K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SESSION: 2022-2023

CO-PO Mapping

Course: SYSTEM SOFTWARE AND COMPILERS			
Type: Core		**Course Code: 18CS61**	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total Teaching Hours
4	0	4	50
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	4

Aim/Objectives of the Course

1. Outline the architecture of SIC and SIC/XE machine. Illustrate the concept of Application software and system software such as assemblers, Loaders.
2. Infer the various phases of compiler and apply these phases to build an application.
3. Identify the methods and strategies for parsing techniques.
4. Identify the tool to produce a parser for given grammar.
5. Devise and perform syntax directed translation schemes for compiler and analyze the optimized code generated after the synthesis phase.

Course Learning Outcomes
After completing the course, the students will be able to

CO1	**Use** the architecture of Simplified Instructional Computer, functions of assembler, Loader Functionsand **Write** the object code for assembly programs.	Applying (K3)
CO2	**Interpret** the tokens and patterns. **Apply**the lexical analyzer for real world problems.	Applying (K3)
CO3	**Identify**and **apply**the different Parsing level techniques to solve grammar.	Applying(K3)
CO4	**Identify** different Regular expression and **use** Lex andYacc tool to build scanner and parser respectively.	Applying(K3)
CO5	**Build** the syntax tree by associating synthesis phase with analysis phase for better optimization and performance.	Applying (K3)

Syllabus Content

Module1: Introduction to System Software, Machine Architecture of SIC and SIC/XE. **Assemblers:** Basic assembler functions, machine dependent assembler features, machine independent assembler features, assembler design options. Basic Loader Functions.	**CO1** **10hrs** PO1-3 PO2-3

LO: At the end of this session the student will be able to, 1. Identify the importance of SIC and SIC/XE. 2. Outline the function of assembler with algorithm. 3. Apply feature of SIC and XE to obtain the object Programme and Explain the basic function of Loader.	PO3-2 PO4 -1 PO9 - 2 PO11 -1 PO12 -1 PSO1-2 PSO2-2

Module 2: **Introduction:** Language Processors, The structure of a compiler, The evaluation of programming languages, The science of building compiler, Applications of compiler technology. **Lexical Analysis:** The role of lexical analyzer, Input buffering, Specifications of token, recognition of tokens. LO: At the end of this session the student will be able to, 1. Outline the structure of compiler and application of it. 2. Making use of compiler stages generate machine code for input strings. 3. Design lexical phase for input problems.	**CO2** **10hrs.** PO1-3 PO2-3 PO3-3 PO4 -2 PO5 -2 PO11 -2 PSO1-2 PSO2-2
Module 3: Syntax Analysis: Introduction, Context Free Grammars, Writing a grammar, Top-Down Parsers, Bottom-Up Parsers. LO: At the end of this session the student will be able to, 1. Infer the role of Parser for syntax analysis and CFG. 2. Contrast the importance Top-down parser and bottom-up parser 3. Apply different methods to check grammar is ambiguous or not and generate parse tree.	**CO3** **10hrs** PO1-3 PO2-3 PO3-3 PO4 -2 PO5 -2 PO11 -2 PSO1-2 PSO2-2
Module 4: Lex and Yacc –The Simplest Lex Program, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers, Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program, Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and	**CO4** **10hrs** PO1-3 PO2-3 PO3-3 PO4 -2 PO5 -3

Ambiguity. LO: At the end of this session the student will be able to, 1. Infer the role of Lexer and parser. 2. Contrast the structure of Lex and Yacc. 3. Apply shift/ reduce parsing with different approaches.	PO11 -2 PSO1-2 PSO2-3
Module 5: Syntax Directed Translation, Intermediate code generation, Code generation LO: At the end of this session the student will be able to, 1. Making use of Syntax directed definition construct annotated parse tree. 2. Construct directed acyclic graphs for expressions. 3. Generate intermediate code generator by making use of different addressing modes.	**CO5** 10hrs PO1-3 PO2-3 PO3-2 PO4 -2 PO5 -2 PO11 -2 PSO1-2 PSO2-2
Text Books: - (specify minimum two foreign authors text books) 1. System Software by Leland. L. Beck, D Manjula, 3rd edition, 2012 2. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers-Principles, Techniques and Tools, Pearson, 2nd edition, 2007 3. Doug Brown, John Levine, Tony Mason, lex &yacc, O'Reilly Media, October 2012.	
Reference Books: 1. Systems programming – Srimanta Pal, Oxford university press, 2016 2. System programming and Compiler Design, K C Louden, Cengage Learning 3. System software and operating system by D. M. Dhamdhere TMG 4. Compiler Design, K Muneeswaran, Oxford University Press 2013.	
Useful Websites: https://nptel.ac.in/courses/106/104/106104123/ https://www.tutorialspoint.com/compiler_design/index.html https://www.javatpoint.com/compiler-tutorial	
Useful Journals • Advances in Compiler Technology. • Special Issue on Languages, Compilers and Tools for Embedded Systems (SI:LCTES18) • Compiler Design - Syntactic and Semantic Analysis **Ph.D. Thesis:** Language Support for Programming High-Performance Code: Leißa, R. Ph.D. Thesis, Saarland University, Saarbrücken, Germany, 2017. [url] [bib]	
Teaching and Learning Methods: 1. Lecture class: 50 hrs. 2. Self-study: --- 3. Field visits/Group Discussions/Seminars: 3hrs. 4. Practical classes: --	
Assessment: Type of test/examination: Written examination **Continuous Internal Evaluation (CIE):** 40 marks (Average of total three tests will be	

considered)
Semester End Exam (SEE): 60 marks (students have to answer all main questions)
Test duration: 1 :30 hr
Examination duration: 3 hrs

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Society **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Mngmt& Finance **PO12:**Lifelong Learning

PSO1: Understand fundamental and advanced concepts in the core areas of Computer Science and Engineering to analyze, design and implement the solutions for the real-world problems.

PSO2: Utilize modern technological innovations efficiently in various applications to work towards the betterment of society and solve engineering problems.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PS O2
18CS61	K-Level														
CO1	K3	3	3	2	1					2		1	1	2	2
2	K3	3	3	3	2	2						2		2	2
CO3	K3	3	3	3	2	2						2		2	2
CO4	K3	3	3	3	2	3						2		2	3
CO5	K3	3	3	2	2	2						2		2	2

Course In charge

Head of the Department

HOD
Department of Computer Science Engineering
K.S School of Engineering & Management
Bangalore-560109

Principal

Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Managemen
Bengaluru - 560 109

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

CO-PO Mapping

Course: DESIGN AND ANALYSIS OF ALGORITHMS				
Type: Integrated Professional Core Course			**Course Code: 21CS42**	
No of Hours				
Theory (Lecture Class)	Tutorials	Practical/Field Work/Allied Activities	Total/Week	Total hours of Pedagogy
4	0	3	7	40 T + 20 P
Marks				
CIE	SEE		Total	Credits
50	50		100	4

Aim/Objectives of the Course

1. Explain the methods of analyzing the algorithms and to analyze performance of algorithms.
2. State algorithm's efficiencies using asymptotic notations.
3. Solve problems using algorithm design methods such as the brute force method, greedy method, divide and conquer, decrease and conquer, transform and conquer, dynamic programming, backtracking and branch and bound.
4. Choose the appropriate data structure and algorithm design method for a specified application.
5. Introduce P and NP classes

Course Learning Outcomes

After completing the course, the students will be able to

CO1	Analyze the performance of the algorithms, state the efficiency using asymptotic notations and analyze mathematically the complexity of the algorithm.	**Applying (K3)**
CO2	Apply divide and conquer approaches and decrease and conquer approaches in solving the problems analyze the same	**Applying (K3)**
CO3	Apply the appropriate algorithmic design technique like greedy method, transform and conquer approaches and compare the efficiency of algorithms to solve the given problem.	**Applying (K3)**
CO4	Apply and analyze dynamic programming approaches to solve some problems. and improve an algorithm time efficiency by sacrificing space.	**Applying (K3)**
CO5	Apply and analyze backtracking, branch and bound methods and to describe P, NP and NP Complete problems.	**Applying (K3)**

Syllabus Content

Module 1: Introduction: What is an Algorithm? It's Properties. Algorithm Specification-using natural language, using Pseudo code convention, Fundamentals of Algorithmic Problem solving, Analysis Framework-Time efficiency and space efficiency, Worst-case, Best-case and Average case efficiency.	**CO1** 8 hrs PO1-3

Performance Analysis: Estimating Space complexity and Time complexity of algorithms. **Asymptotic Notations**: Big-Oh notation (O), Omega notation (Ω), Theta notation with examples, Basic efficiency classes, Mathematical analysis of Non-Recursive and Recursive Algorithms with Examples. **Brute force design technique**: Selection sort, sequential search, string matching algorithm with complexity Analysis. **Laboratory Experiments:** 1. Sort a given set of n integer elements using Selection Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the brute force method works along with its time complexity analysis: worst case, average case and best case. **LO:** At the end of this session the student will be able to 1. Understand what is algorithm. 2. Estimate Space complexity and Time complexity of algorithms. 3. Identify Asymptotic Notations.	PO2-3 PO3-3 PO4-3 PO6-1 PO7-1 PO12 -1 PSO1-1 PSO2-1

Module 2: Divide and Conquer: General method, Recurrence equation for divide and conquer, solving it using Master's theorem, Divide and Conquer algorithms and complexity Analysis of Finding the maximum & minimum, Binary search, Merge sort, Quick sort. **Decrease and Conquer Approach**: Introduction, Insertion sort, Graph searching algorithms, Topological Sorting. It's efficiency analysis. **Laboratory Experiments:** 1. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case. 2. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C++/Java how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case. **LO:** At the end of this session the student will be able to 1. Understand Divide and Conquer approach. 2. Understand Decrease and Conquer approach.	**CO2** 8 hrs. PO1-3 PO2-3 PO3-3 PO4-3 PO6-1 PO7-1 PO12-1 PSO1-1 PSO2-1
Module 3: Greedy Method: General method, Coin Change Problem, Knapsack Problem, solving Job sequencing with deadlines Problems. **Minimum cost spanning trees**: Prim's Algorithm, Kruskal's Algorithm with performance analysis. **Single source shortest paths**: Dijkstra's Algorithm. **Optimal Tree problem**: Huffman Trees and Codes. **Transform and Conquer Approach**: Introduction, Heaps and Heap Sort.	**CO3** 8 hrs PO1-3 PO2-3 PO3-3 PO4-3

Laboratory Experiments: 1. To solve Knapsack problem using Greedy method. 2. To find shortest paths to other vertices from a given vertex in a weighted connected graph, using Dijkstra's algorithm. 3. To find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal's algorithm. Use Union-Find algorithms in your program. 4. To find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm. **LO:** At the end of this session the student will be able to 1. Apply various Greedy methods. 2. Use Single Source shortest paths algorithm 3. Know about Heaps and Heap Sort	PO6-1 PO7-1 PO12-1 PSO1-1 PSO2-1
Module 4: Dynamic Programming: General method with Examples, Multistage Graphs. **Transitive Closure**: Warshall's Algorithm. **All Pairs Shortest Paths**: Floyd's Algorithm, Knapsack problem, Bellman-Ford Algorithm, Travelling Sales Person problem. **Space-Time Tradeoffs**: Introduction, Sorting by Counting, Input Enhancement in String Matching-Harspool's algorithm. **Laboratory Experiments:** 1. Solve All-Pairs Shortest Paths problem using Floyd's algorithm. 2. Solve Travelling Sales Person problem using Dynamic programming. 3. Solve 0/1 Knapsack problem using Dynamic Programming method. **LO:** At the end of this session the student will be able to 1. Understand the Dynamic programming concepts and methods. 2. Solve all pair shortest paths using various algorithms. 3. Do String Matching using Harspool's algorithm.	**CO4** 8 hrs PO1-3 PO2-3 PO3-3 PO4-3 PO6-1 PO7-1 PO12-1 PSO1-1 PSO2-1
Module 5: Backtracking: General method, solution using back tracking to N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles Problems. **Branch and Bound**: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem **NP-Complete and NP-Hard problems**: Basic concepts, non- deterministic algorithms, P, NP, NP Complete, and NP-Hard classes. **Laboratory Experiments:** 1. Design and implement C++/Java Program to 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}. Display a suitable message, if the given problem instance doesn't have a solution. 2. Design and implement C++/Java Program to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle. **LO:** At the end of this session the student will be able to 1. Use backtracking method to solve many problems 2. Solve some problems using Branch and Bound 3. Identify NP-Complete and NP-Hard problems	**CO5** 8hrs PO1-3 PO2-3 PO3-3 PO4-3 PO6-1 PO7-1 PO12-1 PSO1-1 PSO2-1

Text Books

1. Introduction to the Design and Analysis of Algorithms, Anany Levitin: 2nd Edition, 2009. Pearson.
2. Computer Algorithms/C++, Ellis Horowitz, SatrajSahni and Rajasekaran, 2nd Edition, 2014, Universities Press.

Reference Books

1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
2. Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education)

Useful Websites

- http://elearning.vtu.ac.in/econtent/courses/video/CSE/06CS43.html
- https://nptel.ac.in/courses/106/101/106101060/
- http://elearning.vtu.ac.in/econtent/courses/video/FEP/ADA.html
- http://cse01-iiith.vlabs.ac.in/
- http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms

Useful Journals

- IEEE TECHNOLOGY NAVIGATOR
- Journal of informatics and data mining
- Journal of computer and system sciences-Elsevier

Teaching and Learning Methods

1. Lecture class: 40 hrs
2. Tutorial classes: 23 hrs
3. Practical classes: 20hrs

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 1) Three Tests each of 20 marks (duration 01 hour)

2) Two assignments each of 10 Marks

3) Practical Sessions for 20 Marks

Rubrics for each Experiment taken average for all Lab components – 15 Marks. • Viva-Voce– 5 Marks (more emphasized on demonstration topics)

The sum of three tests, two assignments, and practical sessions will be out of 100 marks and will be scaled down to 50 marks

Total CIE: 50 Marks

Semester End Exam (SEE) : 100 marks (students have to answer all main questions) which will be reduced to 50 Marks.

Test duration: 1 hr

Examination duration: 3 hrs

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Society **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Mngmt & Finance **PO12:**Life long Learning

PSO1: An ability to design and develop Artificial Intelligence technology into innovative products for solving real world problems.

PSO2: An ability to design and develop Data Science methods for analyzing massive datasets to extract insights by applying AI as a tool.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
18CS 32	K-level														
CO1	K3	3	3	3	3	-	1	1	-	-	-	-	1	1	1
CO2	K3	3	3	3	3	-	1	1	-	-	-	-	1	1	1
CO3	K3	3	3	3	3	-	1	1	-	-	-	-	1	1	1
CO4	K3	3	3	3	3	-	1	1	-	-	-	-	1	1	1
CO5	K3	3	3	3	3	-	1	1	-	-	-	-	1	1	1

Course In charge HOD-AI & DS IQAC Coordinator Principal

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF APPLIED SCIENCE

SESSION: 2022-2023(EVEN SEMESTER)

CO-PO MAPPING

Course:COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS			
Type: Core		Course Code: 21MAT41	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4	0	4	40
Marks			
Internal Assessment	Examination	Total	Credits
50	50	100	3

Aim/Objectives of the Course

- To provide an insight into applications of complex variables, conformal mapping and special functions arising in potential theory, quantum mechanics, heat conduction and field theory.
- Special functions familiarize the power series solution required to analyse the engineering problems.
- To develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, design engineering and microwave engineering.

Course Learning Outcomes

At the end of the course the studentwill be able to:

CO1	**Solve** the problems arising in electromagnetic field theory by using the concept of analytic function and complex potentials.	**Applying (K3)**
CO2	**Utilize** conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing	**Applying (K3)**
CO3	**Analysing** the probability models arising in engineering field by applying discrete and continuous probability distributions	**Applying (K3)**
CO4	**Fit** a suitable mathematical model for the statistical data by using correlation and regression analysis.	**Applying (K3)**
CO5	**Construct** joint probability distributions and demonstrate the validity of testing the hypothesis.	**Applying (K3)**

Syllabus Content

Module 1: Calculus of complex functions: Review of function of a complex variable, limits, continuity and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms andconsequences. **Construction of analytic functions:** Milne-Thomson method-Problems **Complex integration:** Line integral of a complex function-Cauchy's theorem and Cauchy's integral formula and problems.	**CO1** 8hrs PO1-3 PO2-2 PO3-1 PO4-1

LO: At the end of this session the student will be able to 1. Derive Cauchy-Riemann equations in Cartesian and polar forms. 2. Construct the analytic function when v is given. 3. Find the analytic function when u is given. 4. Evaluate the line integral of a complex function. 5. Derive Cauchy's theorem and Cauchy's integral formula.	PO10-1 PO12-1 PSO1-3 PSO2-1

Module 2: Special functions Series solution of Bessel's differential equation leading to Jn(x) Bessel's function of the first kind ,properties,Orthogonality of Bessel's functions. Series solution of Legendre's differential equation leading to Pn(x)-Legendre polynomials. Rodrigue's formula (without proof), problems. **LO:** At the end of this session the student will be able to 1. Derive series solution of Bessel's differential equation. 2. Discuss the properties of Bessel's function. 3. Derive orthogonality of Bessel's function. 4. Derive series solution of Legendre's differential equation. 5. Solving problems on Rodrigue's formula.	**CO2** 8 hrs. PO1-3 PO2-2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-1
Module 3: **Probability Distributions:** Review of basic probability theory. Random variables (discrete and continuous), probability mass and density functions. Mathematical expectation, mean, variance. Binomial, Poisson and normal distributions-problems (derivations for mean and standard deviation for Binomial and Poisson distributions only)-Illustrative examples. **LO:** At the end of this session the student will be able to 1. Describe the random variables and probability distributions using statistical methods. 2. Define Expectation, mean ,variance 3. Derive mean and standard deviation for Binomial and Poisson distributions.	**CO3** 8hrs PO1-3 PO2-2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-1
Module 4: **Statistical Methods:** Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems. **Curve Fitting:** Curve fitting by the method of least squares- fitting the curves of the form $y = ax + b, y = ax^2 + bx + c, y = ax^b$ **LO:** At the end of this session the student will be able to 1. Obtain the coefficients of correlation and the lines of regression for the given data. 2. Compute the coefficient of rank correlation for the given data.	**CO4** 8 hrs PO1-3 PO2-2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3

3. Fitting of the curves form $y = ax + b, y = ax^2 + bx + c, y = ax^b$ 4. Fit a curve for the given data.	PSO2-1
Module 5: **Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectationand covariance. **Sampling Theory:** Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test ofhypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. **LO:** At the end of this session the student will be able to 1. Explain Type-I and Type-II errors, null hypothesis, level of significance. 2. Find the joint probability distribution for two variables. 3. Find the expectation, co-variance for the joint probability distributions.	**CO5** 8 hrs PO1-3 PO2-2 PO3-1 PO4-1 PO10-1 PO12-1 PSO1-3 PSO2-1

Text Books

1 Advanced Engineering Mathematics E. Kreyszig John Wiley & Sons 10th Edition, 2016

2 Higher Engineering Mathematics B. S. GrewalKhanna Publishers 44th Edition, 2017

3 Engineering Mathematics Srimanta Pal et al Oxford University Press 3 rd Edition, 2016

Reference Books

1. Advanced Engineering Mathematics C. Ray Wylie, Louis C. Barrett McGraw-Hill Book Co 6 th Edition, 1995

2 Introductory Methods of Numerical Analysis S.S..Sastry Prentice Hall of India 4 th Edition 2010

3 Higher Engineering Mathematics B.V. Ramana McGraw-Hill 11th Edition,2010

4 A Textbook of Engineering Mathematics N.P.Bali and Manish GoyalLaxmi Publications 6 th Edition, 2014

5 Advanced Engineering Mathematics Chandrika Prasad and ReenaGargKhanna Publishing, 2018

Useful Websites

- http://nptel.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/
- VTU EDUSAT PROGRAMME - 20

Useful Journals

- Annals of Mathematics
- ActaMathematica
- International Journal of Mathematics
- Communications on pure and applied Mathematics.

Teaching and Learning Methods

1. Lecture class: 40 hrs
2. Practical classes: 0

Assessment

Type of test/examination: Written examination
Continuous Internal Evaluation(CIE) : 40 marks (30 marks -Average of three tests + 10 marks Assignments)
Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.
Test duration: 1 hour
Examination duration: 3 hour

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:**Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:**Environment and Society **PO8:**Ethics **PO9:**Individual & Team Work **PO10:** Communication **PO11:**Project Management& Finance **PO12:**Lifelong Learning

PSO1: Ability to apply concept of Mathematics in engineering to design a system, a component or a process/system to address a real world challenges

PSO2: Ability to develop effective communication, team work, entrepreneurial and computational skills.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO 9	PO10	PO1 1	PO12	PSO1	P 2
18 MAT41	K-level														
CO1	K3	3	2	1	1	-	-	-	-	-	1	-	1	3	1
CO2	K3	3	2	1	1	-	-	-	-	-	1	-	1	3	1
CO3	K3	3	1	2	1	-	-	-	-	-	2	-	1	3	1
CO4	K3	3	2	2	1	-	-	-	-	-	1	-	1	3	1
CO5	K3	3	1	2	1	-	-		-	-	2	-	1	3	1

Course In charge

Head of the Department

Principal
Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Management
Bengaluru - 560 109

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF APPLIED SCIENCE

SESSION: 2022-2023 (EVEN SEMESTER)

CO-PO MAPPING

Course Title: Applied Physics For CSE Stream			
Type: Integrated		Course Code: BPHYS202	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total hours/Week	Total teaching hours
4	3	7	76(40+36)
Marks			
Internal Assessment	Examination	Total	Credits
50	50	100	4

Aim/Objectives of the Course

1. To study the essentials of photonics and its application in computer science.
2. To study the principles of quantum mechanics and its application in quantum computing.
3. To study the electrical properties of materials
4. To study the essentials of physics for computational aspects like design and data analysis.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	Apply the principles of lasers, and optical fibers in modern technology to perform the experiments using laser.	**Applying (K3)**
CO2	Apply the theory of modern physics to explain the principles of quantum mechanics, to set up one-dimensional Schrodinger's wave equation and its applications.	**Applying (K3)**
CO3	Determine the various electrical and thermal properties of materials like conductors and superconductors and its applications.	**Applying (K3)**
CO4	Apply the essential properties of qubits and its applications in quantum computing.	**Applying (K3)**
CO5	Acquire the knowledge of application of physics in animation to design and analyze the statistical data.	**Applying (K3)**

Syllabus Content

Module:1 **Laser and Optical Fibers:** **LASER**: Characteristic properties of a LASER beam, Interaction of Radiation with Matter, Einstein's A and B Coefficients and Expression for Energy Density (Derivation), Laser Action, Population Inversion, Metastable State, Requisites of a laser system, Semiconductor Diode Laser, Applications: Bar code scanner, Laser Printer, Laser Cooling (Qualitative), Numerical Problems.	**CO1**

Optical Fiber: Principle and Structure, Propagation of Light, Acceptance angle and Numerical Aperture (NA), Derivation of Expression for NA, Modes of Propagation, RI Profile, Classification of Optical Fibers, Attenuation and Fiber Losses, Applications: Fiber Optic networking, Fiber Optic Communication. Numerical Problems **LO:** At the end of this module, the students will be able to 1. Derive the expression for energy density in terms of Einstein's Coefficients. 2. Explain the construction and working of different types of lasers and its applications. 3. Explain the mechanism of optical fiber and attenuation. 4. Explain the different types of optical fibers and its applications.	
Module 2: **Quantum Mechanics:** de Broglie Hypothesis and Matter Waves, de Broglie wavelength and derivation of expression by analogy, Phase Velocity and Group Velocity, Heisenberg's Uncertainty Principle and its application (Non-existence of electron inside the nucleus - Non Relativistic), Principle of Complementarity, Wave Function, Time independent Schrödinger wave equation (Derivation), Physical Significance of a wave function and Born Interpretation, Expectation value, Eigen functions and Eigen Values, Particle inside one dimensional infinite potential well, Quantization of Energy States, Waveforms and Probabilities. Numerical Problems. **LO:** At the end of this module, the students will be able to 1. Explain the blackbody radiation spectrum based on Planck's law. 2. Explain the uncertainty principle and its applications. 3. Obtain the expression for time independent Schrodinger wave equation, energy Eigen values and Eigen functions.	**CO2**
Module 3: **Electrical Properties of Materials and Applications** **Electrical Conductivity in metals** Resistivity and Mobility, Concept of Phonon, Matthiessen's rule, Failures of Classical Free Electron Theory, Assumptions of Quantum Free Electron Theory, Fermi Energy, Density of States, Fermi Factor, Variation of Fermi Factor With Temperature and Energy. Numerical Problems. **Superconductivity** Introduction to Super Conductors, Temperature dependence of resistivity, Meissner's Effect, Critical Field, Temperature dependence of Critical field, Types of Super Conductors, BCS theory (Qualitative), Quantum Tunnelling, High Temperature superconductivity, Josephson Junctions (Qualitative), DC and RF SQUIDs (Qualitative), Applications in Quantum Computing: Charge, Phase and Flux qubits, Numerical Problems. **LO:** At the end of this module, the students will be able to 1. Explain CFET, QFET, Fermi energy and Fermi Dirac statistics. 2. Apply the concept of QFET to solve the problems on fermi factor. 3. Explain the concept of superconductors, Meissner's effect and BCS theory. 4. Explain the quantum tunnelling, SQUIDS, and other related applications.	**CO3**

Module 4: **Quantum Computing:** **Principles of Quantum Information & Quantum Computing:** Introduction to Quantum Computing, Moore's law & its end, Differences between Classical & Quantum computing. Concept of qubit and its properties. Representation of qubit by Bloch sphere. Single and Two qubits. Extension to N qubits. **Dirac representation and matrix operations:** Matrix representation of 0 and 1 States, Identity Operator I, Applying I to $\|0\rangle$ and $\|1\rangle$ states, Pauli Matrices and its operations on $\|0\rangle$ and $\|1\rangle$ states, Explanation of i) Conjugate of a matrix and ii) Transpose of a matrix. Unitary matrix U, Examples: Row and Column Matrices and their multiplication (Inner Product), Probability, and Quantum Superposition, normalization rule. Orthogonality, Orthonormality. Numerical Problems **Quantum Gates:** **Single Qubit Gates:** Quantum Not Gate, Pauli – X, Y and Z Gates, Hadamard Gate, Phase Gate (or S Gate), T Gate **Multiple Qubit Gates:** Controlled gate, CNOT Gate, (Discussion for 4 different input states). Representation of Swap gate, Controlled -Z gate, Toffoli gate. **LO:** At the end of this module, the students will be able to 1. Explain the difference between classical and quantum computing. 2. Explain the concept of single Qubit, two Qubit and N-Qubits. 3. Apply the concept of 'ket' 0 and 1 and solve the problems using matrices. 4. Construct single qubit, two qubit and three qubit quantum gates.	**CO4**
Module 5: **Applications of Physics in computing:** **Physics of Animation:** Taxonomy of physics-based animation methods, Frames, Frames per Second, Size and Scale, Weight and Strength, Motion and Timing in Animations, Constant Force and Acceleration, The Odd rule, Odd-rule Scenarios, Motion Graphs, Examples of Character Animation: Jumping, Parts of Jump, Jump Magnification, Stop Time, Walking: Strides and Steps, Walk Timing. Numerical Problems **Statistical Physics for Computing**: Descriptive statistics and inferential statistics, Poisson distribution and modelling the probability of proton decay, Normal Distributions (Bell Curves), Monte Carlo Method: Determination of Value of π. Numerical Problems. **LO:** At the end of this module, the students will be able to 1. Explain the physics-based animation methods, frames, FPS and basics of animation. 2. Acquire the concept of odd rule and solve the problems on base distance and frame numbers. 3. Explain examples of animation related to jumping and walking of a animated character. 4. Explain and apply the concept of various theoretical models to solve the problems on statistical probability.	**CO5**

Text Books

1. A Text book of Engineering Physics- M.N. Avadhanulu and P.G. Kshirsagar, 10th revised Ed, S.Chand & Company Ltd, New Delhi
2. An Introduction to Lasers theory and applications by M.N.Avadhanulu and P.S.Hemne revised edition 2012 . S. Chand and company Ltd -New Delhi.
3. Engineering Physics-Gaur and Gupta-Dhanpat Rai Publications-2017
4. Concepts of Modern Physics-Arthur Beiser: 6th Ed;Tata McGraw Hill Edu Pvt Ltd- New Delhi 2006

Reference Books (specify minimum two foreign authors text books)

1. Solid State Physics, S O Pillai, New Age International Private Limited, 8th Edition, 2018.
2. Lasers and Non-Linear Optics, B B Loud, New age international, 2011 edition.
3. Quantum Computation and Quantum Information, Michael A. Nielsen & Isaac L. Chuang, Cambridge Universities Press, 2010 Edition.
4. Quantum Computing, Vishal Sahani, McGraw Hill Education, 2007 Edition.
5. Quantum Computing – A Beginner's Introduction, Parag K Lala, Indian Edition, Mc GrawHill, Reprint 2020.
6. Engineering Physics, S P Basavaraj, 2005 Edition, Subhash Stores.
7. Physics for Animators, Michele Bousquet with Alejandro Garcia, CRC Press, Taylor & Francis, 2016.
8. Quantum Computation and Logic: How Quantum Computers Have Inspired Logical Investigations, Maria Luisa Dalla Chiara, Roberto Giuntini, Roberto Leporini, Giuseppe Sergioli, Trendsin Logic, Volume 48, Springer.
9. Statistical Physics: Berkely Physics Course, Volume 5, F. Reif, McGraw Hill.
10. Introduction to Superconductivity, Michael Tinkham, McGraw Hill, INC, II Edition.

Web links and Video Lectures (e-Resources):

- LASER: https://www.youtube.com/watch?v=WgzynezPiyc
- Superconductivity : https://www.youtube.com/watch?v=MT5Xl5ppn48
- Optical Fiber : https://www.youtube.com/watch?v=N_kA8EpCUQo
- Quantum Mechanics : https://www.youtube.com/watch?v=p7bzE1E5PMY&t=136s
- Quantum Computing : https://www.youtube.com/watch?v=jHoEjvuPoB8
- Quantum Computing :https://www.youtube.com/watch?v=ZuvCUU2jD30
- Physics of Animation : https://www.youtube.com/watch?v=kj1kaA_8Fu4
- Statistical Physics Simulation : https://phet.colorado.edu/sims/html/plinko-probability/latest/plinko-probability_en.html
- NPTEL Supercoductivity:https://archive.nptel.ac.in/courses/115/103/115103108/
- https://www.britannica.com/technology/laser,k
- https://nptel.ac.in/courses/115/102/115102124/
- http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html
- https://onlinecourses.nptel.ac.in/noc20_mm14/preview
- W1 Nptel.ac.in
- W2 www.physics.org
- W3 www.physicsclassroom.com
- W4 www.coursera.org

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. **NPTEL Quantum Computing :** https://archive.nptel.ac.in/courses/115/101/115101092
2. **Virtual LAB :**https://www.vlab.co.in/participating-institute-amrita-vishwa-vidyapeetham
3. **Virtual LAB :** https://vlab.amrita.edu/index.php?sub=1&brch=189&sim=343&cnt=1

Useful Journals

- Journal of Nature Physics
- Journal of Foundation of Physics
- Journal of Physical Review
- Journal of Applied Physics
- Journal of Classical and Quantum Gravity

Teaching and Learning Methods

1. Lecture class: 40 hours
2. Practical classes: 36 hours

Laboratory Component:

Any Ten Experiments have to be completed from the list of experiments

Note: The experiments have to be classified into

a) Exercise
b) Demonstration
c) Structured Inquiry
d) Open Ended

Based on the convenience classify the following experiments into above categories. Select at least one simulation/spreadsheet activity.

List of Experiments

1. Determination of wavelength of LASER using Diffraction Grating.
2. Determination of acceptance angle and numerical aperture of the given Optical Fiber.
3. Determination of Magnetic Flux Density at any point along the axis of a circular coil.
4. Determination of resistivity of a semiconductor by Four Probe Method
5. Study the I-V Characteristics of the Given Bipolar Junction Transistor.
6. Determination of dielectric constant of the material of capacitor by Charging and Discharging method.
7. Study the Characteristics of a Photo-Diode and to determine the power responsivity / Verification of Inverse Square Law of Intensity of Light.
8. Study the frequency response of Series & Parallel LCR circuits.
9. Determination of Planck's Constant using LEDs.
10. Determination of Fermi Energy of Copper.
11. Identification of circuit elements in a Black Box and determination of values of the components.
12. Determination of Energy gap of the given Semiconductor.
13. Step Interactive Physical Simulations.
14. Study of motion using spread Sheets
15. Study of Application of Statistics using spread sheets
16. PHET Interactive Simulations(https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype)

CO	PO	PO1	PO2	PO3	PO 4	PO5	PO6	PO 7	PO8	PO9	PO10	PO 11	PO 12	PS O1	PS O2
BPHYS102	K-level														
CO1	K3	K3	K3	-	K2	-	K2	K3	-	-	-	-	K3	K3	K3
CO2	K3	K3	K3	-	K3	-	K3	K3	-	-	-	-	K3	K3	K3
CO3	K3	K3	K3	K3	K2	K3	K3	K3	-	-	-	-	K3	K3	K3
CO4	K3	K3	K3	K3	K3	K3	K3	K3	-	K3	K3	K3	K3	K3	K3
CO5	K3	K3	K2	K3	K2	-	K3	-	-	-	-	-	K3	K3	K3

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation (CIE): 50 marks (Sum of three tests + 20 marks Assignments + 20 marks(15 for daily performance based+5 for lab test) laboratory component.

Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be reduced to 50 Marks.

Test duration: 1 :00 hours

Examination duration: 3 hours

CO to PO mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:** Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:** Environment and Society **PO8:** Ethics **PO9:** Individual & Team Work **PO10:** Communication **PO11:** Project Mngmt & Finance **PO12:** Life long Learning

PSO1: Ability to understand the basic principles, laws, theories and problem solving skills of Engineering Physics and their application in engineering and technology.

PSO2: Ability to apply the concepts of physics to design a process to address the real-world challenges.

Course In charge

Head of the Department
24/08/2023
Dr. C. VASUDEV
Professor & HOD
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Bangalore - 560 109

Principal
Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Management
Bengaluru - 560 109

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF APPLIED SCIENCE

SESSION: 2022-2023 (EVEN SEMESTER)

CO-PO MAPPING

Course: Applied Chemistry for Mechanical Engineering stream

Type: Core (Theory/Practical/Integrated) | **Course Code: BCHEM202**

No of Hours

Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
4	3	7 (4 + 3)	76 (40 + 36)

Marks

Internal Assessment	Examination	Total	Credits
50	50	100	4

Aim/Objectives of the Course

1. To enable students to acquire knowledge on principles of chemistry for engineering applications.
2. To develop an intuitive understanding of chemistry by emphasizing the related branches of engineering.
3. To provide students with a solid foundation in analytical reasoning required to solve societal problems.

Course Learning Outcomes

After completing the course, the students will be able to

CO1	**Apply** redox reaction concept to enhance the efficiency of energy storage systems and also able to determine the calorific value of a fuel.	**Applying (K3)**
CO2	**Utilize** the concept of different corrosion control techniques to protect the engineering metals.	**Applying (K3)**
CO3	**Make use** and explore macromolecules for engineering applications.	**Applying (K3)**
CO4	**Utilize** the principle of phase rule, electrochemical and optical sensors for the estimation of different components in the analyte.	**Applying (K3)**
CO5	**Make use** of alloys, ceramics and nanomaterials for the engineering applications.	**Applying (K3)**

Syllabus Content

MODULE 1: Energy; Source, Conversion and Storage **Fuels:** Introduction, calorific value, determination of calorific value using bomb calorimeter, numerical problems on GCV and NCV. **Green fuels:** Introduction, power alcohol, synthesis and applications of biodiesel. **High energy fuels:** Production of hydrogen by electrolysis of water and its advantages. **Energy devices:** Introduction, construction, working, and applications of Photovoltaic cells, Li-ion battery and methanol-oxygen fuel cell. **Self- learning:** Plastic recycling to fuels and its monomers or other useful products. **Practical Component:**	**CO1** 8 hrs PO1-3 PO2-3 PO3-1 PO5-1 PO6-1

1. Determination of acid value of biofuel (Demonstrative experiment) 2. Synthesis of biodiesel (Open ended experiment) **LO:** At the end of this session the student will be able to 1. Calculate the GCV and NCV of a solid fuel. 2. Apply redox reaction concept to illustrate the working of batteries. 3. Utilize the concepts of chemistry in the production of green fuels.	PO7-1 PO9-3 PO12-1 PSO1-2 PSO2-1
MODULE 2: Corrosion Science and Engineering **Corrosion:** Introduction, electrochemical theory of corrosion, types of corrosion-differential metal, differential aeration (waterline and pitting), stress corrosion (caustic embrittlement). **Corrosion control:** Metal coating-galvanization, surface conversion coating-anodization and cathodic protection-sacrificial anode method. Corrosion testing by weight loss method. Corrosion penetration rate (CPR)-numerical problems. **Metal finishing:** Introduction, technological importance. Electroplating: Introduction, Electroplating of chromium (hard and decorative). Electroless plating: Introduction, electroless plating of nickel. Self-learning: Factors affecting the rate of corrosion, factors influencing the nature and quality of electrodeposit (Current density, concentration of metal ion, Ph and temperature). **Practical Component:** Determination of strength of an acid in Pb-acid battery. **LO:** At the end of this session the student will be able to 1. Utilize the concept of electrochemical theory of corrosion to illustrate various types of corrosion and its control. Also able estimate the iron in TMT bar. 2. Determine corrosion penetration rate of metals at different corrosive medium.	**CO2** 8 hrs PO1-3 PO2-3 PO3-1 PO5-1 PO6-1 PO7-1 PO9-1 PO12-1 PSO1-2 PSO2-1
MODULE 3: Macromolecules for Engineering Applications Polymers: Introduction, methods of polymerization (Condensation and Free radical), molecular weight; number average and weight average, numerical problems. Synthesis, properties and industrial applications of polyvinylchloride (PVC) and polystyrene. Fibers: Introduction, synthesis, properties and industrial applications of Kevlar and Polyester. Plastics: Introduction, synthesis, properties and industrial applications of poly (methyl methacrylate) (PMMA) and Teflon. Composites: Introduction, properties and industrial applications of carbon-based reinforced composites (graphene/carbon nano-tubes as fillers) and metal matrix polymer composites. Lubricants: Introduction, classification, properties and applications of lubricants. Self-learning: Biodegradable polymer: Introduction, synthesis, properties and applications of polylactic acid (PLA). **Practical Component:** 1. Estimation of iron in TMT bar by external indicator method. 2. Determination of Chemical Oxygen Demand (COD) of industrial waste water sample. 3. Determination of Viscosity coefficient of lubricant (Ostwald's viscometer). **LO:** At the end of this session the student will be able to 1. Find Number average and Weight average Molecular weight of polymers to know the nature of polymer. Illustrate the methods of e-waste disposal and extraction of precious metals from e-waste. 2. Explain the synthesis, properties and applications of commercial polymers.	**CO3** 8 hrs PO1-3 PO2-3 PO3-1 PO5-1 PO6-1 PO7-3 PO9-3 PO12-1 PSO1-2 PSO2-1

MODULE 4: Phase Rule and Analytical Techniques Phase rule: Introduction, Definition of terms: phase, components, degree of freedom, phase rule equation. Phase diagram: Two component-lead-silver system. Analytical techniques: Introduction, principle, instrumentation of potentiometric sensors; its application in the estimation of iron, Optical sensors (colorimetry); its application in the estimation of the copper, pHsensor (Glass electrode); its application in the determination of pH of beverages. Self-learning: Determinationofviscosityofbiofuelanditscorrelationwithtemperature **Practical Component:** 1. Conductometric estimation of acid mixture 2. Potentiometric estimation of FAS using $K_2Cr_2O_7$ 3. Determination of pKa of vinegar using pH sensor (Glass electrode) 4. Estimation of Copper present in electroplating effluent (PCB) by optical sensor (colorimetry) 5. Estimation of total hardness of water by EDTA method **LO:** At the end of this session the student will be able to 1. Apply phase rule to illustrate two component system. 2. Make use of principle and instruments of electrochemical and optical sensors for sample analysis.	**CO4** 8 hrs PO1-3 PO2-3 PO3-1 PO5-1 PO6-1 PO7-1 PO9-3 PO12-1 PSO1-2 PSO2-1
MODULE 5: Materials for Engineering Applications Alloys: Introduction, classification, composition, properties and applications of Stainless Steel, Brass and Alnico. Ceramics: Introduction, classification based on chemical composition, properties and applications of perovskites (CaTiO3). Nano chemistry: Introduction, size dependent properties of nanomaterial (surface area, catalytical and thermal), synthesis of nanoparticles by sol-gel, and co-precipitation method. Nano materials: Introduction, properties and engineering applications of carbon nanotubes and graphene. Self-learning: Abrasives: Introduction, classification, properties and applications of silicon carbide(carborundum). **Practical Component:** 1. Synthesis of iron oxide nanoparticles. 2. Estimation of percentage of iron in steel. **LO:** At the end of this session the student will be able to 1. Draw the properties and application of nano materials and Perovskite Materials. 2. Classify different alloys on the basis of its composition and properties. 3. Synthesize iron oxide nano particles by precipitation method.	**CO5** 8 hrs PO1-3 PO2-3 PO3-1 PO5-1 PO6-1 PO7-1 PO9-3 PO12-1 PSO1-2 PSO2-1

Text Books

1. Basuchandra's Applied Chemistry for Electrical and Electronic Engineering Stream Fourth edition-2022
2. A Text Book of Engg. Chemistry, Shashi Chawla, & Co.(P)Ltd.
3. SS Dara & Dr. SS Umare. -A Text book of Engineering Chemistry, S Chand & Company Ltd., 12th Edition, 2011.
4. R.V. Gadag and Nithyananda Shetty-A Text Book of Engineering Chemistry, I.K. International Publishing house. 2nd Edition, 2019.
5. B.S. Jai Prakash, R. Venugopal, Sivakumaraiah& Pushpa Iyengar.,- Chemistry for Engineering Students", Subash Publications, Bangalore.5th Edition, 2014
6. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma & M.S. Pathania, S. Nagin Chand & Co., 41 Edition, 2004.

Reference Books (specify minimum two foreign authors text books)

1. Wiley Engineering Chemistry, Wiley India Pvt .Ltd. New Delhi,2013-2ndEdition.
2. Engineering Chemistry, Satyaprakash & Manisha Agrawal, Khanna Book Publishing, Delhi
3. G.A.Ozin, A.C. Arsenault &Lud ovicoCademartiri "*Nanochemistry A Chemical Approach to Nanomaterials*", Royal Society of Chemistry, First Edition, 2005.

4. Wiley."*Engineering Chemistry*", India Pvt. Ltd. New Delhi. Second Edition. 2013.
5. V.R.Gowariker, N.V.Viswanathan&J.Sreedhar., "*Polymer Science*", Wiley-Eastern Ltd. New Delhi, First Edition, 1986.
6. M.G.Fontana., "*Corrosion Engineering*", Tata McGraw Hill Publishing Pvt. Ltd. New Delhi, Third Edition, 1986.

Weblinks and Video Lectures(e-Resources):

- http://libgen.rs/
- https://nptel.ac.in/downloads/122101001/
- https://nptel.ac.in/courses/104/103/104103019/
- https://ndl.iitkgp.ac.in/
- https://www.youtube.com/watch?v=faESCxAWR9k
- https://www.youtube.com/watch?v=TBqXMWaxZYM&list=PLyhmwFtznRhuz8L1bb3X9IbHrDMjHWWh
- https://www.youtube.com/watch?v=j5Hml6KN4TI
- https://www.youtube.com/watch?v=X9GHBdyYcyo
- https://www.youtube.com/watch?v=1xWBPZnEJk8
- https://www.youtube.com/watch?v=wRAo-M8xBHM

Activity Based Learning (Suggested Activities in Class)/Practical Based learning

- https://www.vlab.co.in/broad-area-chemical-sciences
- https://demonstrations.wolfram.com/topics.php
- https://interestingengineering.com/science

Useful Journals

1. Journal of Power Sources.(*www.**journals**.elsevier.com/**journal-of-power-sources**)*
2. Journal of Alloys and Compounds.(*www.journals.elsevier.com/journal-of-alloys-and-compounds)*
3. Fuel Cells Bulletin.(*www.journals.elsevier.com/**fuel-cells-bulletin***)
4. Electrochemical Acta. (*www.journals.elsevier.com/**electrochimica-acta)***
5. European Polymer Journal. (*www.**journals**.elsevier.com/**european-polymer-journal***)

Teaching and Learning Methods

1. **Lecture class**: 40 hrs
2. **Practical classes:** 36

Assignment: 2 assignments

Type of test/examination: Written examination/Assignment

Continuous Internal Evaluation (CIE):

1. Three Unit Tests each of 25 Marks (**Test duration:** 1hour)
2. Two assignments each of 25 Marks
3. **CIE for the practical component:** On completion of every experiment in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The 15 marks are for conducting the experiment, Brief procedure writeup and preparation of the laboratory record, the other 10 marks shall be for the test conducted at the end of the semester (The laboratory test duration of 03 hours is conducted for 50 marks and scale down to 10 marks)

The sum of two /three tests, two assignments will be out of 100 marks and scale down to 25 marks. Lab component 25 marks added to theory component to access total CIE of 50 marks.

Semester End Exam (SEE):

Theory SEE will be conducted by University as per the scheduled time table, with common question papers for the subject (duration 03 hours)

1. The question paper will have ten questions. Each question is set for 20 marks.

2. There will be 2 main questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), should have a mix of topics under that module. The students have to answer 5 full questions, selecting one full question from each module.
SEE will be conducted for 100 marks (students have to answer all main questions) which will be reduced to 50 Marks.
Examination duration: 3 hrs.

CO to PO Mapping

PO1: Science and engineering Knowledge **PO2:** Problem Analysis **PO3:** Design & Development **PO4:** Investigations of Complex Problems **PO5:** Modern Tool Usage **PO6:** Engineer & Society	**PO7:** Environment and Society **PO8:** Ethics **PO9:** Individual & Team Work **PO10:** Communication **PO11:** Project Mngmt & Finance **PO12:**Lifelong Learning

PSO1: Ability to apply concept of Chemistry to design a system, to address a real-world challenge.
PSO2: Ability to develop effective communication, team work and computational skills.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
BCHEM202	K-level														
CO1	K3	3	3	1	-	1	1	1	-	3	-	-	1	2	1
CO2	K3	3	3	1	-	1	1	1	-	1	-	-	1	2	1
CO3	K3	3	3	1	-	1	1	3	-	3	-	-	1	2	1
CO4	K3	3	3	1	-	1	1	1	-	3	-	-	1	2	1
CO5	K3	3	3	1	-	1	1	1	-	3	-	-	1	2	1

Course In charge

Head of the Department

Principal

Dr. C. VASUDEV
Professor & HOD
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Dr. K. RAMA NARASIMHA
Principal/Director
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Bengaluru - 560 109

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF CIVIL ENGINEERING

SESSION: 2022-2023 (EVEN SEMESTER)

CO-PO Mapping

Course: Green Buildings			
Type: Theory		Course Code: BETCK205B	
No of Hours			
Theory (Lecture Class)+Tutorial	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
3L	-	3	40
Marks			
Internal Assessment	Examination	Total	Credits
50	50	100	3

Aim/Objectives of the Course

- To make students understand the definition, concept & objectives of the terms cost effective construction and green buildings.
- To make students learn the various methods of applying environment friendly and cost effective techniques in construction.
- To make students learn the causes, effects and problems due to global warming.
- To make students learn the concepts, importance and rating systems of green buildings.

Course Learning Outcomes
After completing the course, the students will be able to

CO1	**Explain** the different cost-effective building materials for construction.	**Understanding (K2)**
CO2	**Explain** the various environment friendly and cost effective building technologies in construction.	**Understanding (K2)**
CO3	**Explain** the causes, effects and measures to reduce global warming due to different materials in construction.	**Understanding (K2)**
CO4	**Explain** the different green building rating systems.	**Understanding (K2)**
CO5	**Discuss** the various alternative sources of energy and effective management of water, solid waste and sewage.	**Understanding (K2)**

Syllabus Content

Module 1: Introduction to the concept of cost effective construction -Uses of different types of materials and their availability -Stone and Laterite blocks- Burned Bricks- Concrete Blocks- Stabilized Mud Blocks- Lime Pozzolana Cement- Gypsum Board- Light Weight Beams-Fiber Reinforced Cement Components- Fiber Reinforced Polymer Composite-Bamboo-Availability of different materials-Recycling of building materials- Brick- Concrete- Steel- Plastics - Environmental issues related to quarrying of building materials.	**CO1** 8 hrs PO1-3 PO6-3 PO7-3 PO12 -3 PSO1-3

LO: At the end of this session the student will be able to, 1. Explain the concept of cost-effective construction. 2. Explain the different types of building materials, their properties and applications. 3. Explain the various Environmental issues related to quarrying of building materials.	PSO2-2
Module 2: Environment friendly and cost effective Building Technologies - Different substitute for wall construction Flemish Bond - Rat Trap Bond – Arches – Panels - Cavity Wall - Ferro Cement and Ferro Concrete constructions – different pre cast members using these materials - Wall and Roof Panels – Beams – columns - Door and Window frames - Water tanks - Septic Tanks – Alternate roofing systems - Filler Slab - Composite Beam and Panel Roof -Pre-engineered and ready to use building elements - wood products - steel and plastic - Contributions of agencies - Cost ford -Nirmithi Kendra – Habitat. **LO:** At the end of this session the student will be able to, 1. Explain the various alternative techniques used for construction of walls. 2. Explain about ferrocement and ferroconcrete constructions. 3. Explain the various alternate roofing systems.	**CO2** 8 hrs PO1-3 PO6-3 PO7-3 PO12 -3 PSO1-3 PSO2-2
Module 3: Global Warming – Definition - Causes and Effects - Contribution of Buildings towards Global Warming - Carbon Footprint – Global Efforts to reduce carbon Emissions Green Buildings – Definition - Features- Necessity – Environmental benefit - Economical benefits - Health and Social benefits - Major Energy efficient areas for buildings – Embodied Energy in Materials Green Materials - Comparison of Initial cost of Green V/s Conventional Building - Life cycle cost of Buildings. **LO:** At the end of this session the student will be able to, 1. Define global warming. 2. Explain the necessity, causes and effects of global warming due to building materials in construction. 3. Discuss the measures undertaken to reduce global warming and carbon footprint. 4. Explain embodied energy in materials used for construction. 5. Explain the concept of life cycle cost of buildings.	**CO3** 8 hrs PO1-3 PO6-3 PO7-3 PO12 -3 PSO1-3 PSO2-2
Module 4: Green Building rating Systems- BREEAM – LEED - GREEN STAR - GRIHA (Green Rating for Integrated Habitat Assessment) for new buildings – Purpose - Key highlights - Point System with Differential weight age. Green Design – Definition - Principles of sustainable development in Building Design - Characteristics of Sustainable Buildings – Sustainably managed Materials - Integrated Lifecycle design of Materials and Structures (Concepts only). **LO:** At the end of this session the student will be able to 1. Explain the various rating systems for green buildings. 2. Explain the concept of green design and principles of sustainable development in building design. 3. Explain the concept of integrated lifecycle design of materials and structures.	**CO4** 8 hrs PO1-3 PO6-3 PO7-3 PO12 -3 PSO1-3 PSO2-2

Module 5: Utility of Solar Energy in Buildings Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings. **Green Composites for Buildings** Concepts of Green Composites. Water Utilization in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment. **LO:** At the end of this session the student will be able to 1. Explain the alternate sources of energy in building construction. 2. Explain the concept of solar passive cooling and heating of buildings. 3. Explain the concept of green composites. 4. Discuss the various methods to be adopted for effective utilization of water and management of solid waste and sewage.	**CO5** 8 hrs PO1-3 PO6-3 PO7-3 PO12 -3 PSO1-3 PSO2-2

Text Books

1. Harihara Iyer G, Green Building Fundamentals, Notion Press.
2. Dr. Adv. Harshul Savla, Green Building: Principles & Practices.

Reference Books

1. Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery, 5th Edition, March 2022.
2. Abe Kruger, Green Building: Principles and Practices in Residential Construction, Delmar Cengage Learning; New edition (3 January 2012)
3. LEED Certification Guidebook.
4. IGBC Green New Buildings Rating System (Version 3.0).

Useful Websites

1. https://www.youtube.com/watch?v=THgQF8zHBW8
2. https://www.youtube.com/watch?v=DRO_rIkywxQ

Useful Journals

1. Journal of Green Building (https://www.scienceopen.com/collection/JournalofGreenBuilding)
2. Sustainable Buildings (https://www.sustainable-buildings-journal.org/)

Teaching and Learning Methods

Lecture class: 40 hrs
Tutorial class: 11hrs
Revision class: 05 hrs

Assessment

Type of test/examination: Written examination.
Continuous Internal Evaluation (CIE): 50 marks. Average of two internal assessment tests each of 25 marks. Any two assessment methods (continuous comprehensive assessments: assignments, problem-solving activity, quiz, presentations, group discussions) for 25 marks.
Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be scaled down to 50 marks.
Test duration: 1 hr
Examination duration: 3 hrs

CO to PO Mapping

PO1: Science and Engineering Knowledge	**PO7:**Environment and Society
PO2: Problem Analysis	**PO8:**Ethics
PO3: Design & Development	**PO9:**Individual & Team Work
PO4: Investigations of Complex Problems	**PO10:** Communication
PO5: Modern Tool Usage	**PO11:**Project Mngmt & Finance
PO6: Engineer & Society	**PO12:**Life long Learning

PSO1: The proficiency in mathematics, physical and management sciences helps to excel in the areas of planning, analysis related to Civil Engineering systems.

PSO2: Identify sustainable materials and technologies, codes of practice in construction industry and transportation Systems.

CO	PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
BETCK 205B	K-level														
CO1	K2	3	-	-	-	-	3	3	-	-	-	-	3	3	2
CO2	K2	3	-	-	-	-	3	3	-	-	-	-	3	3	2
CO3	K2	3	-	-	-	-	3	3	-	-	-	-	3	3	2
CO4	K2	3	-	-	-	-	3	3	-	-	-	-	3	3	2
CO5	K2	3	-	-	-	-	3	3	-	-	-	-	3	3	2

Course In charge

IQAC

Head - Dept

Professor & Head
Dept. of Civil Engineering
K.S. Group of Institutions
K.S. School of Engineering & Management
Bangalore-560 062.

Principal
Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Management
Bengaluru - 560 109

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CO-PO Mapping

Course: WIRELESS AND CELLULAR COMMUNICATION			
Type: Core		Course Code: 18EC81	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total hours/Week	Total teaching hours
3	0	3	40
Marks			
Internal Assessment	Examination	Total	Credits
40	60	100	3

Aim/Objectives of the Course:

1. Understand the concepts of propagation over wireless channels from a physics standpoint.
2. Application of Communication theory both Physical and networking to understand GSM systems that handle mobile telephony
3. Application of Communication theory both Physical and networking to understand CDMA systems that handle mobile telephony.
4. Application of Communication theory both Physical and networking to understand LTE-4G systems.

Course Learning Outcomes
After completing the course, the students will be able to

CO1	**Explain** concepts of propagation mechanisms like Reflection, Diffraction, Scattering in wireless channels.	**Applying (K3)**
CO2	**Develop** a scheme for idle mode, call set up, call progress handling and call tear down in a GSM cellular network.	**Applying (K3)**
CO3	**Develop** a scheme for idle mode, call set up, call progress handling and call tear down in a CDMA cellular network.	**Applying (K3)**
CO4	Understand **develop** the Basic operations of Air interface in a LTE 4G system.	**Applying (K3)**
CO5	**Explain** concepts of OFDMA and SC-FDMA used in LTE and LTE Standards.	**Applying (K3)**

Syllabus Content

Module-1 **Mobile Radio Propagation** – Large Scale Path Loss - Free Space Propagation Model, Relating Power to Electric Field, Three Basic Propagation Mechanisms – Reflection (Ground Reflection) , Diffraction, Scattering, Practical Link Budget. **Fading and Multipath** – Broadband wireless channel, Delay Spread and Coherence Bandwidth, Doppler Spread and Coherence Time, Angular spread and Coherence Distance. Statistical Channel Model of a Broadband Fading Channel. **The Cellular Concept** – Cellular Concept, Analysis of Cellular Systems, Sectoring. **LO:** At the end of this session the student will be able to, 1. Explain Free space Propagation model. 2. Explain Propagation Mechanisms. 3. Path loss and derive the expression for path loss 4. Analyze Cellular Systems, Sectoring	**CO1** 08 hrs PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PSO1-3 PSO2-2
Module-2 **GSM and TDMA Technology**	**CO2**

GSM System overview – Introduction, GSM Network and System Architecture, GSM Channel Concept. **GSM System Operations** – GSM Identities, System Operations –Traffic cases, GSM Infrastructure Communications (Um Interface). **LO:** At the end of this session the student will be able to, 1. Explain GSM System operation, GSM Identities 2. Explain GSM Network Architecture, Infrastructure Communications. 3. Explain and solve problems on Channel Concept	08 hrs PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PSO1-3 PSO2-2
Module-3 **CDMA Technology** **CDMA System Overview** – Introduction, CDMA Network and System Architecture **CDMA Basics** – CDMA Channel Concepts, CDMA System (Layer 3) operations, 3G CDMA **LO:** At the end of this session the student will be able to, 1. Explain CDMA System operation, CDMA Basics 2. Explain CDMA Network Architecture and Channel Concept 3. Understand the concept of 3G CDMA	**CO3** 08 hrs PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PSO1-3 PSO2-2
Module-4 **LTE – 4G** **Key Enablers for LTE 4G** – OFDM, SC-FDE, SC-FDMA, Channel Dependant Multiuser Resource Scheduling, Multi-Antenna Techniques, Flat IP Architecture, LTE Network Architecture. **Multi-Carrier Modulation** – Multicarrier concepts, OFDM Basics, OFDM in LTE, Timing and Frequency Synchronization, Peak to Average Ration, SC-Frequency Domain Equalization, Computational Complexity Advantage of OFDM and SC-FDE. **LO:** At the end of this session the student will be able to, 1. **Discuss** the key enabling technologies used in LTE design. 2. **Explain** the OFDM concept and how it is used in LTE. 3. Explain Channel Dependent Multiuser Resource Scheduling, Multi-Antenna Techniques. 4. Explain LTE Network Architecture.	**CO4** 08 hrs PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PSO1-3 PSO2-2
Module-5 **LTE - 4G OFDMA and SC-FDMA** – Multiple Access for OFDM Systems, OFDMA, SCFDMA, Multiuser Diversity and Opportunistic Scheduling, OFDMA and SC-FDMA in LTE, OFDMA system Design Considerations. **The LTE Standard** – Introduction to LTE and Hierarchical Channel Structure of LTE, Downlink OFDMA Radio Resources, Uplink SC-FDMA Radio Resources. **LO:** At the end of this session the student will be able to, 1. Explain Multiple Access for OFDM Systems 2. Explain OFDMA system Design Considerations 3. Explain Hierarchical Channel Structure of LTE 4. Explain Downlink OFDMA Radio Resources, Uplink SC-FDMA Radio Resources	**CO5** 08 hrs PO1-3 PO2-2 PO3-2 PO5-1 PO6-2 PO12 -1 PSO1-3 PSO2-2

Text Books:

1. "Fundamentals of LTE" Arunabha Ghosh, Jan Zhang, Jefferey Andrews, Riaz Mohammed, Pearson education (Formerly Prentice Hall, Communications Engg and Emerging Technologies), ISBN-13: 978-0-13-703311-9.
2. "Introduction to Wireless Telecommunications Systems and Networks", Gary Mullet, First Edition, Cengage Learning India Pvt Ltd., 2006, ISBN - 13: 978-81-315-0559-5.

Reference Books:

1. "Wireless Communications: Principles and Practice" Theodore Rappaport, 2nd Edition, Prentice Hall Communications Engineering and Emerging Technologies Series,2002,ISBN 0- 13-042232-0.
2. LTE for UMTS Evolution to LTE-Advanced' Harri Holma and Antti Toskala, Second Edition - 2011, John Wiley & Sons, Ltd. Print ISBN: 9780470660003. 2

Useful Websites

1. https://www.tutorialspoint.com/wireless_communication/index.htm
2. https://onlinecourses.nptel.ac.in/noc21_ee66/preview
3. https://www.coursera.org/learn/wireless-communications
4. https://www.coai.com/home
5. https://www.gsma.com/

Useful Journals

1. IEEE transaction on Wireless communication:- www.ieee.org/
2. https://www.hindawi.com/journals/wcmc/
3. https://jwcn-eurasipjournals.springeropen.com/

Teaching and Learning Methods

1. Lecture class: 40 hours
2. Practical classes: 0 hours

Assessment:

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 40 marks (30 marks -Average of three tests + 10 marks Assignments)

Semester End Exam (SEE): 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.

Test duration: 1 :30 hours

Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge	**PO7:** Environment and sustainability
PO2: Problem Analysis	**PO8:**Ethics
PO3: Design & Development	**PO9:**Individual & Team Work
PO4: Investigations of Complex Problems	**PO10:**Communication
PO5: Modern Tool Usage	**PO11:**Project Mngmt & Finance
PO6: Engineer & Society	**PO12:**Lifelong Learning

PSO1: Be able to acquire knowledge and apply concepts in the field of engineering and interdisciplinary subjects.

PSO2: Be able to identify the existing problems, effectively utilize tools to provide solution, and disseminate the information.

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
18 EC36	K-level														
CO1	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2
CO2	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2
CO3	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2
CO4	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2
CO5	K3	3	2	2	-	1	2	-	-	-	-	-	1	3	2

Course In-charge

Head - Dept

Principal
Dr. K. RAMA NARAS
Principal/Director
K S School of Engineering and
Bengaluru - 560 10

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF MANAGEMENT STUDIES

CO-PO Mapping

Course: FINANCIAL MANAGEMENT			
Type: CORE		Course Code: 22MBA22	
No of Hours			
Theory (Lecture Class)	Practical/Field Work/Allied Activities	Total/Week	Total teaching hours
3	2	5	52
Marks			
Internal Assessment	Examination	Total	Credits
50	50	100	3

Aim/Objectives of the Course

1. To familiarize the students with basic concepts of financial management and financial system.
2. To understand concept of time value of money and its implication.
3. To evaluate the investment proposals.
4. To understand the management of working capital in an organization.
5. To analyse capital structure and dividend decision of an Organization.

Course Learning Outcomes
After completing the course, the students will be able to:

CO1	**Understand** the basic financial concepts	**Understanding (K1)**
CO2	**Apply** time value of money	**Applying (K3)**
CO3	**Evaluate** the Cost of Capital	**Applying (K3)**
CO4	**Analyze** the capital structure and dividend decisions	**Applying (K3)**
CO5	**Evaluate** the investment decisions	**Applying (K3)**
CO6	**Estimate** working capital requirements	**Applying (K3)**

Syllabus Content

Unit 1: (7 Hours) Introduction: Financial Management: Definition and scope - objectives of Financial Management, role and functions of finance managers. Interface of Financial Management with other functional areas. **Indian Financial System**: Structure - Types Financial markets, Financial Instruments, Financial institutions and financial services. Non-Banking Financial Companies(NBFCs) Emerging areas in Financial Management: Risk Management, Behavioural Finance, Financial Engineering, Derivatives (Theory). **LO:** At the end of this session the student will be able to 1. Describe the significance of Financial Management. 2. Explain Emerging issues in Financial Management? 3. Write short note on Derivatives. 4. Describe all Money Market Instruments?	**CO1** 07 hrs PO1, PO5 PSO1

5. Explain Capital Market?	
Unit 2: (9 Hours) Time value of money : Meaning of Time value of money –Future value of single cash flow & annuity, present value and Discounting – Present Value of single cash flow, annuity & perpetuity. Simple interest & Compound interest, Capital recovery factor & Equated Annual Instalments (Theory & Problem). **LO:** At the end of this session the student will be able to 1. Define term Time Value of money? 2. Explain the forms of time value of money. 3. What is Annuity 4. Distinguish between Compound Interest and Simple Interest?	**CO2** 9 hrs. PO3,PSO2
Unit 3: (9 Hours) Long term Sources of Finance and Cost of Capital: Shares, Debentures, Term loans and Deferred Credit - Lease financing, Hybrid financing, Venture Capital, Angel investing –Crowd Funding (Theory Only). **Cost of Capital**: Basic concepts. Components and computation of Cost of Capital Cost of debenture capital, cost of preferential capital, cost of term loans, cost of equity capital (Dividend discounting and CAPM model) - Cost of retained earnings - Determination of Weighted average cost of capital (WACC) (Theory & Problem). **LO:** At the end of this session the student will be able to 1. Define Shares and Debentures? 2. Determine the meaning of Hybrid Financing and Venture Capital. 3. Discuss the Cost of Capital. 4. Explain Dividend Discounting and CAPM Model?	**CO3** 9 hrs PO2, PO3, PSO3
Unit 4: (9 Hours) Capital Structure and Dividend Decisions : Capital Structure- Planning the capital structure- Optimum Capital Structure – Determination of Capital Structure Governance of Equity and Debt. Leverages, EBIT and EPS analysis. Return on Investment (ROI) & Return On Earnings (ROE) analysis. (Theory & Problem). **Dividend decisions & Policy** – Factors affecting the dividend policy – types of Dividend Policies- Forms of Dividend – Bonus issue- Stock Split (Theory Only) **LO:** At the end of this session the student will be able to 1. Discuss the factors affecting Dividend Policy. 2. How do you calculate Leverages? 3. Write short note on Capital Structure. 4. What is Debt Financing.	**CO4** 9hrs PO4, PSO3
Unit 5: (9 Hours) Long Term Investment Decisions(Capital Budgeting): Need & Importance of Capital budgeting & its process, Techniques of Capital	**CO5** 9 hrs

Budgeting– (Payback period, time adjusted payback period, accounting rate of return, Net present value, Internal rate of return, Modified internal rate of return, Profitability index Method). Capital Rationing. Estimation of Cash Flows for new Projects & replacement project . (Theory & Problems). **LO:** At the end of this session the student will be able to 1. Outline the meaning of Net Present Value 2. Discuss the Capital Budgeting Process. 3. Explain the Investment Evaluation Techniques.	PO2,PO4, PSO4
Unit 6: (9 Hours) Working Capital Management : Sources of Working Capital - Factors influencing working capital requirements - Current asset policy and current asset finance policy- Determination of operating cycle and cash cycle - Estimation of working capital requirements of a firm. (Theory Only). Case study on Working Capital Determination and the impact of negative working capital. **LO:** At the end of this session the student will be able to 1. Explain the Operating Cycle and Cash Cycle. 2. Explain the impact of Net Working Capital. 3. Discuss the factors influencing Working Capital Requirements.	**CO-6** 9 hrs PO1, PO5, PSO1

Suggested Learning Resources:
Books

1. Financial Management: Text, Problems & Cases by M Y Khan and P K Jain , TMH 7e, 2017
2. Financial Management: Theory & Practice by Prasanna Chandra , TMH 10e, 2019
3. Financial Management by Dr. G Nagarajan & Dr. Binoy Mathew, Jayvee Digital Publishing, 2/e , 2022
4. Financial Management by Prahlad Rathod, Babitha Thimmiah and Harish Babu , HPH 1e, 2015.
5. Financial Management by I.M. Pandey , Vikas Publishing House Pvt. Ltd, 11e

Useful Web links & Video Lectures (e-resources)

https://www.pdfdrive.com/financial-management-and-analysis-workbook-step-by-step-exercises-and-tests-tohelp-you-master-financial-management-and-analysis-e158595305.html
https://www.pdfdrive.com/fundamentals-of-financial-management-concise-sixth-edition-e20229517.html
https://www.youtube.com/watch?v=CCQwz_Gwo6o
https://www.digimat.in/nptel/courses/video/110107144/L01.html

Note: The aforesaid links and study materials are suggestive in nature, they may be used with due regards to copyrights, patenting and other IPR rules.

Useful Journals

- Journal of Finance
- Journal of Financial Economics
- Review of Financial studies
- Global Finance Journal
- Indian Journal of Finance

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF MANAGEMENT STUDIES

CO-PO Mapping

Teaching and Learning Methods

1. Lecture class: 44 hrs
2. Practical classes: 08 hrs

Question Paper: 40 % Theory 60% problems

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 50 marks (Average of TWO tests will be considered)

Semester End Exam(SEE) : 100 marks (students have to answer all main questions) which will be reduced to 50 Marks.

Test duration: 1 :30 hrs

Examination duration: 3 hrs

PROGRAM OUTCOMES:

PO 1. Apply knowledge of management theories and practices to solve business problems.

PO 2. Foster analytical and critical thinking abilities for data-based decision making.

PO 3. Ability to develop value-based leadership.

PO 4. Ability to understand, analyse and communicate global, economic, legal and ethical aspects of business.

PO 5. Ability to lead themselves and others in the achievement of organizational goals contributing effectively to a team environment.

PROGRAM SPECIFIC OUTCOMES (PSOs):

The post graduate students of the department shall be able to

PSO1) Comprehend the contemporary features and characteristics of Business Management Science and its administration

PSO2) Analyse and interpret the dynamic situations for making Business Management strategies and decisions at the national and global level

PSO3) Handle responsibility with the ethical values for all actions undertaken by them.

PSO4) Adapt and focus on achieving the organisational goal and objectives with complete zeal and commitment.

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BANGALORE - 560109

DEPARTMENT OF MANAGEMENT STUDIES

CO-PO Mapping

CO		PO					PSO			
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4
22MBA22	K- Level	-	-	-	-			-		
CO1	K3	1	-	-	-	2	3			
CO2	K3			2		-		2		
CO3	K3		2	2		-			2	
CO4	K3		-		3	-			2	
CO5	K3		2		2	-				3
CO6	K3	1	-		-	2	3			

Course in Charge

HOD-MBA

Professor & HOD-MBA,
K.S School of Engineering & management,
#15, Mallasandra, Off. Kanakapura Road.
Bengaluru - 560 109.

IQAC

Principal

Dr. K. RAMA NARASIMHA
Principal/Director
K S School of Engineering and Manageme
Bengaluru - 560 109

KSSEM

K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU - 560109

DEPARTMENT OF MECHANICAL ENGINEERING

SESSION: 2022-2023 (EVEN SEMESTER)

CO-PO MAPPING

Course: Finite Element Method			
Type: Core		**Course Code:18ME61**	
No of Hours per week			
Theory (Lecture Class)	Theory (Lecture Class)	Theory (Lecture Class)	Total teaching hours
4	4	4	50
Marks			
Internal Assessment	Internal Assessment	Internal Assessment	Credits
40	40	40	4

Aim/Objective of the Course:

To have a knowledge of different coordinate systems

1. To have a knowledge of shape functions
2. To have a working knowledge of solving problems by finite element method
3. To get an idea of finding frequency and mode shapes of the elements

Course Learning Outcomes

After completing the course, the students will be able to

CO1	Explain the basic concepts of Theory of Elasticity, basic principles of Finite Element Method and solve problems by using Potential energy principles, RR and Galerkins method	**Applying (K3)**
CO2	Derive the shape functions for different types of elements and Solve the Problems on Trusses and bars	**Applying (K3)**
CO3	Solve the problems on beams and derive the equations of deflection in beams	**Applying (K3)**
CO4	Derive the stiffness matrix and solve the thermal problems using FEM	**Applying (K3)**
CO5	Derive the displacement, stress and strain relation for axisymmetric problems and solve the same numeric	**Applying (K3)**

Syllabus Content

MODULE: 1 **Introduction to Finite Element Method:** General description of the finite element method. Engineering applications of finite element method. Boundary conditions: homogeneous and nonhomogeneous for structural, heat transfer and fluid flow problems. Potential energy method, Rayleigh Ritz method, Galerkin's method, Displacement method of finite element formulation. Convergence criteria, Discretization process, Types of elements: 1D, 2D and 3D, Node numbering, Location of nodes. Strain displacement relations, Stress strain relations, Plain stress and Plain strain conditions, temperature effects.	CO1 08 hrs PO1-3 PO2-3 PO3-3 PO4-2 PO5-2

Interpolation models: Simplex, complex and multiplex elements, Linear interpolation polynomials in terms of global coordinates 1D, 2D, 3D Simplex Elements LO: After the completion of the chapter the student will be able to 1. Summarize the fundamentals of Theory of Elasticity 2. Identify a problem as plane stress or plane strain based on loading and geometry of the structure 3. Describe the basic principles of Finite Element Method with its applications and limitations 4. Identify the different types of elements used in Finite Element Method	PO6-1 PO12-1

MODULE: 2 **One-Dimensional Elements-Analysis of Bars Trusses:** Linear interpolation polynomials in terms of local coordinate's for 1D, 2D elements. Higher order interpolation functions for 1D quadratic and cubic elements in natural coordinates, Constant strain triangle, Four-Nodded Tetrahedral Element (TET 4), Eight-Nodded Hexahedral Element (HEXA 8), 2D isoperimetric element, Lagrange interpolation functions, Numerical integration: Gaussian quadrature one point, two point formulae, 2D integrals. Fore terms: Body force, traction force and point loads **Numerical Problems:** Solution for displacement, stress and strain in 1D straight bars, stepped bars and tapered bars using elimination approach and penalty approach, Analysis of trusses LO: After the completion of the chapter the student will be able to:- 1. Derive Euler-Lagrange equation and apply it to bars, beam (cantilever/simply supported and fixed) with different loading and end conditions 2. Describe the Principle of virtual work and principle of minimum potential energy 3. Summarize Rayleigh Ritz method and Galerkin's method and determine the displacement, strain and stress in bars and beams using those methods	CO2 08 hrs PO1-3 PO2-3 PO3-2 PO4-2 PO5-2 PO6-1 PO12-1
MODULE: 3 **Beams and Shafts**: Boundary conditions, Load vector, Hermite shape functions, Beam stiffness matrix based on Euler-Bernoulli beam theory, Examples on cantilever beams, propped cantilever beams, Numerical problems on simply supported, fixed straight and stepped beams using direct stiffness method with concentrated and uniformly distributed load. **Torsion of Shafts:** Finite element formulation of shafts, determination of stress and twists in circular shafts. LO: Student will be able to 1. Explain the interpolation polynomials corresponding to different element types used in FEM 2. Define simplex, complex and multiplex elements 3. Explain the use of 2D PASCAL's triangle in determining the polynomial function for an element in FEM 4. Explain with an illustration the importance of Jacobian transformation	CO3 08 hrs PO1-3 PO2-3 PO3-3 PO4-2 PO5-2 PO6-1 PO12-1

matrix.	
MODULE: 4 **Heat Transfer:** Basic equations of heat transfer: Energy balance equation, Rate equation: conduction, convection, radiation, energy generated in solid, energy stored in solid, 1D finite element formulation using vibrational method, Problems with temperature gradient and heat fluxes, heat transfer in composite sections, straight fins. LO: Student will be able to 1. Derive the shape function, element stiffness matrix and load vector matrix of a bar element used in FEM 1. Analyse the structural problems involving bars for maximum stresses by discretizing it with 1D bar elements	CO4 08 hrs PO1-3 PO2-3 PO3-3 PO4-2 PO5-2 PO6-1 PO12-1
MODULE: 5 **Axi-symmetric Solid Elements:** Derivation of stiffness matrix of axisymmetric bodies with triangular elements, Numerical solution of axisymmetric triangular element(s) subjected to point loads. **Dynamic Considerations:** Formulation for point mass, Consistent element mass matrix of one-dimensional bar element, truss element, Lumped mass matrix of bar element, truss element. LO: Student will be able to 1. Apply Langrange's interpolation function to determine the shape function for higher order 1D, 2D elements. 2. Distinguish between Iso, sub and super parametric elements. Evaluate the given integral using one point and two-point Gauss-quadrature	CO5 08 hrs PO1-3 PO2-3 PO3-3 PO4-2 PO5-2 PO6-1 PO12-1

Text Books:

1. **Logan, D. L.,** A first course in the finite element method,6th Edition, Cengage Learning, 2016.
2. **Rao, S. S.,** Finite element method in engineering, 5th Edition, Pergaman Int. Library of Science, 2010.
3. R.Chandrupatla, "Introduction to Finite Elements in Engineering", 4th Edition, Prentice Hall, 2013.

Reference Books (specify minimum two foreign authors textbooks)

1. J.N.Reddy, "Finite Element Method"- McGraw -Hill International Edition. Bathe K. J. Finite Elements Procedures, PHI.
2. Cook R. D., et al. "Concepts and Application of Finite Elements Analysis"- 4th Edition, Wiley & Sons, 2003
3. Olek C Zienkiewicz, Robert L Taylor, J.Z. Zhu, "The Finite Element Method: Its Basis and Fundamentals", 6th Edition, Butterworth Heinemann 2005.

Useful Websites

- http://audilab.bmed.mcgill.ca/AudiLab/teach/fem/fem.html
- http://nptel.ac.in/courses/112104115/
- http://freevideolectures.com/Course/2358/Introduction-to-Finite-Element- Method

Useful Journals

- Finite Elements in Analysis and Design, An International Journal for Innovations in Computational Methodology and Application, Elsevier.
- International Journal of Computational Methods, World Scientific.

Teaching and Learning Methods

1. Lecture class: 40 hours
2. Practical classes: 3 hours

Assessment

Type of test/examination: Written examination

Continuous Internal Evaluation(CIE) : 40 marks (30 marks -Average of three tests + 10 marks Assignments)

Semester End Exam(SEE) : 100 marks (students have to answer all main questions) which will be reduced to 60 Marks.

Test duration: 1 :30 hours

Examination duration: 3 hours

CO to PO Mapping

PO1: Science and engineering Knowledge	**PO7:** Environment and Society
PO2: Problem Analysis	**PO8:** Ethics
PO3: Design & Development	**PO9:** Individual & Teamwork
PO4: Investigations of Complex Problems	**PO10:** Communication
PO5: Modern Tool Usage	**PO11:** Project Mngmt & Finance
PO6: Engineer & Society	**PO12:** Life long Learning

PSO1: Ability to apply concept of mechanical engineering to design a system, a component or a process/system to address a real world challenges

PSO2: Ability to develop effective communication, team work, entrepreneurial and computational skills

CO	PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO12	PS O1	PS O2
18M E61	K-level														
CO1	K3	3	3	3	2	-	1	-	-	-	-	-	1	3	1
CO2	K3	3	3	2	2	-	1	-	-	-	-	-	1	3	1
CO3	K3	3	3	3	2	1	1	-	-	-	-	-	1	3	1
CO4	K3	3	3	3	2	1	1	-	-	-	-	-	1	3	1
CO5	K3	3	3	3	2	1	1		-	-	-	-	1	3	1

Course In charge **Head of the Department** **Principal**