino and GoutamSaha: Digital Principles and Applications, 7th Edition and onwards, Tata McGraw Hill, 2011.

Reference Books:

1. Donald Givone: Digital Principles and Design, Palgrave Macmillan, 2003 and onwards.
2. R D Sudhaker Samuel: Illustrative Approach to Logic Design, Sanguine-Pearson, 2012 and onwards.
3. Ronald J. Tocci, Neal S. Widmer, Gregory L. Moss: Digital Systems Principles and Applications, 10th Edition, Pearson Education, 2007 and onwards.

E-resourses (NPTEL/SWAYAM.. Any Other)- mention links

1. **https://nptel.ac.in/courses/117106086/**

Course Outcome (COs)

	At the end of the course, the student will be able to	Bloom's Level
1.	**Analyze** different simplification methods for Boolean functions and design the logic circuits.	**L4**
2.	**Realize** the combinational and sequential logic circuits by using various logical blocks	**L3**
3.	**Design** synchronous counters and develop sequential circuit applications using flip flop and registers.	**L4**
4.	**Develop** simple HDL programs for combinational logic circuits.	**L3**

	Program Outcome of this course (POs)	**PO No.**
1.	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
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	**2**
3.	**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	**5**
4.	**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.	**12**

Course delivery methods	**Assessment methods**
1. Chalk and board	1. Internal assessment
2. PPT	2. Assignment
3. Video lectures	3. Quiz
	4. Seminar / project

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50

Writing two IA tests is compulsory.

Minimum marks required to qualify for SEE : 20 out of 50 marks

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Object Oriented Programming with Java (Theory)

Course Code	18CS34/18IS34	**Credits**	03
Course type	PC	**CIE Marks**	50 marks
Hours/week: L-T-P	3 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	Lecture = 40 Hrs; Tutorial = 00 Hrs Total = 40 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. Understand the fundamentals of object-oriented programming in Java.

2. Demonstrate the features of object-oriented programming such as encapsulation, inheritance and polymorphism to design and develop programs in Java.

3. Understand exception handling mechanism supported in Java to handle run time errors.

4. Understand the concept of packages and interfaces in Java.

5. To introduce the design of Graphical User Interface (GUI) programming through Java Swing.

Pre-requisites: Basics programming concepts.

Unit – I 08 Hours

OOP Paradigm: The key attributes of object-oriented programming.

Java basics: The Java language, JDK, arrays, multidimensional arrays, alternative array declaration, assigning array references, using the length member, the for-each loop, Strings, using the command line arguments.

Introducing classes and objects: Class fundamentals, how objects are created, reference variables and assignment.

Unit – II 08 Hours

Methods and classes: methods, returning from a method, returning a value, using parameters, constructors, parameterized constructors, the new operator revisited, garbage collection and

finalizers, this keyword. controlling access to class members, pass objects to methods, argument passing, returning objects, method overloading, recursion, static, nested and inner classes, varargs.

Unit – III **08 Hours**

Inheritance: Inheritance basics, member access and inheritance, constructors and inheritance, using super, multilevel hierarchy, when are constructors executed, superclass reference and subclass objects, method overriding, polymorphism, using abstract classes, using final, the Object class.

Interfaces: interface fundamentals, creating, implementing and using interfaces, implementing multiple interfaces, constants in interfaces, extending interfaces and nested interfaces.

Unit – IV **08 Hours**

Packages: Package fundamentals, packages and member access, importing packages, static import.

Exception handling: the exception hierarchy, exception handling fundamentals, uncaught exceptions, handle errors gracefully, multiple catch, catching subclass exceptions, nested try, throwing exception, throwable, using finally and throws, built-in exceptions, new exception features in JDK7, creating exception subclasses.

String Handling: String fundamentals, constructors, String related language features, length(), obtaining characters within a String, String comparison, indexOf() and lastIndexOf(), obtaining a modified String, Changing Case, StringBuffer and StringBuilder.

Unit – V **08 Hours**

Swing fundamentals: origins and design philosophy, components and containers, layout managers, event handling, push button, JTextField, anonymous inner classes.

Swing Controls: JLabel and ImageIcon, Swing Buttons, Trees.

Books

Text Books:

1. Herbert Schildt& Dale Skrien, “Java Fundamentals A Comprehensive Introduction”, TMH. Special Indian edition.

Reference Books:

1. 1. Kathy Sierra & Bert Bates, “Head First Java”, O’Reilly, 2nd Edition and onwards.

E-resourses (NPTEL/SWAYAM.. Any Other)- mention links

Course Outcome (Cos)

	At the end of the course, the student will be able to:	Bloom's Level
1	**Identify** classes, objects, members of a class and relationships among them needed for a specific problem	**L2**
2	**Write** Java application programs using OOP principles and proper program structuring	**L3**
3	**Demonstrate** the concepts of polymorphism and inheritance	**L3**
4	**Write** Java programs to implement error handling techniques using exception handling	**L3**
5	**Create** and design GUI using Java Swing.	**L4**

	Program Outcome of this course (POs)	**PO No.**
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2	**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.	**3**
3	**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.	**12**

Course delivery methods	**Assessment methods**
1. Lecture & Board	1. Assignments
2. Power-point Presentation	2. Quizzes
3. Online Videos / Learning	3. Internal Assessment
4. Class Room Exercises	

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Computer Organization

(Theory)

Course Code	18CS35/18IS35	**Credits**	03
Course type	PC	**CIE Marks**	50 marks
Hours/week: L-T-P	3 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	Lecture = 40 Hrs; Tutorial = 0 Hrs Total = 40 Hrs	**SEE Duration**	3 Hours for 100 marks

Course Learning Objectives

1. To understand the operation of CPUs including I/O, Processor, Memory systems, Busses and Computer Arithmetic
2. To understand the different ways of communicating with I/O devices and to introduce the hierarchical memory system including cache memories
3. To understand the implementation of different computer arithmetic algorithms for various arithmetic operations
4. To study the internal functional units of processor and understand the generation of internal functions to execute instructions, pipelining and embedded systems.

Pre-requisites : Digital Electronics

Unit – I **08 Hours**

Basic Structure of Computers:

Functional Units, Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement, Machine Instructions and Programs: Numbers, Arithmetic Operations and Characters, Memory Location and Addresses, Memory Operations, Instructions and Instruction Sequencing. Addressing Modes.

Self learning topics: Computer Types, Historical Perspective

Unit – II **08 Hours**

Input / Output Organization:

Accessing I/O Devices, Program controlled I/O, Memory mapped I/O, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Direct Memory Access, Bus Arbitration Techniques: Centralized & Distributed, Buses : Synchronous & Asynchronous

Unit – III **08 Hours**

Memory System

Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories–Mapping Functions: Direct Mapping, Associative Mapping, Set-Associative Mapping.

Unit – IV **08 Hours**

Arithmetic:

Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division.

Application of the algorithms for arithmetic operations.

Self learning topics: Floating-point Numbers and Operations

Unit – V **08 Hours**

Basic Processing Unit:

Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control.

Self learning topics: Embedded Systems

Books

Text Books:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002.Chapter 1, 2, 4, 5, 6, 7 & 9.

Reference Books:

1. Computer Architecture, A Quantitative Approach – John L. Hennessey and David A. Patterson: 5th Edition, Elsevier.
2. William Stallings: Computer Organization & Architecture, 8th Edition, PHI, 2006.

Course Outcome (COs)

	At the end of the course, the student will be able to	Bloom's Level
1.	**Identify** the functional units of the processor and the factors affecting the performance of a computer	L1
2.	**Explain** the addressing modes and instructions sets.	L2
3.	**Discuss** the algorithms for computer arithmetic operations and learn the working of those algorithms for arithmetic operations	L3
4.	**Infer** the internal functional units of processor and generate sequence of signals to execute different instructions	L4

	Program Outcome of this course (POs)	**PO No.**
1.	**Engineering Knowledge**: Apply the knowledge of mathematics , science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems	**1**
2.	**Conduct investigation 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 conclusion.	**4**

Course delivery methods	**Assessment methods**
1. Power Point Presentation	1. **Assignment**
2. Chalk & Talk	2. **Quiz**

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks

3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Web Programming (Integrated)

Course Code	18CSL36/18ISL36	**Credits**	03
Course type	PC	**CIE Marks**	25 marks
Hours/week: L-T-P	2 – 0 – 2	**SEE Marks**	50 marks
Total Hours:	Lecture =20 Hrs; Practical = 20 Hrs Total = 40 Hrs	**SEE Duration**	3 Hours for 50 marks

Course learning objectives

1. To introduce the fundamentals of world wide web.
2. To develop client based web pages using HTML5, CSS3, JavaScript, Jquery and AngularJS.
3. To develop responsive web pages using Bootstrap.

Pre-requisites : Computer Concepts and C Programming

Unit – I 08 Hours

Introduction: The Internet Versus the Web, Serving Up Your Information, Web Page Addresses (URLs), The Anatomy of a Web Page, A Dizzying Multitude of Devices, Sticking with the Standards, Progressive Enhancement, Responsive Web Design, Accessibility, Site Performance, Steps to becoming a web developer, skills and tools, Dos and Don'ts, career trends

Self learning topics: Web history, web standards

Unit – II 08 Hours

HTML5: Basic Elements, drag and drop, File upload, Dropdown menu, audio player, local storage, graphics and animation, Geolocation and form validation, CSS3: Basic properties, Inheritance, Multiple classes, Box model, Effects.

Self learning topics: HTML5 code validation

Unit – III 08 Hours

Basics of JavaScript: Dialog boxes, Conditional statements, loops, arrays, objects, events, Jquery: Add/Remove class, UI Datepicker, File upload, Autocomplete

Self learning topics: JavaScript Code Validation, JQuery basics

Unit – IV **08 Hours**

Basics of AngularJS: Form validation, Routing, Controller, Table, Data binding

Self learning topics: AgularJS API, W3.CSS, Includes

Unit – V **08 Hours**

Basics of Bootstrap: Grid, Navbar, Table, Dropdown, Form, Layout, Tooltip, Panel, Pop-over, Tabs, Modals

Self learning topics: Concepts of responsive design, BS4 basic template

PART A

List of experiments

1. Create multi column article using HTML tags. Integrate social sharing feature. Implement both web view and mobile view.
2. Implement HTML5 dropdown menu with CSS3 and bootstrap.
3. Implement HTML5 Local Storage.
4. Form Validation using HTML5, JavaScript, angularJS and Bootstrap.
5. Implement AngularJS Routing and AngularJS Controller.
6. Implement UI Datepicker using Jquery.
7. Implement Drag and drop using, HTML5 and Jquery.
8. Implement UI Autocomplete using Jquery

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Books

1. Jennifer Niederst Robbins, Learning Web Design: A Beginner's Guide to HTML, CSS, JavaScript, and Web Graphics, O'reilly, 4th Edition,2012
2. Cody Lindley, jQuery Cookbook, O'Reilly Media, 2009
3. Matt Frisbie, AngularJS Web Application Development Cookbook, Packt Publishing, 2014
4. Syed Fazle Rahman, Jump Start Bootstrap, SitePoint, 2014

E-Resourses

1. www.w3schools.com

2. www.tutorialspoint.com

Course Outcome (COs)

At the end of the course, the student will be able to		Bloom's Level
1.	**Explain** basic concepts and principles of world wide web.	L2
2.	**Apply** design principles for interactive client side web pages	L3
3.	**Design** and **develop** responsive website for a given application.	L5

	Program Outcome of this course (POs)	**PO No.**
1.	**Individual and team work:** An ability to visualize and work on multidisciplinary tasks.	**5**
2.	**Use of engineering tools:** An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.	**6**
3.	**Communication skills:** An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.	**8**
4.	**Life-long learning:** An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.	**12**

Assessment methods

1. **I A Test**
2. **Mini Project**
3. **Periodic Journal Evaluation**

Scheme of Continuous Internal Evaluation (CIE):

Components	IA test*	Journal and lab test **OR** Project report and intermediate evaluation	Total Marks
Maximum marks :50	30	20	50
*IA test could be two tests each of one hour duration or only one test of 2 hours duration. Submitting Journal/ Project report is compulsory.			

Minimum marks required to qualify for SEE : 20 out of 50 marks

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Initial write up stating the objectives, methodology and the outcome	10 marks	50 marks
	Presentation (PPT) of the project	15 marks	
	Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codesrelated to a section of the project.	25 marks	
3.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

DATA STRUCTURES With C Laboratory

Course Code	18CSL37/18ISL37	**Credits**	1.5
Course type	Lab	**CIE Marks**	25 marks
Hours/week: L-T-P	0 – 0 – 3	**SEE Marks**	25 marks
Total Hours:	30	**SEE Duration**	3 Hours for 50 marks

Course learning objectives

1. Demonstrate the abstract properties of various data structures such as stacks, queues, lists, and trees.
2. Compare different implementations of data structures and recognize the advantages and disadvantages of the different implementations
3. Able to demonstrate features of different data structures such as Linked List, Hash Table, Queues to solve real world problems.

Pre-requisites :C programming Skills

List of experiments

1. Write a C program to merge contents of two files containing USNs of students in a sorted order in to the third file such that the third file contains Unique USNs. Program should also display common USNs in both the files.
2. Consider a calculator that needs to perform checking the correctness of parenthesized arithmetic expression and convert the same to postfix expression for evaluation. Develop and execute a program in C using suitable data structures to perform the same and print both the expressions. The input expression consists of single character operands and the binary operators + (plus), - (minus), * (multiply) and / (divide).
3. A calculator needs to evaluate a postfix expression. Develop and execute a program in C using a suitable data structure to evaluate a valid postfix expression. Assume that the postfix expression is read as a single line consisting of non-negative single digit operands and binary arithmetic operators. The arithmetic operators are + (add), - (subtract), * (multiply) and / (divide).
4. Write a C program to simulate the working of Messaging System in which a message is placed in a Queue by a Message Sender, a message is removed from the queue by a Message Receiver, which can also display the contents of the Queue.
5. Consider a super market scenario where sales manager wants to search for the customer details using a customer-id. Customer information like (custid, custname, &custphno) are

stored as a structure, and custid will be used as hash key. Develop and execute a program in C using suitable data structures to implement the following operations:

a. Insertion of a new data entry.
b. Search for customer information using custid.
c. Display the records. (Demonstrate collision and its handling using linear probing method).

6. Consider a warehouse where the items have to be arranged in an ascending order. Develop and execute a program in C using suitable data structures to implement warehouse such that items can be traced easily.

7. Consider a polynomial addition for two polynomials. Develop and execute a program in C using suitable data structures to implement the same.

8. Develop and execute a program in C to perform following operations on binary search tree:

a. To count number of non terminal nodes.
b. To count number of terminal nodes.
c. To count nodes with degree 2.
d. To count total number of nodes.

9. Develop and execute a program in C using suitable data structures to create a binary tree for an expression. The tree traversals in some proper method should result in conversion of original expression into prefix, infix and postfix forms. Display the original expression along with the three different forms also.

10. Develop and execute a program in C using suitable data structures to perform Searching a data item in an ordered list of items in both directions and implement the following operations:

a. Create a doubly linked list by adding each node at the start.
b. Insert a new node at the end of the list.
c. Display the content of a list.

Consider an integer number as a data item.

Books

1. Richard.F.Gilberg, Behrouz.A. Forouzan, Data Structures: A Pseudo code Approach with C, Cengage Learning, 2nd edition 2007 and onwards.

2. Horowitz, Sahni, Anderson-Freed, Fundamentals of Data Structures in C, Universities Press, 2nd Edition, 2007 and onwards.

E-Recourses

1. https://www.geeksforgeeks.org/

2. https://www.sanfoundry.com/c-programming-examples-data-structures/

3. https://www.programmingsimplified.com/c/data-structures/c-program-implement-linked-list

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. **Demonstrate** the understanding of structured programming.	L3
2. **Analyze** the problem statement and able to choose right data structure for implementation.	L4
3. **Develop** an ability to construct robust, maintainable programs which satisfy the requirements of user.	L3

Program Outcome of this course (POs)	PO No.
1. **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.	**3**
2. **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.	**4**
3. **Modern tool usage:** Create, select, and apply appropriate techniques resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.	**5**
4. **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.	**12**

Assessment methods

1. Periodic journal evaluation
2. I.A Test
3. Viva Voce

Scheme of Continuous Internal Evaluation (CIE):

Components	Attendance/conduct of lab	Journal	Lab project	Total Marks
Maximum marks :25	10	10	5	25
Submission and certification of journal is compulsory to qualify for SEE Minimum marks required to qualify for SEE : 10 out of 25 marks				

Semester End Examination (SEE):

<table>
<tr><td>1.</td><td colspan="3">It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.</td></tr>
<tr><td>2.</td><td colspan="3">Only one experiment to be conducted. In case, there are two parts then one experiment from each part.</td></tr>
<tr><td rowspan="4">3.</td><td>Initial write up:Algorithm/Flowchart/Tracing</td><td>10 marks</td><td rowspan="4">50 marks</td></tr>
<tr><td>Conduct of experiment(s), result and conclusion</td><td>20 marks</td></tr>
<tr><td>One marks question</td><td>10 marks</td></tr>
<tr><td>Viva-voce</td><td>10 marks</td></tr>
<tr><td>4.</td><td colspan="3">Viva voce is conducted for individual student and not in group</td></tr>
<tr><td>5.</td><td colspan="3">Minimum passing marks to be scored in SEE: 20 out of 50 marks</td></tr>
</table>

Object Oriented Programming with Java Lab

Course Code	18CSL38/18ISL38	**Credits**	1.5
Course type	Lab	**CIE Marks**	25 marks
Hours/week: L-T-P	0 – 0 – 3	**SEE Marks**	25 marks
Total Hours:	40	**SEE Duration**	3 Hours

Course learning objectives (CLOs):

1. To introduce Java compiler and the NetBeans IDE.

2. To learn and apply the object-oriented approach to developing software programs.

3.Design,using good design principles simple software programs to solve problems.

4.Analyse and implement a given problem using Java with the specified concept.

Pre-requisites: Basics of C and Object-Oriented Programming.

List of Experiments:

The students are required to develop and execute the following programs in Java:

1. Write a program to demonstrate the implementation of 2-dimension array.
2. Write a program to demonstrate the implementation of class and its member metho
3. Write a program to demonstrate the implementation of parameterized:
    a. Methods.
    b. Constructor.
4. Write a program to demonstrate the implementation of inheritance.
5. Write a program to demonstrate the implementation of method:
    a. Overloading.
    b. Overriding.
6. Write a program to demonstrate the implementation of interface.
7. Write a program to demonstrate the implementation of packages.

8. Write a program to demonstrate the implementation of customized exception handling.
9. Write a program to demonstrate the implementation of string handling.
10. Write a program to demonstrate the implementation of JAVA swings.

Course Outcome (Cos)

At the end of the course, the student will be able to:		Bloom's Level
1.	Use the NetBeans IDE to write and execute Java programs.	**L3**
2.	Write Java application programs using OOP principles and proper program structuring.	**L3**
3.	Identify classes, members of a class and relationships among them needed for a specific problem	**L2**
4.	Write Java programs to demonstrate error handling techniques using exception handling.	**L3**
5.	Write Java programs to demonstrate packages and interfaces and String handling.	**L3**
6.	Use Swing concept to develop simple GUI applications.	**L3**

Program Outcome of this course (POs)		PO No.
1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**1**
2.	**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.	**3**
3.	**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.	**5**
4.	**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.	**12**

Books

Text Books:

1. Herbert Schildt& Dale Skrien, "Java Fundamentals A Comprehensive Introduction", TMH. Special Indian edition.

Reference Books:

1. 1. Kathy Sierra & Bert Bates, "Head First Java", O'Reilly, 2nd Edition and onwards.

Assessment methods	
1.	Regular Journal Evaluation and Attendance Monitoring.
2.	Lab Internal Assessment.

Scheme of Continuous Internal Evaluation (CIE):

Components	Attendance/conduct of lab	Journal	Lab project	Total Marks
Maximum marks :25	10	10	5	25
Submission and certification of journal is compulsory to qualify for SEE Minimum marks required to qualify for SEE : 10 out of 25 marks				

Semester End Examination (SEE):

1	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2	Only one experiment to be conducted. In case, there are two parts then one experiment from each part.		
3	Initial write up	10 marks	50 marks
	Conduct of experiment(s), result and conclusion	20 marks	
	One marks question	10 marks	
	Viva-voce	10 marks	
4	Viva voce is conducted for individual student and not in group		
5	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

Calculus, Fourier Analysis and Linear Algebra

(All Branches)

Course Code	18DMATCS31	**Credits**	04
Course type	BS	**CIE Marks**	50 marks
Hours/week: L-T-P	4–0– 0	**SEE Marks**	50 marks
Total Hours:	50	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

Students should

1. Learn the concept of series expansion using Taylor's and Maclaurin's series and get acquainted with the polar curves and partial differentiation.
2. Learn Differential Equations of first order and higher order and apply them.
3. Get acquainted with Fourier transforms and its properties.
4. Learn numerical methods to solve algebraic, transcendental and ordinary differential equations.
5. Understand and interpret the system of equations and various solutions.

Pre-requisites :

1. Basic differentiation and integration
2. Trigonometry
3. Matrix and determinant operations
4. Vector algebra

Unit – I 10 Hours

Differential Calculus: Taylor's and Maclaurin's theorems for function of one variable (statement only)-problems. Angle between polar curves. **Partial Differentiation:** Definition and problems. Total differentiation- problems. Partial differentiation of composite functions-problems.

Unit – II 10 Hours

Laplace Transforms: Definition, Laplace transforms of elementary functions. Laplace transforms of $e^{at} f(t)$, $t^n f(t)$, $\int_0^t f(t)\,dt$, $\frac{f(t)}{t}$ (without proof), Inverse Laplace transforms: Inverse Laplace transforms -problems, applications to solve linear differential equation.

Unit –III **10 Hours**

Fourier Analysis: Fourier Series: Fourier series, half range Fourier sine and cosine series. Practical examples. Harmonic analysis.

Fourier Transforms: Infinite Fourier transform and properties. Fourier sine and cosine transforms. Properties and problems.

Unit – IV **10 Hours**

Numerical Techniques: Numerical solution of algebraic and transcendental equations: Method of false position, Newton- Raphson method, fixed point iteration method (without derivation).

Numerical solution of ordinary differential equations: Taylor's series method, Euler and modified Euler method, fourth order Runge-Kutta method (without derivation).

Unit – V **10 Hours**

Linear Algebra: Rank of a matrix by elementary transformation, solution of system of linear equations-Gauss elimination method and Gauss-Seidal method. Eigen value and eigen vectors – Rayleigh's Power method.

Books

Text Books:

1. B.S. Grewal – Higher Engineering Mathematics, Khanna Publishers, 42nd Edition, 2012 and onwards.
2. Erwin Kreyszig –Advanced Engineering Mathematics, John Wiley & Sons Inc., 9th Edition, 2006 and onwards.
3. B. V. Ramana - Higher Engineering Mathematics, Tata McGraw-Hill Education Private Limited, Tenth reprint 2010 and onwards.

Reference Books:

1. P. N. Wartikar & J. N. Wartikar – Applied Mathematics (Volume I and II) Pune Vidyarthi Griha Prakashan, 7th Edition 1994 and onwards.
2. Peter V. O' Neil –Advanced Engineering Mathematics, Thomson Brooks/Cole, 7th Edition, 2011 and onwards.
3. Glyn James –Advanced Modern Engineering Mathematics, Pearson Education, 4th Edition, 2010 and onwards.

Course Outcome (COs)

At the end of the course, the student will be able to		**Bloom's Level**
1.	**Develop** the Taylors and Maclaurins series using derivative concept.	L1, L2
2.	**Demonstrate** the concept and use of Partial Differentiation in various problems.	L1, L2
3.	**Classify** Laplace transforms of various categories and **apply** them to solve relevant problems**.**	L1, L3

4.	**Develop** frequency bond series from time bond functions using Fourier series.	L3
5.	**Use** numerical methods and **Solve** algebraic, transcendental and ordinary differential equations	L1, L2
6.	**Interpret** the various solutions of system of equations and **Solve them.**	L2

	Program Outcome of this course (POs)	**PO No.**
Students will acquire		
1.	An ability to apply knowledge of mathematics, science and engineering.	**PO1**
2.	An ability to identify, formulate and solve engineering problems.	**PO5**
3.	An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.	**PO11**

Course delivery methods	**Assessment methods**
1. Black board teaching	1. Internal Assessment Tests
2. Power point presentation	2. Assignments
3. Scilab/ Matlab/ R-Software	3. Quizes

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments /matlab/Scilab activity	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

3rd sem B.E.

Communicative Kannada/ Kannada for Communication

(for **Non – Kannadigas,** Common to all branches**)**

Course Code	**18CS39**	**Credits**	MNC
Course type	HS	**CIE Marks**	25 marks
Hours/week: L-T-P	2 – 0 – 0	**SEE Marks**	---
Total Hours:	Lecture = 2 Hrs; Tutorial = 0 Hrs Total = 28 Hrs	**SEE Duration**	---

Course learning objectives

1. Learners are Non – Kannadigas, so that course will make them to understand the kannada words and to communicate in kannada language.

Unit - I **1 Hours**

About Kannada Language and Karnataka State

Vyavaharika Kannada – Parichaya (Introduction to Vyavaharika Kannada)

Unit - II **8 Hours**

Kannada Aksharamale haagu Uchcharane (Kannada Alphabets and Pronunciation):
Kannada Aksharamale

Kannada stress letters - vattakshara (Ottakashara)

Kannada letters Pronunciation – Uchcharane

Unit - III **8 Hours**

Sambhashanegaagi Kannada Padagalu (**Kannada Vocabulary for Communication**):
Kannada Vocabulary for Communication

Unit - IV **8 Hours**

Kannada Grammar in Conversations (Sambhashaneyalli Kannada Vyakarana)

Unit - V 3 Hours

Activities in Kannada: General Conversations in Kannada with Activities

Books

Text Books:

1. Vyavaharika Kannada Text Book, Published by Prasaranga,Visvesvaraya Technological University, Belagavi.

E-resourses :

1. https://play.google.com/store/apps/details?id=com.englearner.kannadatohindispeaking&hl=en_US
2. http://www.kannada-praadhikaara.gov.in/docs/KANNADA_ABHIVRUDDHI_PRADHIKARA.pdf

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. Spell and Translate in Kannada language	L1,L2

Program Outcome of this course (POs)	PO No.
1. Communicate effectively with society at large	**10**

Course delivery methods	Assessment methods
1. Lectures	1. IA tests
2. Presentation	2. Presentation
3. Videos	

Scheme of Continuous Internal Evaluation (CIE):

Components	Two IA Tests	Assignment/Quiz/Presentation/activity	Total marks
Maximum Marks: 25	10 + 10	5	25
•Writing two IA tests is compulsory. •Minimum marks required: 10 out of 25 marks			

3rd sem B.E.

ಆಡಳಿತ ಕನ್ನಡ ಪಠ್ಯಕ್ರಮ

Kannada for Administration (for **Kannadigas,** Common to all branches**)**

Course Code	**18CS39**	**Credits**	MNC
Course type	HS	**CIE Marks**	25 marks
Hours/week: L-T-P	2 – 0 – 0	**SEE Marks**	---
Total Hours:	Lecture = 2 Hrs; Tutorial = 0 Hrs Total = 28 Hrs	**SEE Duration**	---

Course learning objectives
ಆಡಳಿತ ಕನ್ನಡ ಭಾಷಾ ಕಲಿಕೆಯ ಉದ್ದೇಶಗಳು: • ಪದವಿ ವಿದ್ಯಾರ್ಥಿಗಾಗಿರುವುದರಿಂದ ಆಡಳಿತ ಕನ್ನಡದ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು. • ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ ಕನ್ನಡ ಭಾಷೆಯ ವ್ಯಾಕರಣದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು. • ಕನ್ನಡ ಭಾಷಾ ರಚನೆಯಲ್ಲಿನ ನಿಯಮಗಳು ಮತ್ತು ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡುಬರುವ ದೋಷಗಳು ಹಾಗೂ ಲೇಖನ ಚಿಹ್ನೆಗಳನ್ನು ಪರಿಚಯಿಸುವುದು. • ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು, ಸರ್ಕಾರಿ ಮತ್ತು ಅರೆ ಸರ್ಕಾರಿ ಪತ್ರವ್ಯವಹಾರದ ಬಗ್ಗೆ ಅರಿವು ಮೂಡಿಸುವುದು. • ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧ ರಚನೆ ಬಗ್ಗೆ ಅಸಕ್ತಿ ಮೂಡಿಸುವುದು. • ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ ಮತ್ತು ಸಾಮಾನ್ಯ ಕನ್ನಡ ಹಾಗೂ ಆಡಳಿತ ಕನ್ನಡದ ಪದಗಳ ಪರಿಚಯ ಮಾಡಿಕೊಡುವುದು.

Unit - I	**1 Hours**
ಅಧ್ಯಾಯ – 1, ಆಡಳಿತ ಕನ್ನಡ – ಒಂದು ಪಕ್ಷಿನೋಟ	

Unit – II	**6 Hours**
ಅಧ್ಯಾಯ – 2, ಕನ್ನಡ ಭಾಷಾ ಬರಹದಲ್ಲಿ ಕಂಡುಬರುವ ದೋಷಗಳು ಹಾಗೂ ನಿವಾರಣೆಗಳು ಅಧ್ಯಾಯ – 3, ಲೇಖನ ಚಿಹ್ನೆಗಳು ಮತ್ತು ಅವುಗಳ ಉಪಯೋಗ ಹಾಗೂ ಬಳಕೆಯ ರೀತಿ	

Unit – III	8 Hours
ಅಧ್ಯಾಯ – 4, ಸಾಮಾನ್ಯ ಅರ್ಜಿಗಳು ಮತ್ತು ವಿವಿಧ ರೀತಿಯ ಅರ್ಜಿಗಳ ನಮೂನೆಗಳು ಅಧ್ಯಾಯ – 5, ಆಡಳಿತ ಪತ್ರವ್ಯವಹಾರ – ವಿವಿಧ ರೀತಿಯ ಅರ್ಜಿಗಳ ನಮೂನೆಗಳು, ಸರ್ಕಾರಿ ಪತ್ರಗಳು ಮತ್ತು ಅರೆಸರ್ಕಾರಿ ಪತ್ರಗಳು, ವೈಯಕ್ತಿಕ ಪತ್ರಗಳು ಮತ್ತು ಮನವಿ ಪತ್ರಗಳು ಅಧ್ಯಾಯ – 6, ಸರ್ಕಾರದ ಆದೇಶ. ನಡೆವಳಿ. ಅದಿಸೂಚನೆ. ಸುತ್ತೋಲೆಗಳು ಮತ್ತು ಜಾಹೀರಾತು, ಪತ್ರಿಕಾ ಪ್ರಕಟಣೆ ಹಾಗೂ ಟೆಂಡರ್ ಪತ್ರಗಳು	

Unit – IV	8 Hours
ಅಧ್ಯಾಯ – 7, ಭಾಷಾಂತರ ಮಾಡುವುದು, ಸಂಕ್ಷೀಪ್ತ ಪ್ರಬಂಧ ಹಾಗೂ ಪ್ರಬಂಧ ರಚನೆ. ಭಾಷಾಂತರ ಮತ್ತು ಪ್ರಬಂಧದ ಮಾದರಿಗಳು. ಅಧ್ಯಾಯ – 8, ಕನ್ನಡ ಭಾಷಾಭ್ಯಾಸ, ಕನ್ನಡದ ದೇಶ್ಯ ಪದಗಳು ಮತ್ತು ಕನ್ನಡೀಕರಣಗೊಂಡಿರುವ ಅನ್ಯದೇಶ್ಯ ಪದಗಳು.	

Unit – V	5 Hours
ಅಧ್ಯಾಯ – 9, ಕನ್ನಡ ಮತ್ತು ಕಂಪ್ಯೂಟರ್/ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ ಅಧ್ಯಾಯ – 10, ಪಾರಿಭಾಷಿಕ ಕನ್ನಡ ಪದಗಳು ಮತ್ತು ತಾಂತ್ರಿಕ / ಕಂಪ್ಯೂಟರ್ ಕನ್ನಡ ಪಾರಿಭಾಷಿಕ ಪದಗಳು	

Books	
	Text Books:
1.	ಆಡಳಿತ ಕನ್ನಡ ಪಠ್ಯ ಪುಸ್ತಕ **ಪ್ರಕಾಶಕರು : ಪ್ರಸಾರಾಂಗ, ವಿಶ್ವೇಶ್ವರಯ್ಯ ತಾಂತ್ರಿಕ ವಿಶ್ವವಿದ್ಯಾಲಯ, ಬೆಳಗಾವಿ.**

Course Outcome (COs)		
At the end of the course, the student will be able to		Bloom's Level
1.	Explain, interpret, summarize and Translate in Kannada language for administrative purposes	L1,L2

Program Outcome of this course (POs)		PO No.
1.	Communicate effectively with society at large	10

Course delivery methods	Assessment methods
1. Lectures	1. IA tests
2. Presentation	2. Presentation
3. Videos	

Scheme of Continuous Internal Evaluation (CIE):

Components	Two IA Tests	Assignment/Quiz/Presentation/activity	Total marks
Maximum Marks: 25	10 + 10	5	25
•Writing two IA tests is compulsory. •Minimum marks required: 10 out of 25 marks			

IV SEM

(2018-19)

Discrete Mathematical Structures and Graph Theory

(Computer Science / Information Science)

Subject Code:	18MATCS41	**Credits:**	04
Course Type:	BS	**CIE Marks:**	50
Hours/week: L – T – P	4 –0– 0	**SEE Marks:**	50
Total Hours:	40	**SEE Duration:**	3 Hours

Course Learning Objectives (CLOs):

Students should

1. Understand and apply Logic in the field of Computer science.
2. Understand the various Relations and Functions.
3. Understand advanced counting techniques.
4. Get acquainted with basic concepts of Graph Theory and their applications.
5. Get acquainted with elementary Number theory, and their properties for applications in Cryptography.

Prerequisites:

1. Set Theory
2. Power series
3. Binomial Series
4. Basics of Counting

Detailed Syllabus

Unit-I **08 hrs**

Fundamentals of Logic: Laws of Logic, Logical Implication-Rules of Inference. Quantifiers- Universal and Existential Quantifiers, Proofs Techniques: direct, indirect and Contradiction.

Unit–II **08 hrs**

Relations and Functions: Zero-One Matrices and Directed Graphs, Closure and Equivalence Relations and Partitions, Partial Orders, Hasse Diagrams, Lattice, Properties of functions, Composition and Invertible functions.

Unit-III **08 hrs**

Advanced Counting Techniques: Sterling Number of second kind, Inclusion and Exclusion, Pigeonhole Principle, Generating Function, Recurrence relations, Solution of Linear homogeneous and non-homogeneous recurrence relations with constant coefficients, Divide and Conquer Algorithms, Merge sort algorithm.

Unit-IV **08 hrs**

Basic Graph Theory: Definitions and Examples, Subgraphs, Complements and Graph Isomorphism, Connectivity, Euler Trails and Circuits, Planar Graphs, Hamiltonian Paths and Cycles, Coloring, Matching.

Unit-V **08 hrs**

Elementary Number Theory and Cryptography: Fields, Modular Arithmetic, Prime Numbers, Fermat's and Euler's theorem. Testing of Primality, Chinese Remainder Theorem. Caesar Encryption/Decryption, RSA Cryptosystem.

Text Books:

1. Kolman, Busby, Ross "Discrete Mathematical Structures", 6th Edition Prentice Hall of India, 2010 onwards.
2. William Stallings "Cryptography and Network Security", Pearson Prentice Hall 6th Edition, 2013 onwards.
3. Kenneth H. Rosen "Discrete Mathematics and its applications", Mc Graw Hill 7th Edition.

Reference Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2004 onwards.
2. K. D. Joshi, "Foundations of Discrete Mathematics", 2nd Edition, New Age International Publishers, 2014 onwards.

Course Outcomes (COs): At the end of the course students will be able to:

1. **Understand** and **Apply** the Logic of Mathematics in the field of Computer science. **[L2, L3]**
2. **Explain and Analyze** Different Relations and Functions**. [L2, L3]**
3. **Discuss** basic concepts of Graph Theory and its **Use** in Computer Science. **[L2, L3]**
4. **Explain** the concept of Finite Fields. **[L2]**
5. **Apply** Finite Fields to Cryptography. **[L3]**

Program Outcomes (POs) of the course: Students will acquire

1. An ability to apply knowledge of Mathematics, science and Engineering. **[PO1]**
2. An ability to identify, formulate and solve engineering problems. **[PO5]**
3. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice. **[PO11]**

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments /matlab/Scilab activity	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Operating System (Theory)

Course Code	18CS42/18IS42	**Credits**	04
Course type	PC	**CIE Marks**	50 marks
Hours/week: L-T-P	4 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	Lecture = 47 Hrs; Tutorial = 00 Hrs Total = 47 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To introduce the functions of operating system, design, structure and associated system calls.
2. To study and analyze various scheduling algorithms and process synchronization techniques.
3. To develop an understanding about deadlocks and deadlock recovery techniques.
4. To discuss and realize the importance of memory management techniques.
5. To gain the knowledge of file systems and secondary storage structures.

Pre-requisites: Basic knowledge of computer concepts & programming, Computer Organization.

Unit – I 10 Hours

Introduction to Operating System: System structures: What operating systems do; Operating System operations; Process management; Memory management; Storage management; Protection and security; Distributed system; Operating System Services; System calls; Types of system calls; Operating System structure; System boot.

Introduction to UNIX File System: Inside UNIX, Internal and External Commands, Command structure.

Case Study: Android Operating System / iOS

Unit – II 09 Hours

Process Management: Process concept; Process scheduling; Process Scheduling: Basic concepts; Scheduling criteria; Scheduling algorithms.

The Process: Understanding the process, How a process is created, the login shell, init, internal and external commands, ps.

Unit – III **09 Hours**

Process Synchronization: Synchronization: The Critical section problem; Peterson's solution; Semaphores; Classical problems of synchronization.

Deadlocks: Deadlocks: System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock.

Unit – IV **09 Hours**

Memory Management: Memory Management Strategies: Background; Swapping; Contiguous memory allocation; Paging; Virtual Memory Management: Background; Demand paging; Copy-on-write; Page replacement;

Unit – V **10 Hours**

File System: Implementation of File System: File System: File concept; Access methods; Directory structure; File system mounting; File sharing; Protection. Implementing File System: File system structure.

The File System: The parent child relationship, The UNIX file system, Absolute Pathnames, Relative Pathnames, pwd, cd, mkdir, rmdir, cp, rm, mv, cat. **File Attributes:** ls, ls-l, ls-d, file permissions, chmod.

Books

Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Principles", Wiley India, 6th edition and onwards.
2. Sumitabha Das: "YOUR UNIX – The Ultimate Guide" , Tata McGraw Hill, 23rd reprint , 2012 and onwards.

Reference Books:

1. Gary Nutt, "Operating System", Pearson Education, 2nd edition and above.
2. Harvey M Deital, "Operating system", Addison Wesley, 2nd edition and above.
3. D.M Dhamdhere, "Operating System", "A concept based Approach", Tata McGraw- Hill, 2nd edition and onwards.
4. Behrouz A. Forouzan and Richard F. Gilberg: "UNIX and Shell Programming ", Cengage Learning, 2005 and onwards.

E-resourses (NPTEL/SWAYAM)

1. **https://onlinecourses.nptel.ac.in/**

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. **Explain** the computer system resources and the role of an operating system in managing those resources.	**L2**
2. **Develop** applications keeping concurrency and synchronization, semaphores, Monitors, sharedmemory, **mutual** exclusion, process scheduling services of general operating system in the mind.	**L3**
3. **Describe and analyze memory** management, file management and secondary Memory Management techniques**.**	**L3**
4. **Discuss** UNIX shell commands for file handling , process control and do the ca study on on Android Operating System / iOS.	**L2**

Program Outcome of this course (POs)	PO No.
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**PO1**
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.	**PO2**

Course delivery methods	Assessment methods
1. Lecture & Board	1. Assignments
2. Power-point Presentation	2. Quizzes
3. Online Videos / Learning	3. Internal Assessment Tests
4. NPTEL / Edusat	4. Course Seminar
5. Class Room Exercises	5. Course Project (Mini project)
	6. Case Studies

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Database Management System (Theory)

Course Code	18CS43/18IS43	**Credits**	04
Course type	PC	**CIE Marks**	50 marks
Hours/week: L-T-P	4 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	Lecture = 48 Hrs; Tutorial = 00 Hrs Total = 50 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To discuss and realize the importance of Database Architecture Design notations, ER Modeling, Mapping and Schema design.
2. To gain the knowledge Relational algebra and learn the use of SQL and PL/SQL.
3. To introduce formal database design approach through normalization and discuss various normal forms.
4. To understand the importance of Concurrent Transactions and discuss issues and transaction control algorithms.

Pre-requisites :

- Basic programming concepts.

Unit – I 9 Hours

Introduction: Introduction to database, Characteristics of Database approach, Advantages of using DBMS approach, Three-schema architecture and data independence.

Entity-Relationship Model: Using High-Level Conceptual Data Models for Database Design; An Example Database Application; Entity Types, Entity Sets, Attributes and Keys; Relationships, Relationship types, Roles and Structural Constraints; Weak Entity Types.

CASE STUDY: ER-Modeling of Airline Reservation System, Hospital Management and Educational Institute.

Unit – II 9 Hours

Relational Model and Relational Algebra: Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update Operations, Dealing with constraint

violations; Unary Relational Operations: SELECT and PROJECT; Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN and DIVISION; Additional Relational Operations.

Unit – III **9 Hours**

Database Design: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys; General Definitions of Second and Third Normal Forms; Boyce-Codd Normal Form.

Transaction Processing Concepts: Introduction to Transaction processing, Transaction and System concepts, Desirable properties of Transactions and issues with concurrent transactions.

SELF STUDY: Triggers **1 Hour**

Unit – IV **9 Hours**

SQL :SQL Data Definition and Data Types; Specifying basic constraints in SQL; Schema change statements in SQL; Basic queries in SQL; More complex SQL Queries. Insert, Delete and Update statements in SQL.

Unit – V **9 Hours**

PL/SQL :PL/SQL Block Structure, PL/SQL Variables, PL/SQL Function , PL/SQL Procedure, PL/SQL IF Statement , PL/SQL Loop Statement: PL/SQL WHILE Loop Statement, PL/SQL FOR Loop Statement.

SELF STUDY: PLSQL installation and Programming. **2 Hours**

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, Addison-Wesley, 3rd edition and onwards.
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, McGraw-Hill, 2nd edition and onwards.

Reference Books::

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, Mc-GrawHill, 3rd edition and onwards.
2. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, Pearson education, 5th edition and onwards.

E Resources:

3. PL/SQL study material.

Course Outcome (Cos)

At the end of the course, the student will be able to	Bloom's Level
1. **Apply** the database concepts and design database for given application scenerio.	**L3**
2. **Apply** the concepts of Normalization and design database which eliminates all anomalies.	**L3**
3. **Create** database and develop database programming skills in SQL and PL/SQL.	**L4**
4. **Explain** the issue of concurrency control in transaction processing.	**L2**

Program Outcome of this course (POs)	PO No.
1. **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.	**PO2**
2. **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.	**PO3**
3. **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.	**PO4**
4. **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.	**PO10**
5. **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.	**PO12**

Course delivery methods **Assessment methods**

1. Lecture & Board	1. Assignments
2. Power-point Presentation	2. Quizzes
3. Online Videos / Learning	3. Internal Assessment Tests
4. NPTEL / Edusat	4. Course Project (Mini project)
5. Class Room Exercises	5. Case Studies

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Design and Analysis of Algorithm(Theory)

Course Code	18CS44/18IS44	**Credits**	03
Course type	PC	**CIE Marks**	50 marks
Hours/week: L-T-P	3 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	Lecture = 40 Hrs; Tutorial = 00 Hrs Total = 40 Hrs	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. To bring out the importance of the study of algorithms.
2. To study and analyze time complexity of various algorithms.
3. To discuss various algorithm design techniques.
4. To develop a technique of analyzing and computing the performance of algorithms.
5. To discuss various string matching algorithms.

Pre-requisites: Basic Computer Programming

Unit – I 8 Hours

Introduction: Fundamentals of Algorithmic Problem Solving, Analysis Framework, Asymptotic Notations and basic efficiency classes, Mathematical Analysis of Non-Recursive and Recursive Algorithms, Brute Force Approaches: Introduction, Selection Sort, linear search.

Self learning topics: Short Tutorial on Recurrence Relations, Bubble Sort(1Hr)

Unit – II 8 Hours

Algorithm Design Technique-I: Divide and Conquer, Decrease-and-Conquer Transform and Conquer, the General approach and illustration.

Applications of Divide and Conquer technique: Binary Search, Merge Sort, Quick Sort and their performance comparison. Counting Leaf-nodes, Tiling-Game Implementation.

Applications of Decrease and Conquer technique: Insertion Sort, Depth First Search and Breadth First Search. Maze-Game implementation.

Applications of Transform and Conquer: Heaps and Heap Sort, Horner's Rule. Clustering.

Self learning topics: Multiplication of Large Integers and Binary Exponentiation. (2 Hrs)

Unit – III **8 Hours**

Algorithm Design Technique-II: The General Greedy Technique, Illustration with examples**.**

Applications of Greedy method: Kruskal's Algorithm – Minimum-Cost Spanning Trees: Prim's Algorithm, Single Source Shortest Path - Dijkstra's Algorithm, Huffman Trees – Encoding of Data.

Unit – IV **8 Hours**

Algorithm Design Technique-III: Dynamic Programming Definition and Concept Illustration. The General Method,

Applications of Dynamic programming: Warshall's Algorithm – Transitive Closure, Floyd's Algorithm for the All-Pairs Shortest Paths, Knapsack using General Weights and 0/1 Knapsack. Longest Common Difference – Used in implementation of Diff command and polynomial interpolation.

Self learning topics: Computing nCr, the dynamic approach (1 Hr)

Unit – V **8Hours**

Algorithm Design Technique-IV: Backtracking, Branch-and-Bound, String Matching, basics and illustrations.

Applications of backtracking: N - Queens's problem, Hamiltonian Circuit Problem, Sum of Subset – Problem and its use in public key cryptosystem. Graph coloring problem.

Applications of branch and bound: JobAssignment Problem, Knapsack Problem, Traveling Salesperson Problem. Best First Search used in AI.

Applications string matching: Input Enhancement in String Matching, Horsepool's method, Rabin-Karp Algorithm. Used in Text processing toolkits like nltk.

Self learning topics: Naïve String Matching Algorithm. (1Hr)

Text Books:

1. Anany Levitin, Introduction to The Design & Analysis of Algorithms, Pearson Education 1st edition and onwards.
2. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, Fundamentals of Computer Algorithms Universities Press, 1st edition and onwards.

Reference Books:

1. Kenneth Berman, Jerome Paul, Algorithms, Cengage Learning.
2. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, introduction to Algorithms PHI, 2nd edition and above.
3. R.C.T. Lee, S.S. Tseng, R.C. Chang &Y.T.Tsai: Introduction to the Design and analysis of Algorithms A Strategic Approach, TataMcGraw Hill.
4. NarasimhaKarumanchi, Data structures and Algorithms Made Easy, Career Monk Publications, 1st edition and above.

E Resources:

https://onlinecourses.nptel.ac.in/

Course Outcome (COs)

At the end of the course, the student will be able to	**Bloom's Level**
1. **Formulate and Solve** recurrence equation and compute time complexity of recursive and iterative algorithms	L3
2. **Explain** divide ,decrease ,transform and conquer strategy as applied to sorting and analyze the algorithm complexity	L2
3. Apply Dynamic Programming, Greedy approach, to solve a variety of problems.	L3
4. Design and analyze String search algorithms and Compare their time complexities.	L4
5. Apply branch and bound and backtracking approaches to solve a variety of practical problems	L3

Program Outcome of this course (POs)	**PO No.**
1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**PO1**
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.	**PO2**
3. **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.	**PO4**

Course delivery methods	Assessment methods
1. Lecture & Board	1. Assignments
2. Power-point Presentation	2. Quizzes
3. Online Videos / Learning	3. Internal Assessment Tests
4. NPTEL / Edusat	4. Course Seminar
5. Class Room Exercises	5. Course Project (Mini project)
	6. Case Studies

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Software Engineering (Theory)

Course Code	18CS45/18IS45	**Credits**	03
Course type	PC	**CIE Marks**	50 marks
Hours/week: L-T-P	3 – 0 – 0	**SEE Marks**	50 marks
Total Hours:	40	**SEE Duration**	3 Hours for 100 marks

Course learning objectives

1. **Recall** the professional & ethical responsibilities and process models of Software Engineering.
2. **Prepare** Test cards and Project schedule models for the given scenarios.
3. **Identify** the requirements and the cost for the development of Software.
4. **Compare** the various software testing processes

Pre-requisites : Knowledge of Basic Programming Language.

Unit – I **8 Hours**

Introduction: Professional Software Development: Software Engineering, Software Engineering Ethics. A Case Study.

Software Process: Software Process models: The Waterfall model – A Case study**,** Incremental development, Reuse- oriented software engineering, Process activities: Software specification, Software design and implementation, Software validation, Coping with Change: Prototyping, Incremental Delivery, Boehm's Spiral Model.

Unit – II **8 Hours**

Requirements Engineering: Functional and non-functional requirements: Functional requirements, non-functional requirements, Case studies, The Software requirements document, Introduction to Requirements specification, Requirements Engineering processes: Requirement Elicitation and Analysis.

Unit – III **8 Hours**

Design Engineering: Context Models, Interaction Models, Design within the Context of Software Engineering ,Design Process and Design Quality, Design Concepts: Abstraction , Architecture, Patterns, Modularity , Information Hiding, Functional Independence, Refinement, Refactoring

Agile Software Development: Agile methods, Plan driven and Agile Development, Introduction to Extreme Programming. Self Study: SCRUM

Unit – IV **8 Hours**

Project Planning: Software pricing, Plan-driven Development: Project Plans, Planning process, Project scheduling: Schedule Representation, Agile Planning, Estimation techniques: Algorithmic Cost Modeling. The COCOMO II Model. Project Duration and Staffing.

Unit – V **8 Hours**

Software Testing: Development Testing: Unit Testing, Choosing Unit Test Cases, Component Testing, System Testing, Test Driven Development, Release Testing, Requirements Based Testing, Scenario Testing, Performance Testing, User Testing. A Demo of Selenium.

Books

Text Books:

1. Ian Sommerville: Software Engineering, Pearson Education, 9th Edition onwards. **Chapter 1: 1.1, 1.2, 1.3 , Chapter 2: 2.1, 2.2, 2.3, Chapter 3: 3.1, 3.2, 3.3 Chapter 4: 4.1, 4.2, 4.3, 4.4, 4.5, Chapter 5: 5.1, 5.2 , Chapter 8: 8.1, 8,2, 8.3, 8.4 Chapter 23: 23.1, 23.2, 23.3, 23.4, 23.5**
2. Rajib Mall, Fundamentals of Software Engineering , 4th Edition onwards PHI Learning Private Ltd.

Reference Books:

1. Roger .S. Pressman: Software Engineering-A Practitioners approach, 6th Edition and above, Tata McGraw Hill, 2007 onwards. **(Chapter 9th : 9.1 to 9.3)**
2. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India, 2009 onwards.

E Resources:
https://onlinecourses.nptel.ac.in/

Course Outcome (COs)

At the end of the course, the student will be able to

		Bloom's Level
1.	**Recall** the professional & ethical responsibilities and process models of Software Engineering.	**L1,L2**
2.	**Prepare** Test cards and Project schedule models for the given scenarios.	**L3**
3.	**Identify** the requirements and the cost for the development of Software.	**L2**
4	**Compare** the various software testing processes	**L4**

	Program Outcome of this course (POs)	**PO No.**
1.	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	1
2.	**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.	**3**

3.	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	**8**
4.	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	**9**
5.	**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.	**11**
6.	**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.	**12**

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks				

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

Python Programming (Integrated Lab)

Course Code	**18CSL46/18ISL46**	**Credits**	03
Course type	PC	**CIE Marks**	25 marks
Hours/week: L-T-P	2 – 0 – 2	**SEE Marks**	25 marks
Total Hours:	Lecture = 20 Hrs; Lab= 30 Hrs Total = 50 Hrs	**SEE Duration**	3 Hours for 50 marks

Course learning objectives

1. Gain knowledge about basic Python language syntax and semantics to write Python programs and use concepts such as variables, conditional and iterative execution methods etc.
2. Understand the fundamentals of object-oriented programming in Python, including defining classes, objects, invoking methods,exception handling mechanisms.
3. Understand the principles of inheritance, packages and interfaces.
4. Demonstrate the NumPy and SciPy package for scientific computing and data manipulation.

Pre-requisites : Basics of Object Oriented Programming using C++/Java

Unit - I **8 Hours**

Introduction to Python, use IDLE to develop programs, Basic coding skills, working with data types and variables, working with numeric data, working with string data, Python functions, Boolean expressions, selection structure, iteration structure, Illustrative Programs

Unit - II **8 Hours**

Define and use functions and modules, Basic skills for working with lists, work with a list of lists, work with tuples, get started with dictionaries, An introduction to file I/O, use text files, use CSV files, Handle a single exception, handle multiple exceptions Illustrative programs

Unit - III **8 Hours**

Object Oriented Programming, An introduction to classes and objects, define a class, work with object composition, work with encapsulation, work with inheritance, override object methods, Using SQLite Manager to work with a database, Using Python to work with a database, Creating a GUI that handles an event Illustrative programs

Unit - IV **8 Hours**

NumPy Basics: Arrays and Vectorized Computation: Creating ndarrays, Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Indexing with slices, Boolean Indexing, Transposing Arrays and Swapping Axes.

Unit - V **8 Hours**

SciPy:Optimization and Minimization, Interpolation, Integration, Statistics

Books

Text Books:

1. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016
2. Wes McKinney, Python for Data Analysis, OReilly, 1st Edition, 2012
3. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010

Reference Books:

1. SciPy and NumPy, O`Reilly, 1st Edition, 2012

E-resourses

1. NumPy Reference Manual

Course Outcome (COs)

At the end of the course, the student will be able to	Bloom's Level
1. **Explain** basic principles of Python programming language	L2
2. **Implement** object oriented concepts, database and GUI applications.	L3
3. **Implement** basic programs using Numpy and Panda packages	L3

Program Outcome of this course (POs)	PO No.
1. **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.	PO3
2. **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.	PO5
3. **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.	PO12

Course delivery methods	Assessment methods
1. Chalk and board	1. Project
2. PPT	2. Experiments
3. Video lectures	

List of Experiments (Part A)

1. Develop and execute an Object Oriented program in Python using basic data structures like arrays and dictionaries.
2. Develop and execute an Object Oriented program in Python to demonstrate inheritance and polymorphism.
3. Develop and execute an Object Oriented program in Python to demonstrate database connectivity.
4. Develop and execute an Object Oriented program in Python using file I/O and exception handling.
5. Develop a program in Python to demonstrate the use of NumPy package.
6. Develop a program in Python to demonstrate the use of SciPy package.

PART B

Each student needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval. Project report has to be submitted by each student individually.

Scheme of Continuous Internal Evaluation (CIE):

Components	IA test*	Journal and lab test **OR** Project report and intermediate evaluation	Total Marks
Maximum marks :50	30	20	50
*IA test could be two tests each of one hour duration or only one test of 2 hours duration. Submitting Journal/ Project report is compulsory. Minimum marks required to qualify for SEE : 20 out of 50 marks			

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Initial write up stating the objectives, methodology and the outcome	10 marks	50 marks
	Presentation (PPT) of the project	15 marks	
	Hardware project: Exhibiting and demonstration of working of project. Software project: Demonstration of the programming capabilities by writing flowchart, algorithm and codesrelated to a section of the project.	25 marks	
3.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

Algorithms Laboratory

Course Code	18CSL47/18ISL47	**Credits**	1.5
Course type	LAB	**CIE Marks**	25 marks
Hours/week: L-T-P	0 – 0 – 3	**SEE Marks**	25 marks
Total Hours:	36	**SEE Duration**	3 Hours for 50 marks

Course learning objectives

1. Illustrate the importance of algorithms in a variety of applications.
2. Illustrate the use of recursive/iterative sorting algorithms in different scenarios.
3. Demonstrate time complexity of various algorithms using various design techniques.
4. Demonstrate efficient algorithms by drawing comparisons.
5. Illustrate the use of algorithms for graph search problems.

Pre-requisites :

- Basic computer science concepts such as procedures, decision statements, and loops.
- Basic data structures such as lists, dictionaries, and hash tables.

List of experiments(Programming language C / Java)

1. Implement Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
2. Implement Quick Sort algorithm and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
3. Implement Insertion Sort algorithm and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.
4. Implement Heap Sort algorithm and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n.

5. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
6. Find the Minimum Cost Spanning Tree of a given undirected graph using Prim’s algorithm.
7. Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.
8. Implement 0/1 Knapsack problem using Dynamic Programming.
9. Find a subset of a given set S = {sl, s2,.....,sn} of n positive integers whose sum is equal to a given positive integer d. For example, if S={1, 2, 5, 6, 8} and d = 9 there are two solutions{1,2,6}and{1,8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
10. Implement N Queen's problem using Back Tracking.

Text Books:

1. Anany Levitin, Introduction to The Design & Analysis of Algorithms, Pearson Education, 1st edition and onwards.
2. Java, The Complete Reference, Herbert Schildt.

Reference Books::

1. Kenneth Berman, Jerome Paul, Algorithms, Cengage Learning.
2. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, introduction to Algorithms PHI, 2nd edition and onwards.

E Resources:

https://onlinecourses.nptel.ac.in/

Course Outcome (COs)

At the end of the course, the student will be able to	**Bloom’s Level**
1. **Identify** and implement an appropriate algorithm design technique for a given problem.	**L1**
2. **Implement** and **Compute** time required for recursive and iterative algorithms.	**L3**
3. **Design** algorithms for specific applications using appropriate techniques.	**L6**
4. **Design** graph search and sorting algorithms.	**L6**

Program Outcome of this course (POs)	PO No.
1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	**PO1**
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.	**PO2**
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.	**PO3**
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.	**PO4**

Assessment methods

1. Regular Journal Evaluation & Attendance Monitoring.
2. Lab Internal Assessment.

Scheme of Continuous Internal Evaluation (CIE):

Components	Attendance/conduct of lab	Journal	Lab project	Total Marks
Maximum marks :25	10	10	5	25
Submission and certification of journal is compulsory to qualify for SEE Minimum marks required to qualify for SEE : 10 out of 25 marks				

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Only one experiment to be conducted. In case, there are two parts then one experiment from each part.		
3.	Initial write up:Algorithm/Flowchart/Tracing	10 marks	50 marks
	Conduct of experiment(s), result and conclusion	20 marks	
	One marks question	10 marks	
	Viva-voce	10 marks	
4.	Viva voce is conducted for individual student and not in group		

5.	Minimum passing marks to be scored in SEE: 20 out of 50 marks

Database Application Laboratory

Course Code	18CSL48/18ISL48	**Credits**	1.5
Course type	LAB	**CIE Marks**	25 marks
Hours/week: L-T-P	0 – 0 – 3	**SEE Marks**	25 marks
Total Hours:	36	**SEE Duration**	3 Hours for 50 marks

Course learning objectives

1. Gain a good understanding of the architecture and functioning of Database Management Systems as well as associated tools and techniques.
2. Understand and apply the principles of data modeling using Entity Relationship and develop a good database design
3. Apply Normalization techniques to normalize a database.
4. Understand the use of Structured Query Language (SQL) and its syntax.
5. Learn the tools required for graphical user interface design

LAB TERM WORKS:

PART – A

1. Suppose you are given the following requirements for a simple database for the National Hockey League (NHL):
   - the NHL has many teams,
   - each team has a name, a city, a coach, a captain, and a set of players,
   - each player belongs to only one team,
   - each player has a name, a position (such as left wing or goalie), a skill level, and a set of injury records,
   - a team captain is also a player,
   - a game is played between two teams (referred to as host_team and guest_team) and has a date (such as May 11th, 1999) and a score (such as 4 to 2).

Design a ER-Model for this application scenario using all the standard notations of ER-Model. Apply the ER-to-Relational Rules and normalization to get the relational schema and do the following :

a. Create the database with all necessary constraints(Primary and Foreign keys)
b. Populate each table with appropriate data
c. Execute queries on the tables created.(open ended)
d. Create graphical user interfaces (GUI) using HTML/PHP/VB.Net/Java

2. Design an ER-Model for an educational institute which is required to record the students attendance and IA performance in all the subjects and inform the same to their parents. The institute will have many department, each with its own faculty and Head of the department. The subjects the students study can be either elective or core. A faculty has to take atleast one subject and atmost 2 subjects and the subjects are not shared. The students take 3 tests and the average is computed by taking average of best two of the three scores. The model be designed to record only the CIE marks and not SEE marks. After the ER-Model, map it to relational schema by indentifying Primary and Foreign keys. Normalize and do the following.
    a. Create the database with all necessary constraints(Primary and Foreign keys)
    b. Populate each table with appropriate data
    c. Execute queries on the tables created.(open ended)
    d. Create graphical user interfaces (GUI) using HTML/PHP/VB.Net/Java

3. Consider the schema for airline flight information Database:

FLIGHTS (*no: integer, fromPlace: string, toPlace: string, distance: integer, Departs: date,arrives: date, price: real*)

AIRCRAFT (*aid: integer, aname: string, cruisingrange: integer*)

CERTIFIED (*eid: integer,aid: integer*)

EMPLOYEES (*eid: integer, ename: string, salary: integer*)

Create tables and populate with appropriate values(Atleast 5 records in each table) for the given database.

Write SQL queries to

1. Find the names of aircraft such that all pilots certified to operate them have salaries more than Rs.80,000.
2. For each pilot who is certified for more than three aircrafts, find the eid, ename and the maximum cruising range of the aircraft for which she or he is certified.
3. Find the names of pilots whose salary is less than the price of the cheapest route from Bengaluru to Frankfurt.
4. Find the aids of all aircraft that can be used on routes from Bengaluru to New Delhi

4. Consider the following schema for Order Database:

SALESMAN (*Salesman_id, Name, City, Commission*)

CUSTOMER (*Customer_id, Cust_Name, City, Grade, Salesman_id*)

ORDERS (*Ord_No, Purchase_Amt, Ord_Date, customer_id,Saleman_id)*

Create tables and populate with appropriate values(Atleast 5 records in each table) for the given database.

Write SQL queries to

1. Count the customers with grades above Bangalore‘s average.
2. Find the name and numbers of all salesmen who had more than one customer.
3. List all salesmen names and customer names for whom order amount is more than 4000.
4. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

5. Consider the schema for Movie Database:

ACTOR (*Act_id, Act_Name, Act_Gender*)

DIRECTOR (*Dir_id, Dir_Name, Dir_Phone*)

MOVIES (*Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id*)

MOVIE_CAST (*Act_id,Mov_id, Role*)

RATING (*Mov_id, Rev_Stars*)

Create tables and populate with appropriate values(Atleast 5 records in each table) for the given database.

Write SQL queries to

1. List the titles of all movies directed by “Sanjay Leela Bansali” .
2. Find the movie names where one or more actors acted in two or more movies.
3. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
4. Update rating of all movies directed by “Ram GopalVerma” to 5.

PART – B

The students will design and implement a mini project on the lines of part A.

Text Books:

1. Elmasri and Navathe: Fundamentals of Database Systems, Addison-Wesley, 3rd edition and onwards.
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, McGraw-Hill, 2nd edition and onwards.

Reference Books::

1. Silberschatz, Korth and Sudharshan: Data base System Concepts, Mc-GrawHill, 3rd edition and onwards.
2. C.J. Date, A. Kannan, S. Swamynatham: A Introduction to Database Systems, Pearson education, 5th edition and onwards.

E Resources:

3. PL/SQL study material.

Course Outcome (COs)

At the end of the course, the student will be able to		Bloom's Level
1	**Apply** the ER-Modeling concepts,Normalization and design a database accordingly	**L3**
2	**Demonstrate** use of DDL and DML statements	**L3**
3	**Identify and write** SQL statements for the given end user queries	**L3**
4	**Demonstrate** the use of GUI tools	**L3**

Program Outcome of this course (POs)	PO No.
1. **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.	**PO2**
2. **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.	**PO3**
3. **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.	**PO5**

Assessment methods

1. Lab Journal
2. Lab Test
3. Demo and Viva

Scheme of Continuous Internal Evaluation (CIE):

Components	Attendance/conduct of lab	Journal	Lab project	Total Marks
Maximum marks :25	10	10	5	25
Submission and certification of journal is compulsory to qualify for SEE Minimum marks required to qualify for SEE : 10 out of 25 marks				

Semester End Examination (SEE):

1.	It will be conducted for 50 marks having 3 hours/2 hours duration. It will be reduced to 25 marks for the calculation of SGPA and CGPA.		
2.	Only one experiment to be conducted. In case, there are two parts then one experiment from each part.		
3.	Initial write up:Algorithm/Flowchart/Tracing	10 marks	50 marks
	Conduct of experiment(s), result and conclusion	20 marks	
	One marks question	10 marks	
	Viva-voce	10 marks	
4.	Viva voce is conducted for individual student and not in group		
5.	Minimum passing marks to be scored in SEE: 20 out of 50 marks		

Graph Theory and Discrete Mathematical Structures

(Computer Science / Information Science)

Subject Code:	18DMATCS41	**Credits:**	04
Course Type:	BS	**CIE Marks:**	50
Hours/week: L – T – P	4 –0– 0	**SEE Marks:**	50
Total Hours:	50	**SEE Duration:**	3 Hours

Course Learning Objectives (CLOs):

Students should

1. Understand and apply Logic in the field of Computer science.
2. Understand the various Relations and Functions.
3. Understand advanced counting techniques.
4. Get acquainted with basic concepts of Graph Theory and their applications.
5. Get acquainted with elementary Number theory, and their properties for applications in Cryptography.

Prerequisites:

1. Set Theory
2. Power series
3. Binomial Series
4. Basics of Counting

Detailed Syllabus

Unit-I **10 hrs**

Fundamentals of Logic: Laws of Logic, Logical Implication-Rules of Inference. Quantifiers-Universal and Existential Quantifiers, Proofs Techniques: direct, indirect and Contradiction.

Unit –II **10 hrs**

Relations and Functions: Zero-One Matrices and Directed Graphs, Closure and Equivalence Relations and Partitions, Partial Orders, Hasse Diagrams, Lattice, Properties of functions, Composition and Invertible functions.

Unit III **10 hrs**

Advanced Counting Techniques: Sterling Number of second kind, Inclusion and Exclusion, Pigeonhole Principle, Generating Function, Recurrence relations, Solution of Linear homogeneous and non-homogeneous recurrence relations with constant coefficients, Divide and Conquer Algorithms, Merge sort algorithm.

Unit IV **10 hrs**

Basic Graph Theory: Definitions and Examples, Subgraphs, Complements and Graph Isomorphism, Connectivity, Euler Trails and Circuits, Planar Graphs, Hamiltonian Paths and Cycles, Coloring, Matching.

Unit V **10 hrs**

Elementary Number Theory and Cryptography: Fields, Modular Arithmetic, Prime Numbers, Fermat's and Euler's theorem. Testing of Primality, Chinese Remainder Theorem. Caesar Encryption/Decryption, RSA Cryptosystem.

Text Books:

1. Kolman, Busby, Ross "Discrete Mathematical Structures", 6th Edition Prentice Hall of India, 2010 onwards.
2. William Stallings "Cryptography and Network Security", Pearson Prentice Hall 6th Edition, 2013 onwards.
3. Kenneth H. Rosen "Discrete Mathematics and its applications", Mc Graw Hill 7th Edition.

Reference Books:

1. Ralph P Grimaldi, "Discrete and Combinatorial Mathematics", 5th Edition, Pearson Education, 2004 onwards.
2. K. D. Joshi, "Foundations of Discrete Mathematics", 2nd Edition, New Age International Publishers, 2014 onwards.

Course Outcomes (COs): At the end of the course students will be able to:

1. **Understand** and **Apply** the Logic of Mathematics in the field of Computer science **[L2, L3]**
2. **Explain and Analyze** Different Relations and Functions**. [L2, L3]**
3. **Discuss** basic concepts of Graph Theory and its **Use** in Computer Science. **[L2, L3]**
4. **Explain** the concept of Finite Fields. **[L2]**
5. **Apply** Finite Fields to Cryptography. **[L3]**

Program Outcomes (POs) of the course: Students will acquire

1. An ability to apply knowledge of Mathematics, science and Engineering. **[PO1]**
2. An ability to identify, formulate and solve engineering problems. **[PO5]**
3. An ability to use the techniques, skills and modern engineering tools necessary for engineering practice. **[PO11]**

Scheme of Continuous Internal Evaluation (CIE):

Components	Addition of two IA tests	Average of two assignments	Quiz/Seminar/Course Project	Total Marks
Maximum marks :50	15+15 = 30	10	10	50
Writing two IA tests is compulsory.				

Minimum marks required to qualify for SEE : 20 out of 50 marks

Semester End Examination (SEE):

1. It will be conducted for 3 hours duration and 100 marks. It will be reduced to 50 marks for the calculation of SGPA and CGPA.
2. Minimum passing marks required to be scored in SEE: 40 out of 100 marks
3. Question paper will have 10 questions carrying 20 marks each. Students have to answer FIVE full questions selecting atleast one full question from each unit.

ENVIRONMENTAL STUDIES (MNC)

Subject Code:	18CS49	Credits:	MNC
Course Type:	HS	CIE Marks:	25 marks
Hours/week: L – T – P	2– 0– 0	SEE Marks:	-
Total Hours:	28	SEE Duration:	-

Course Learning Objectives (CLOs)

1. To understand the scope of Environmental Engineering.
2. Identify the Environmental impact due to Human activities.
3. To understand the concept of Disaster Management.
4. Identify the renewable and non renewable sources of energy.
5. Identify the various Legal aspects in Environmental Protection.

Pre-requisites: NIL

UNIT I

Definition of Environment, Ecology and Eco-system, Structure and functions of ecosystem, balanced ecosystem, Introduction to Environmental Impact Assessment.

Natural Resources: Material Cycles - Oxygen, Carbon, Nitrogen and Hydrological cycle. Importance of water quality, Water borne diseases, Water induced diseases, Significance of Fluoride in drinking water.

06 Hours

UNIT II

Energy - Different types of energy, Conventional and Non - Conventional sources – Advantages and Limitations of Wind Mills, Hydro Electric, Fossil fuel, Nuclear, Solar, Biomass and Bio-gas, Geothermal energy.

06 Hours

UNIT III

Disasters - Natural Disasters: Meaning and nature of natural disasters, their types and effects (Floods, drought, cyclone, earthquakes, Tsunami). Man Made Disasters: Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution and marine pollution.

06 Hours

UNIT IV

Disaster Management: International strategy for disaster reduction. Concept of disaster management and national disaster management framework

05 Hour

UNIT V

Environmental Protection: Role of Government, Legal aspects, Initiatives by Non - Governmental Organizations (NGO), Environmental Education, Women Education. E waste and solid waste management rules

05 Hours

Text Books:

1. Benny Joseph, "**Environmental Studies**", Tata McGraw - Hill Publishing Company Limited (2005).
2. Ranjit Daniels R.J. and Jagdish Kirshnaswamy, "**Environmental Studies**", Wiley India Private Ltd., New Delhi (2009).
3. Rajagopalan R. "**Environmental Studies – From Crisis to Cure**", Oxford University Press (2005).
4. Sanjay K. Sharma, "**Environment Engineering and Disaster Management**", USP (2011).
5. Harsh K. Gupta, "**Disaster Management**", Universities Press (India) Pvt. Ltd (2003).

References Books:

1. Raman Sivakumar, "**Principles of Environmental Science and Engineering**", Second Edition, Thomson Learning, Singapore (2005).
2. Meenakshi P., "**Elements of Environmental Science and Engineering**", Prentice Hall of India Private Limited, New Delhi (2006).
3. Prakash S.M., "**Environmental Studies**", Elite Publishers, Mangalore (2007).
4. Erach Bharucha, "**Text Book of Environmental Studies**", for UGC, Universities Press (2005).
5. Tyler Miller Jr. G., "**Environmental Science – Working with the Earth**", Tenth Edition, Thomson Brooks/Cole (2004).

Course Outcomes (COs)

	At the end of the course, the student will be able to	Bloom's Level
1	**Explain** the importance of the Environment	**L2**
2	**Evaluate** Environmental disasters caused by human activities	**L5**
3	**Outline** the water stress problems and energy crisis in present era.	**L2**
4	**Explain and classify** the Renewable and Non Renewable sources of energy.	**L2**
5	**Summarize** the various Legislations related to Environment.	**L2**

Program Outcomes (POs)

1	Graduates shall be able to understand and apply the basic mathematical and scientific concepts that underlie the field of Civil Engineering**.**	**PO 1**
2	Graduates shall continue to upgrade the skills and possess the motivation for continuing education and professional growth	**PO 8**
3	Graduates shall maintain an awareness of contemporary issues and arrive at the environmentally sustainable solutions	**PO 9**

4	Graduates shall be proficient in the core principles of Civil Engineering such as Environmental Engineering, Geotechnical Engineering, Structural Engineering and Water Resources Engineering, and shall be able to apply these principles in Engineering practice.	**PO 10**

Content Delivery/Assessments methods and Scheme of Evaluation:

Course delivery methods	**Assessment methods**
1. Lecture and Board	1. Assignments and Open Book Assignment
2. NPTEL/ Edusat	2. Quizzes
3. Power Point Presentation	3. Internal Assessment Tests
4. Videos	4. Semester End Examination

Scheme of Continuous Internal Evaluation (CIE):

Components	**Addition of two IA tests**	**Quiz/Assignment/Activity**	**Total Marks**
Maximum marks: 25	10+10 = 20	05	25
•Writing two IA tests is compulsory. •Minimum marks required: 10 out of 25 marks			

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