

JVE - 301/ JVE- 401
Human Values and Professional Ethics

Universal
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2 2 0

Objectives:

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcome:

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

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

UNIT-1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-2 Understanding Harmony in the Human Being - Harmony in Myself

Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT-3 Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas*) and Respect (*Samman*) as the foundational values of relationship, Understanding the meaning of *Vishwas*; Difference between intention and competence, Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): *Samadhan*, *Samridhi*, *Abhay*, *Sah-astitva* as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (*AkhandSamaj*), Universal Order (*SarvabhaumVyavastha*) - from family to world family!.

UNIT-4 Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-5 Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly

production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations.

Text Books:

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

References:

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
3. Susan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.
5. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
6. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
7. A N Tripathy, 2003, Human Values, New Age International Publishers.
8. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.
12. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

Course Objectives:

- Students will be able to **UNDERSTAND** the nature and objective of Technical Communication relevant for the work place as Engineers.
- Students will be able to **DEVELOP** an understanding of key concepts of writing, designing and speaking.
- Students will be able to **UTILIZE** the technical writing skills for the purposes of Technical Communication and its exposure in various dimensions.
- Students will be able **BUILD UP** interpersonal communication traits that will make the transition from institution to workplace smoother and help them to excel in their jobs.
- Students will be able to **APPLY** technical communication to build their personal brand and handle crisis communication.

Unit 1 : Fundamentals of Communication and Voice Dynamics:

Role and Purpose of Communication, Types & Flow of Communication, Barriers to Effective Communication, 7 C's of Communication, Code and Content; Stimulus & Response, Vowel Sounds, Consonant Sounds, Tone: Rising and Falling Tone.

Unit 2 : Communication Skills for Career Building

CV and Résumé Writing, Interview Skills, Group Discussion, Effective Profiling, Communication and Networking: Building relationships, Writing the Statement of Purpose (SOP) for admission in Higher Studies, Seminar & Conference Paper Writing, Expert Technical Lecture: Writing and Presenting.

Unit 3: Communication Skills for Presentation: Writing, Designing, and Speaking

Thesis and Project Report Writing, Technical Proposal Writing, How to Pitch an Idea: Process, Preparation and Structure, Elements of Speech Delivery: Passion, Poise & Illustrations.

Unit 4 : Communication and Leadership Development

Leadership Communication, Communication and Social competence: context, feelings, intentions, behaviors, Providing and Receiving feedback, Difference between Tact and Intelligence, Emotional Intelligence: Trust through Communication, Thinking Skills: Meaning and Types.

Unit 5 : Digital Communication and Personality Making

Content Creation for Social Media: Emails, Webinars, podcasts, Blogs. Effective and Ethical use of Social Media by Text and Technique, Speech and Personality, Personality Analysis: Types of Personality; Concept of Personality: Maslow, Freud, Vivekananda, Jung Typology & Personality Assessment.

Prescribed Books:

1. Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2018, New Delhi
2. Personality Development and Soft Skills by Barun K. Mitra, OUP, 2012, New Delhi.
3. Technical Communication, by Pfeiffer, 6th edn (Pearson)
4. Soft Skills & Employability, Sabina Pillai and Agna Fernandez Cambridge University Press 2018.
5. Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S.Publications India Ltd.; Krishan Nagar, 2014, Delhi.

Web link/ free resources for reference:

- <https://online.hbs.edu/blog/post/leadership-communication>
- <https://blog.hubspot.com/marketing/content-creation>
- <https://vincenttriola.com/blogs/ten-years-of-academic-writing/sigmund-freud-carl-jung-carl-rogers-abraham-maslow>
- <https://www.verywellmind.com/jungs-theory-of-personality-learning-styles-2795160>
- <https://www.humanmetrics.com/personality>
- <https://hbr.org/2022/11/how-great-leaders-communicate>

ENGINEERING MATHEMATICS-III (JAS-301/JAS-401)
(For Third/ Fourth Semester)
(Function of Complex Variable, Statistical and Numerical Techniques)
(To be offered to all branches)

Course Objective:-The objective of this course is to familiarize the students with the functions of complex variables, statistical and numerical techniques along with their applications in different areas of engineering and technology. It aims to present with standard concepts and tools at an Intermediate to superior level that will provide them well to words undertaking a variety of problem in the various disciplines.

L T P: 3 1 0

Contents	Contact Hours
Module I: Complex Variable–Differentiation Functions of complex variable, Limit, Continuity and differentiability, Analytic functions, Cauchy-Riemann equations (Cartesian and Polar form), Harmonic function, Harmonic Conjugate, Milne’s Thomson Method, Conformal mapping, Mobius transformation and their properties	08
Module-II: Complex Variable–Integration Complex integration, Cauchy-Integral theorem, Cauchy Integral formula, Cauchy Integral Formula for derivatives, Taylor’s and Laurent’s Series, Zeros and Singularities and its classification, Residues, Cauchy’s Residue theorem and its applications	08
Module III: Statistical Techniques Moments, Skewness, Kurtosis, Curve Fitting: Method of least squares, Fitting of straight lines, polynomials, Exponential curves, Correlation and Regression, Binomial distribution, Poisson Distribution and Normal distribution, Test of Significance, Sampling Theory (small & large), Null Hypothesis, Alternative Hypothesis, Test of hypothesis: Chi-square test, t-test	08
Module IV: Numerical Techniques-I Zeroes of transcendental and polynomial equations using Bisection method, Regula-Falsi method and Newton’s Raphson method and their Rate of convergence Interpolation: Finite differences, Newton’s Forward and Backward difference interpolation Formulae, Lagrange’s interpolation formula and Newton’s divided difference formula for unequal intervals. Numerical Differentiation at equal and unequal intervals Numerical integration: Trapezoidal rule, Simpson’s one-third and three-eight rules	10

Module V: Numerical Techniques-II Solution of system of linear equations, LU Decomposition method, Jacobi method, Gauss-Seidel method, Relaxation Method Solution of ordinary differential equations by Picard's method, Euler's method, Modified Euler's Method and Runge-Kutta method of Fourth order	06
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Course Outcomes:

Course Outcomes (CO)		Bloom's Level
At the end of this course, the students will be able to:		
CO1	understand the concept of analyticity, harmonic functions and create the image of functions of complex variable	K2,K3& K6
CO2	Apply the concepts of complex integration and residues for evaluating real integrals	K2,K3 &K5
CO3	Apply the basic ideas of statistical techniques including measure of central Tendency, Correlation, Regression, Hypothesis testing and their properties	K2, K3
CO4	Apply Numerical Techniques in solving algebraic equations and transcendental equations, polynomial interpolation with equal and unequal intervals along with the methods of numerical differentiation and integration.	K2&K3&K5
CO5	Apply Numerical Techniques in solving linear system of equations along with the numerical solution of Ordinary Differential Equations	K3&K4

K1–Remember, K2–Understand, K3–Apply, K4–Analyze, K5–Evaluate, K6–Create

Text Books:

1. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publishing Company Ltd.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications
3. B.S. Grewal, Numerical Methods in Engineering & Science, Khanna Publications
4. A. C. Srivastava & P. K. Srivastava, Engineering Mathematics, Vol. III, PHI Learning Pvt Limited
5. M. K. Jain, S. R. K. Iyengar, R. K. Jain, Numerical Methods for Scientific and Engineering Computations, New Age International (P) Limited Publishers, New Delhi

Reference Books:

1. E. Kreyszig, Advance Engineering Mathematics, John Wiley & Sons
2. Peter V. O'Neil, Advance Engineering Mathematics, Thomson (Cengage) Learning
3. Ray Wylie C and Louis C Barret, Advanced Engineering Mathematics, McGraw-Hill Publishing Company Ltd
4. S. S. Sastry, "Introduction methods of Numerical Solutions" 4th Edition, Prentice Hall
5. R. K. Jain & S. R. K. Iyenger, Numerical Methods, Narosa Publishing House
6. E. Balagurusamy, Numerical Methods, McGraw Hill Education
7. James W Brown & R. V. Churchill, "Complex Variables and Applications, McGraw Hill Higher Education

BUNDELKHAND INSTITUTE OF ENGINEERING & TECHNOLOGY, JHANSI



Evaluation Scheme & Syllabus

For

B. Tech. 2nd Year

- **Computer Science & Engineering**
- **Information Technology**
- **Artificial Intelligence & Data Science**
- **Artificial Intelligence & Machine Learning**

(Effective from the Session: 2026-27)

BUNDELKHAND INSTITUTE OF ENGINEERING & TECHNOLOGY

Kanpur Road, Jhansi-284128, Uttar Pradesh, India

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B. Tech. Second Year, SEMESTER-III
(Computer Science & Engineering)

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional(SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA				
1	JOE3**/ JAS302	Science Based Open Elective/BSC (Maths III /Math IV/Math V)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	JVE301/ JAS301	Universal Human Value and Professional Ethics/ Technical Communication	T	VA/HS	2	1	0	20	10	30	70	100	3
3	JCS301	Data Structure	T	PC	3	1	0	20	10	30	70	100	4
4	JCS302	Computer Organization and Architecture	T	PC	3	1	0	20	10	30	70	100	4
5	JCS303	Discrete Structures & Theory of Logic	T	PC	3	1	0	20	10	30	70	100	4
6	JCS351	Data Structure Lab	P	PC	0	0	2		50	50	50	100	1
7	JCS352	Computer Organization and Architecture Lab	P	PC	0	0	2		50	50	50	100	1
8	JCS353	Web Designing Workshop	P	PC	0	0	2		50	50	50	100	1
9	JCC301/ JCC302	Cyber Security/Python programming	T	VA	2	0	0	20	10	30	70	100	2
10	JCC351	Internship Assessment /Mini Project*	P							100		100	2
		Total			16	5	6					1000	26

- **Mathematics-III** for CE/ENV and allied branches
- **Mathematics-IV** for Computer/Electronics/Electrical & allied Branches, Mechanical & Allied Branches Textile/Chemical & allied Branches
- **Mathematics-V** for Bio Technology/Agriculture Engineer

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B. Tech. Second Year, SEMESTER-IV
(Computer Science & Engineering)

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional(SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Gr
					L	T	P	CT	TA				
1	JAS402/ JOE4**	BSC(Math's-III/Math IV/ Math V)/Science Based Open Elective	T	BS/ES	3	1	0	20	10	30	70	100	4
2	JAS401/ JVE401	Technical Communication / Universal Human Value And Professional Ethics	T	HS/VA	2	1	0	20	10	30	70	100	3
3	JCS401	Operating System	T	PC	3	1	0	20	10	30	70	100	4
4	JCS402	Theory of Automata and Formal Languages	T	PC	3	1	0	20	10	30	70	100	4
5	JCS403	Object Oriented Programming with Java	T	PC	3	1	0	20	10	30	70	100	4
6	JCS451	Operating System Lab	P	PC	0	0	2		50	50	50	100	1
7	JCS452	Object Oriented Programming with Java Lab	P	PC	0	0	2		50	50	50	100	1
8	JCS453	Cyber Security Workshop	P	PC	0	0	2		50	50	50	100	1
9	JCC402/ JCC401	Python Programming/Cyber Security	P	VA	2	0	0	20	10	30	70	100	2
10	JVE451/ JVE452	Sports and Yoga-II/ NSS-II	P	VA	0	0	3			50*		50*	0
11		Minor Degree/Honors Degree MT-1/HT-1	T	PC	3	1	0	20	10	30	70	100	4**
		Total			16+3	5+1	9					900+50*+ 100	24

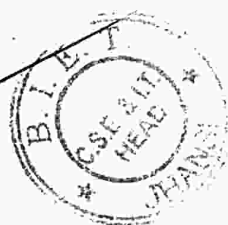
*The Mini Projector internship (4weeks) will be done during summer break after 4th Semester and will be assessed during V semester.

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B. Tech. Second Year, SEMESTER-III
(Information Technology)

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					L	T	P	CT	TA				
1	JOE3**/ JAS302	Science Based Open Elective/BSC (Maths III /Math IV/Math V)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	JVE301/ JAS301	Universal Human Value and Professional Ethics/ Technical Communication	T	VA/HS	2	1	0	20	10	30	70	100	3
3	JCS301	Data Structure	T	PC	3	1	0	20	10	30	70	100	4
4	JCS302	Computer Organization and Architecture	T	PC	3	1	0	20	10	30	70	100	4
5	JCS303	Discrete Structures & Theory of Logic	T	PC	3	1	0	20	10	30	70	100	4
6	JCS351	Data Structure Lab	P	PC	0	0	2		50	50	50	100	1
7	JCS352	Computer Organization and Architecture Lab	P	PC	0	0	2		50	50	50	100	1
8	JCS353	Web Designing Workshop	P	PC	0	0	2		50	50	50	100	1
9	JCC301/ JCC302	Cyber Security/Python programming	T	VA	2	0	0	20	10	30	70	100	2
10	JCC351	Internship Assessment /Mini Project*	P							100		100	2
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B. Tech. Second Year, SEMESTER-IV
(Information Technology)

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4	JCS402	Theory of Automata and Formal Languages	T	PC	3	1	0	20	10	30	70	100	4
5	JCS403	Object Oriented Programming with Java	T	PC	3	1	0	20	10	30	70	100	4
6	JCS451	Operating System Lab	P	PC	0	0	2		50	50	50	100	1
7	JCS452	Object Oriented Programming with Java Lab	P	PC	0	0	2		50	50	50	100	1
8	JCS453	Cyber Security Workshop	P	PC	0	0	2		50	50	50	100	1
9	JCC402/ JCC401	Python Programming/Cyber Security	P	VA	2	0	0	20	10	30	70	100	2
10	JVE451/ JVE452	Sports and Yoga-II/ NSS-II	P	VA	0	0	3			50*		50*	0
11		Minor Degree/Honors Degree MT-1/HT-1	T	PC	3	1	0	20	10	30	70	100	4**
		Total			16+3	5+1	9					900+50*+ 100	24

*The Mini Projector internship (4weeks) will be done during summer break after 4th Semester and will be assessed during V semester.



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B. Tech. Second Year, SEMESTER-III
(Artificial Intelligence & Machine Learning)

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional(SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
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3	JCS301	Data Structure	T	PC	3	1	0	20	10	30	70	100	4
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5	JCS303	Discrete Structures & Theory of Logic	T	PC	3	1	0	20	10	30	70	100	4
6	JCS351	Data Structure Lab	P	PC	0	0	2		50	50	50	100	1
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B. Tech. Second Year, SEMESTER-IV
(Artificial Intelligence & Machine Learning)

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2	JAS401/ JVE401	Technical Communication / Universal Human Value And Professional Ethics	T	HS/VA	2	1	0	20	10	30	70	100	3
3	JCS401	Operating System	T	PC	3	1	0	20	10	30	70	100	4
4	JCS402	Theory of Automata and Formal Languages	T	PC	3	1	0	20	10	30	70	100	4
5	JCS403	Object Oriented Programming with Java	T	PC	3	1	0	20	10	30	70	100	4
6	JCS451	Operating System Lab	P	PC	0	0	2		50	50	50	100	1
7	JCS452	Object Oriented Programming with Java Lab	P	PC	0	0	2		50	50	50	100	1
8	JCS453	Cyber Security Workshop	P	PC	0	0	2		50	50	50	100	1
9	JCC402/ JCC401	Python Programming/Cyber Security	P	VA	2	0	0	20	10	30	70	100	2
10	JVE451/ JVE452	Sports and Yoga-II/ NSS-II	P	VA	0	0	3			50*		50*	0
11		Minor Degree/Honors Degree MT-1/HT-1	T	PC	3	1	0	20	10	30	70	100	4**
		Total			16+3	5+1	9					900+50*+ 100	24

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SYLLABUS

JCS301 DATA STRUCTURE		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Describe how arrays, linked lists, stacks, queues, trees, and graphs are represented in memory, used by the algorithms and their common applications.	K ₁ , K ₂
CO 2	Discuss the computational efficiency of the sorting and searching algorithms.	K ₂
CO 3	Implementation of Trees and Graphs and perform various operations on these data structure.	K ₃
CO 4	Understanding the concept of recursion, application of recursion and its implementation and removal of recursion.	K ₄
CO 5	Identify the alternative implementations of data structures with respect to its performance to solve a real world problem.	K ₅ , K ₆
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Introduction: Basic Terminology, Elementary Data Organization, Built in Data Types in C. Algorithm, Efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations: Big Oh, Big Theta and Big Omega, Time-Space trade-off. Abstract Data Types (ADT) Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of arrays, Sparse Matrices and their representations. Linked lists: Array Implementation and Pointer Implementation of Singly Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition Subtraction & Multiplications of Single variable & Two variables Polynomial.	08
II	Stacks: Abstract Data Type, Primitive Stack operations: Push & Pop, Array and Linked Implementation of Stack in C, Application of stack: Prefix and Postfix Expressions, Evaluation of postfix expression, Iteration and Recursion- Principles of recursion, Tail recursion, Removal of recursion Problem solving using iteration and recursion with examples such as binary search, Fibonacci numbers, and Hanoi towers. Tradeoffs between iteration and recursion. Queues: Operations on Queue: Create, Add, Delete, Full and Empty, Circular queues, Array and linked implementation of queues in C, Dequeue and Priority Queue.	08
III	Searching: Concept of Searching, Sequential search, Index Sequential Search, Binary Search. Concept of Hashing & Collision resolution Techniques used in Hashing. Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Merge Sort, Heap Sort and Radix Sort.	08



IV	Trees: Basic terminology used with Tree, Binary Trees, Binary Tree Representation: Array Representation and Pointer(Linked List) Representation, Binary Search Tree, Strictly Binary Tree ,Complete Binary Tree . A Extended Binary Trees, Tree Traversal algorithms: Inorder, Preorder and Postorder, Constructing Binary Tree from given Tree Traversal, Operation of Insertation , Deletion, Searching & Modification of data in Binary Search . Threaded Binary trees, Traversing Threaded Binary trees. Huffman coding using Binary Tree. Concept & Basic Operations for AVL Tree , B Tree & Binary Heaps	08
V	Graphs: Terminology used with Graph, Data Structure for Graph Representations: Adjacency Matrices, Adjacency List, Adjacency. Graph Traversal: Depth First Search and Breadth First Search, Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prims and Kruskal algorithm. Transitive Closure and Shortest Path algorithm: Warshal Algorithm and Dijkstra Algorithm.	08

Text books:

1. Aaron M. Tenenbaum , Yedidyah Langsam and Moshe J. Augenstein, "Data Structures Using C and C++", PHI Learning Private Limited, Delhi India.
2. Gilberg , Forouzan, Data Structures: A Pseudocode Approach with C 3rd edition , Cengage Learning publication.
3. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publications Pvt Ltd Delhi India.
4. Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
5. Thareja, "Data Structure Using C" Oxford Higher Education.
6. AK Sharma, "Data Structure Using C", Pearson Education India.
7. Rajesh K. Shukla, "Data Structure Using C and C++" Wiley Dreamtech Publication.
8. Michael T. Goodrich, Roberto Tamassia, David M. Mount "Data Structures and Algorithms in C++", Wiley India.
9. P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication.
10. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education.
11. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
12. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill.
13. Adam Drozdek "Data Structures and Algorithm in Java", Cengage Learning

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JCS302

COMPUTER ORGANIZATION AND ARCHITECTURE

Course Outcome (CO)

Bloom's Knowledge Level (KL)

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

CO 1	Study of the basic structure and operation of a digital computer system.	K ₁ , K ₂
CO 2	Analysis of the design of arithmetic & logic unit and understanding of the fixed point and floating-point arithmetic operations.	K ₂ , K ₄
CO 3	Implementation of control unit techniques and the concept of Pipelining	K ₃
CO 4	Understanding the hierarchical memory system, cache memories and virtual memory	K ₂
CO 5	Understanding the different ways of communicating with I/O devices and standard I/O interfaces	K ₂ , K ₄

DETAILED SYLLABUS

3-1-0

Unit	Topic	Proposed Lecture
I	Introduction: Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.	08
II	Arithmetic and logic unit: Look ahead carries adders. Multiplication: Signed operand multiplication, Booths algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic & logic unit design. IEEE Standard for Floating Point Numbers	08
III	Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc), micro operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Pipelining. Hardwire and micro programmed control: micro programme sequencing, concept of horizontal and vertical microprogramming.	08
IV	Memory: Basic concept and hierarchy, semiconductor RAM memories, 2D & 2 1/2D memory organization. ROM memories. Cache memories: concept and design issues & performance, address mapping and replacement Auxiliary memories: magnetic disk, magnetic tape and optical disks Virtual memory: concept implementation.	08
V	Input / Output: Peripheral devices, I/O interface, I/O ports, Interrupts: interrupt hardware, types of interrupts and exceptions. Modes of Data Transfer: Programmed I/O, interrupt initiated I/O and Direct Memory Access., I/O channels and processors. Serial Communication: Synchronous & asynchronous communication, standard communication interfaces.	08

Text books:

1. Computer System Architecture - M. Mano
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998. Reference books
4. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
5. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.
6. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012
7. Structured Computer Organization, Tannenbaum(PHI)

JCS303		
Discrete Structures & Theory of Logic		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Acquire Knowledge of sets and relations for solving the problems of POSET and lattices.	K ₃ , K ₄
CO 2	Apply fundamental concepts of functions and Boolean algebra for solving the problems of logical abilities.	K ₁ , K ₂
CO 3	Employ the rules of propositions and predicate logic to solve the complex and logical problems.	K ₃
CO 4	Explore the concepts of group theory and their applications for solving the advance technological problems.	K ₁ , K ₄
CO 5	Illustrate the principles and concepts of graph theory for solving problems related to computer science.	K ₂ , K ₆
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Set Theory& Relations: Introduction, Combination of sets. Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Recursive definition of relation, Order of relations. POSET & Lattices: Hasse Diagram, POSET, Definition & Properties of lattices – Bounded, Complemented, Distributed, Modular and Complete lattice.	08
II	Functions: Definition, Classification of functions, Operations on functions. Growth of Functions. Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps.	08
III	Theory of Logics: Proposition, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference. Predicate Logic: First order predicate, well-formed formula of predicate, quantifiers, Inference theory of predicate logic.	08
IV	Algebraic Structures: Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups, Permutation and Symmetric groups, Group Homomorphisms, Definition and elementary properties of Rings and Fields.	08
V	Graphs: Definition and terminology, Representation of graphs, Multigraphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph coloring. Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle	08
Text books: 1. Koshy, Discrete Structures, Elsevier Pub. 2008 Kenneth H. Rosen, Discrete Mathematics and Its Applications, 6/e, McGraw-Hill, 2006. 2. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004. 3. E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000. 4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004 5. Liptschütz, Seymour, "Discrete Mathematics", McGraw Hill. 6. Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill. 4. Deo, 7. Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI. 8. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi		

JCS351- Data Structure Lab

List of Experiments (Indicative & not limited to)

1. **Implementing Sorting Techniques:** Bubble Sort, Insertion Sort, Selection Sort, Shell , Sort, Radix Sort, Quick sort
2. **Implementing Searching and Hashing Techniques:** Linear search, Binary search, Methods for Hashing: Modulo Division, Digit Extraction, Fold shift, Fold Boundary, Linear Probe for Collision Resolution. Direct and Subtraction hashing
3. **Implementing Stacks:** Array implementation, Linked List implementation, Evaluation of postfix expression and balancing of parenthesis , Conversion of infix notation to postfix notation
4. **Implementing Queue:** Linked List implementation of ordinary queue, Array implementation of circular queue, Linked List implementation of priority queue, Double ended queue
5. **Implementing Linked List:** Singly Linked Lists, Circular Linked List, Doubly Linked Lists : Insert, Display, Delete, Search, Count, Reverse(SLL), Polynomial , Addition , Comparative study of arrays and linked list
6. **Implementing Trees:** Binary search tree : Create, Recursive traversal: preorder, post order, in order, Search Largest , Node, Smallest Node, Count number of nodes, Heap: Min Heap, Max Heap: reheap Up, reheap Down, Delete , Expression Tree, Heapsort
7. **Implementing Graphs:** Represent a graph using the Adjacency Matrix, BFS, Find the minimum spanning tree (using any method Kruskal's Algorithm or Prim's Algorithm) Self Learning Topics : Shortest Path Algorithm

JCS352- Computer Organization Lab

List of Experiments (Indicative & not limited to)

1. Implementing HALF ADDER, FULL ADDER using basic logic gates
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3-8 line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT.
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.
10. Implement a simple instruction set computer with a control unit and a data path.

The bottom of the page features several handwritten signatures and initials in black ink. From left to right, there is a signature that appears to be 'Ravi', a circled number '12', a signature that looks like 'A', a signature that looks like 'S', a signature that looks like 'B', a signature that looks like 'R', a signature that looks like 'S', a signature that looks like 'S', and a signature that looks like 'S'. There are also some other marks and scribbles.

JCS353- Web Designing Workshop

Syllabus:

- ✚ **HTML:** Elements, attributes, heading, paragraph, styles, comments, links, images, favicon, tables, list, class, id, HTML forms, HTML media, navigation bar.
- ✚ **CSS:** Types of CSS, colors, background, margins, padding, height, width, text, font, icon, links, list, tables, display, z-index, float, overflow, CSS media queries, inline block, navigation bar, image gallery, forms, round corners
- ✚ **BOOTSTRAP :** Fundamentals of implementing responsive web design ,Use Balsamiq to mockup and wireframe websites, The fundamentals of UI design for websites ,How to install the Bootstrap framework ,Understanding the Bootstrap grid layout system, How to use bootstrap containers to layout your website easily, Use other Bootstrap components such as buttons ,Adding symbols using Font Awesome, Bootstrap carousels. Add Bootstrap cards to your website. Using Bootstrap navigation bars,
- ✚ **JavaScript** script, function, output, statement, variables, operators, data types, objects, events, string methods, Arrays, if else, switch, loop for, loop in, loop for, debugging, validation of forms , Functions and invocation patterns Discussion of ECMA Scripts Intermediate JavaScript , JS Expressions, Operators, Statements and Declarations , Object-Oriented Programming JS Objects and Prototypes, `This`, Scope and Closures Objects and Prototypes Refactoring and Debugging

Textbook

1. Meloni, J. C., Kyrnin, J. (2018). HTML, CSS, and JavaScript All in One: Covering HTML5, CSS3, and ES6, Sams Teach Yourself. United Kingdom: Pearson Education.
2. McGrath, M. (2020). HTML, CSS & JavaScript in easy steps. United Kingdom: In Easy Steps Limited.

Reference Books

1. Duckett, J. (2014). Web Design with HTML, CSS, JavaScript and J Query Set. United Kingdom: Wiley.
2. Fajfar, I. (2015). Start Programming Using HTML, CSS, and JavaScript. United Kingdom: CRC Press.

List of Experiments (Indicative & not limited to)

Experiment No.	List of Experiments (Indicative & not limited to)
1	Design the following static web pages required for an online bookstore website. HOME PAGE: ✚ The static home page must contain three frames. ✚ Top frame: Logo and the college name and links to Homepage, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Dr. P. M. (12) S. G. R. P. 3

For example: When you click the link "CSE" the catalogue for CSE Books should be displayed in the Right frame. Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Description of the Web Site			

LOGINPAGE:

This page looks like below:

Logo	WebSite Name			
Home	Login	Registration	Catalogue	Cart
CSE ECE EEE CIVIL	Login Page User Name: Passwords: Submit Reset			

CATALOGUE PAGE: The catalogue page should contain the details of all the books available in the website in a table. The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

Logo	WebSite Name			
Home	Login	Registration	Catalogue	Cart
CSE		Book: XML Bible Author: Winston Publication: Wiely	\$40.5	
ECE				
EEE				
CIVIL		Book :AI Author: S. Russel Publication: Princetonthall	\$63	



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				Book : Java 2 Author:Watson Publication:BPBpublications	\$35.5	
				Book : HTML in 24 hours Author : Sam Peter Publication:Sampublication	\$50	

CARTPAGE: The cart page contains the details about the books which are added to the cart. The cart page should look like this:

Logo	Web Site Name			
Home	Login	Registration	Catalogue	Cart
CSE	Book name	Price	Quantity	Amount
ECE	Java 2	\$35.5	2	\$70
EEE	XML bible	\$40.5	1	\$40.5
CIVIL	Total amount	- \$130.5		

REGISTRATION PAGE : Create a "registration form" with the following fields

- 1) Name (Text field)
- 2) Password (password field)
- 3) E-mailid(text field)
- 4) Phone Number(text field)
- 5) Sex(radius button)
- 6) Date of birth(3 select boxes)
- 7) Languages known(checkboxes-English, Telugu, Hindi, Tamil)
- 8) Address(text area)

Js VALIDATION: Write *JavaScript* to validate the following fields of the above registration page.

1. Name (Name should contains alphabets and the length should not be less than 6 characters).
2. Password (Password should not be less than 6 characters length).

Js VALIDATION:

3. E-mailid (should not contain any invalid and must follow the standard pattern(name@domain.com)
4. Phone Number(Phone number should contain 10 digits only).

CSS: Design a web page using **CSS(Cascading Style Sheets)** which includes the following:

- 1) Use different font, styles:
In the style definition you define how each selector should work(font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.
- 2) Set a background image for both the page and single elements on the page.

CSS:

- 1) Control the repetition of the image with the background-repeat property.
- 2) Define styles for links as

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	A:link A:visited A:active A:hover
10.	Consider a small topic of your choice on which you can develop static Webpages and try to implement all topics of html, CSS and Js within the topic. Choose any one topic. 1. Your Own Portfolio 2. To-Do List 3. Survey Form 4. A Tribute Page 5. A Questionnaire

FOURTH SEMESTER (DETAILED SYLLABUS)

JCS401 Operating system		
Course Outcome (CO)		Bloom's Knowledge Level (KL)
At the end of course , the student will be able to understand		
CO 1	Understand the structure and functions of OS	K ₁ , K ₂
CO 2	Learn about Processes, Threads and Scheduling algorithms.	K ₁ , K ₂
CO 3	Understand the principles of concurrency and Deadlocks	K ₂
CO 4	Learn various memory management scheme	K ₂
CO 5	Study I/O management and File systems.	K ₂ , K ₄
DETAILED SYLLABUS		3-0-0
Unit	Topic	Proposed Lecture
I	Introduction : Operating system and functions, Classification of Operating systems- Batch, Interactive, Time sharing, Real Time System, Multiprocessor Systems, Multiuser Systems, Multiprocess Systems, Multithreaded Systems, Operating System Structure- Layered structure, System Components, Operating System services, Reentrant Kernels, Monolithic and Microkernel Systems.	08
II	Concurrent Processes : Process Concept, Principle of Concurrency, Producer / Consumer Problem, Mutual Exclusion, Critical Section Problem, Dekker's solution, Peterson's solution, Semaphores, Test and Set operation; Classical Problem in Concurrency- Dining Philosopher Problem, Sleeping Barber Problem; Inter Process Communication models and Schemes, Process generation.	08
III	CPU Scheduling : Scheduling Concepts, Performance Criteria, Process States, Process Transition Diagram, Schedulers, Process Control Block (PCB), Process address space, Process identification information, Threads and their management, Scheduling Algorithms, Multiprocessor Scheduling. Deadlock : System model, Deadlock characterization, Prevention, Avoidance and detection, Recovery from deadlock.	08
IV	Memory Management : Basic bare machine, Resident monitor, Multiprogramming with fixed partitions, Multiprogramming with variable partitions, Protection schemes, Paging, Segmentation, Paged segmentation, Virtual memory concepts, Demand paging, Performance of demand paging, Page replacement algorithms, Thrashing, Cache memory organization, Locality of reference.	08
V	I/O Management and Disk Scheduling : I/O devices, and I/O subsystems, I/O buffering, Disk storage and disk scheduling, RAID. File System : File concept, File organization and access mechanism, File directories, and File sharing, File system implementation issues, File system protection and security.	08

Text books:

1. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley
2. Sibsankar Halder and Alex A Aravind, "Operating Systems", Pearson Education
3. Harvey M Dietel, " An Introduction to Operating System", Pearson Education
4. D M Dhamdhare, "Operating Systems : A Concept based Approach", 2nd Edition,
5. TMH 5. William Stallings, "Operating Systems: Internals and Design Principles", 6th Edition, Pearson Education

JCS402

Theory of Automata and Formal Languages

Course Outcome (CO)

Bloom's Knowledge Level (KL)

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

CO 1	Analyse and design finite automata, pushdown automata, Turing machines, formal languages, and grammars	K ₄ , K ₅
CO 2	Analyse and design, Turing machines, formal languages, and grammars	K ₄ , K ₅
CO 3	Demonstrate the understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving	K ₁ , K ₅
CO 4	Prove the basic results of the Theory of Computation.	K ₂ , K ₃
CO 5	State and explain the relevance of the Church-Turing thesis.	K ₁ , K ₅

DETAILED SYLLABUS

3-1-0

Unit	Topic	Proposed Lecture
I	Basic Concepts and Automata Theory: Introduction to Theory of Computation- Automata, Computability and Complexity, Alphabet, Symbol, String, Formal Languages, Deterministic Finite Automaton (DFA)- Definition, Representation, Acceptability of a String and Language, Non Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, NFA with ϵ -Transition, Equivalence of NFA's with and without ϵ -Transition, Finite Automata with output- Moore Machine, Mealy Machine, Equivalence of Moore and Mealy Machine, Minimization of Finite Automata.	08
II	Regular Expressions and Languages: Regular Expressions, Transition Graph, Kleen's Theorem, Finite Automata and Regular Expression- Arden's theorem, Algebraic Method Using Arden's Theorem, Regular and Non-Regular Languages- Closure properties of Regular Languages, Pigeonhole Principle, Pumping Lemma, Application of Pumping Lemma, Decidability- Decision properties, Finite Automata and Regular Languages	08
III	Regular and Non-Regular Grammars: Context Free Grammar(CFG)-Definition, Derivations, Languages, Derivation Trees and Ambiguity, Regular Grammars-Right Linear and Left Linear grammars, Conversion of FA into CFG and Regular grammar into FA, Simplification of CFG, Normal Forms- Chomsky Normal Form(CNF), Greibach Normal Form (GNF), Chomsky Hierarchy, Programming problems based on the properties of CFGs.	08
IV	Push Down Automata and Properties of Context Free Languages: Nondeterministic Pushdown Automata (NPDA)- Definition, Moves, A Language Accepted by NPDA, Deterministic Pushdown Automata(DPDA) and Deterministic Context free Languages(DCFL), Pushdown Automata for Context Free Languages, Context Free grammars for Pushdown Automata, Two stack Pushdown Automata, Pumping Lemma for CFL, Closure properties of CFL, Decision Problems of CFL, Programming problems based on the properties of CFLs.	08
V	Turing Machines and Recursive Function Theory : Basic Turing Machine Model, Representation of Turing Machines, Language Acceptability of Turing Machines, Techniques for Turing Machine Construction, Modifications of Turing Machine, Turing Machine as Computer of Integer Functions, Universal Turing machine, Linear Bounded Automata, Church's Thesis, Recursive and Recursively Enumerable language, Halting Problem, Post's Correspondence Problem, Introduction to Recursive Function Theory.	08

Text books:

1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
4. Mathematical Foundation of Computer Science, Y.N. Singh, New Age Inter nationa

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JCS403

Object Oriented Programming with Java

Course Outcome (CO)

Bloom's Knowledge Level (KL)

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

CO 1	Develop the object-oriented programming concepts using Java	K ₃ , K ₄
CO 2	Implement exception handling, file handling, and multi-threading in Java	K ₂ , K ₄
CO 3	Apply new java features to build java programs.	K ₃
CO 4	Analyse java programs with Collection Framework	K ₄
CO 5	Test web and RESTful Web Services with Spring Boot using Spring Framework concepts	K ₅

DETAILED SYLLABUS

3-1-0

Unit	Topic	Proposed Lecture
I	Introduction: Why Java, History of Java, JVM, JRE, Java Environment, Java Source File Structure, and Compilation. Fundamental, Programming Structures in Java: Defining Classes in Java, Constructors, Methods, Access Specifiers, Static Members, Final Members, Comments, Data types, Variables, Operators, Control Flow, Arrays & String. Object Oriented Programming: Class, Object, Inheritance Super Class, Sub Class, Overriding, Overloading, Encapsulation, Polymorphism, Abstraction, Interfaces, and Abstract Class. Packages: Defining Package, CLASSPATH Setting for Packages, Making JAR Files for Library Packages, Import and Static Import Naming Convention For Packages	08
II	Exception Handling: The Idea behind Exception, Exceptions & Errors, Types of Exception, Control Flow in Exceptions, JVM Reaction to Exceptions, Use of try, catch, finally, throw, throws in Exception Handling, In-built and User Defined Exceptions, Checked and Un-Checked Exceptions. Input /Output Basics: Byte Streams and Character Streams, Reading and Writing File in Java. Multithreading: Thread, Thread Life Cycle, Creating Threads, Thread Priorities, Synchronizing Threads, Inter-thread Communication.	08
III	Java New Features: Functional Interfaces, Lambda Expression, Method References, Stream API, Default Methods, Static Method, Base64 Encode and Decode, For Each Method, Try-with-resources, Type Annotations, Repeating Annotations, Java Module System, Diamond Syntax with	08

	Inner Anonymous Class, Local Variable Type Inference, Switch Expressions, Yield Keyword, Text Blocks, Records, Sealed Classes	
IV	Java Collections Framework: Collection in Java, Collection Framework in Java, Hierarchy of Collection Framework, Iterator Interface, Collection Interface, List Interface, Array List, Linked List, Vector, Stack, Queue Interface, Set Interface, Hash Set, Linked Hash Set, Sorted Set Interface, Tree Set, Map Interface, Hash Map Class, Linked Hash Map Class, Tree Map Class, Hash table Class, Sorting, Comparable Interface, Comparator Interface, Properties Class in Java.	08
V	Spring Framework: Spring Core Basics-Spring Dependency Injection concepts, Spring Inversion of Control, AOP, Bean Scopes- Singleton, Prototype, Request, Session, Application, Web Socket, Auto wiring, Annotations, Life Cycle Call backs, Bean Configuration styles Spring Boot: Spring Boot Build Systems, Spring Boot Code Structure, Spring Boot Runners, Logger, BUILDING RESTFUL WEB SERVICES, Rest Controller, Request Mapping, Request Body, Path Variable, Request Parameter, GET, POST, PUT, DELETE APIs, Build Web Applications	08

Text Books

1. Herbert Schildt, "Java The complete reference", McGraw Hill Education
2. Craig Walls, "Spring Boot in Action" Manning Publication
1. Steven Holzner, "Java Black Book", Dreamtech.
2. Balagurusamy E, "Programming in Java", McGraw Hill
3. Java: A Beginner's Guide by Herbert Schildt, Oracle Press
4. Greg L. Turnquist "Learning Spring Boot 2.0 - Second Edition", Packt Publication
5. AJ Henley Jr (Author), Dave Wolf, "Introduction to Java Spring Boot: Learning by Coding", Independently Published

JCS451- Operating System Lab

List of Experiments (Indicative & not limited to)

1. Study of hardware and software requirements of different operating systems (UNIX,LINUX,WINDOWS XP, WINDOWS7/8)
2. Execute various UNIX system calls for
 - i. Process management
 - ii. File management
 - iii. Input/output Systems calls
3. Implement CPU Scheduling Policies:
 - i. SJF
 - ii. Priority
 - iii. FCFS
 - iv. Multi-level Queue
4. Implement file storage allocation technique:
 - i. Contiguous(using array)

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- ii. Linked-list(using linked-list)
 - iii. Indirect allocation (indexing)
- 5. Implementation of contiguous allocation techniques:
 - i. Worst-Fit
 - ii. Best- Fit
 - iii. First- Fit
- 6. Calculation of external and internal fragmentation
 - i. Free space list of blocks from system
 - ii. List process file from the system
- 7. Implementation of compaction for the continually changing memory layout and calculate total movement of data
- 8. Implementation of resource allocation graph RAG)
- 9. Implementation of Banker's algorithm
- 10. Conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of method used for storing graph.
- 11. Implement the solution for Bounded Buffer (producer-consumer)problem using inter process communication techniques-Semaphores
- 12. Implement the solutions for Readers-Writers problem using inter process communication technique - Semaphore

JCS452- Object Oriented Programming with Java

List of Experiments (Indicative & not limited to)

1. Use Java compiler and eclipse platform to write and execute java program.
2. Creating simple java programs using command line arguments
3. Understand OOP concepts and basics of Java programming.
4. Create Java programs using inheritance and polymorphism.
5. Implement error-handling techniques using exception handling and multithreading.
6. Create java program with the use of java packages.
7. Construct java program using Java I/O package.
8. Create industry oriented application using Spring Framework.
9. Test RESTful web services using Spring Boot.
10. Test Frontend web application with Spring Boot

JCS453- Cyber Security Workshop

List of Experiments (Indicative & not limited to)

Module 1: Packet Analysis using Wire shark

1. Basic Packet Inspection: Capture network traffic using Wire shark and analyze basic protocols like HTTP, DNS, and SMTP to understand how data is transmitted and received.

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2. **Detecting Suspicious Activity:** Analyze network traffic to identify suspicious patterns, such as repeated connection attempts or unusual communication between hosts.
3. **Malware Traffic Analysis:** Analyze captured traffic to identify signs of malware communication, such as command-and-control traffic or data infiltration.
4. **Password Sniffing:** Simulate a scenario where a password is transmitted in plaintext. Use Wireshark to capture and analyze the packets to demonstrate the vulnerability and the importance of encryption.
5. **ARP Poisoning Attack:** Set up an ARP poisoning attack using tools like Ettercap. Analyze the captured packets to understand how the attack can lead to a Man-in-the-Middle scenario.

Module 2: Web Application Security using DVWA

1. **SQL Injection:** Use DVWA to practice SQL injection attacks. Demonstrate how an attacker can manipulate input fields to extract, modify, or delete database information.
2. **Cross-Site Scripting (XSS):** Exploit XSS vulnerabilities in DVWA to inject malicious scripts into web pages. Show the potential impact of XSS attacks, such as stealing cookies or defacing websites.
3. **Cross-Site Request Forgery (CSRF):** Set up a CSRF attack in DVWA to demonstrate how attackers can manipulate authenticated users into performing unintended actions.
4. **File Inclusion Vulnerabilities:** Explore remote and local file inclusion vulnerabilities in DVWA. Show how attackers can include malicious files on a server and execute arbitrary code.
5. **Brute-Force and Dictionary Attacks:** Use DVWA to simulate login pages and demonstrate brute-force and dictionary attacks against weak passwords. Emphasize the importance of strong password policies.

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BUNDELKHAND INSTITUTE OF ENGINEERING & TECHNOLOGY,
JHANSI



Evaluation Scheme & Syllabus For
B. Tech. 2nd Year

- **ELECTRONICS AND COMMUNICATION ENGINEERING**
- **HONORS DEGREE IN ADVANCE COMMUNICATION TECHNOLOGY**
- **MINOR DEGREE IN PROJECT MANAGEMENT**

[Effective from the Session: 2025-2026]

SEMESTER III

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA	CT+TA	TE/PE		
1	JOE3** / JAS303	Science Based Open Elective/BSC (Maths-III/Math IV/ Math V)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	JVE301/ JAS301	Universal Human Value and Professional Ethics/ Technical Communication	T	VA/H S	2	1	0	20	10	30	70	100	3
3	JEC301	Electronic Devices	T	PC	3	1	0	20	10	30	70	100	4
4	JEC302	Digital System Design	T	PC	3	1	0	20	10	30	70	100	4
5	JEC303	Network Analysis and Synthesis	T	PC	3	1	0	20	10	30	70	100	4
6	JEC351	Electronic Devices Lab	P	PC	0	0	2		50	50	50	100	1
7	JEC352	Digital System Design Lab	P	PC	0	0	2		50	50	50	100	1
8	JEC353	Network Analysis and Synthesis lab	P	PC	0	0	2		50	50	50	100	1
10	JCC301 / JCC302	Cyber Security/Python programming	T	VA	2	0	0	20	10	30	70	100	2
11	JCC351	Internship Assessment /Mini Project	P							100		100	2
		Total			16	5	6						26

- **Mathematics –III** for CE / ENV and allied branches
- **Mathematics-IV** for Computer/Electronics/Electrical & allied Branches, Mechanical & Allied Branches Textile/Chemical & allied Branches
- **Mathematics-V** for Bio Technology / Agriculture Engineering

SEMESTER –IV

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA				
1	JAS403 / JOE4**	BSC(Maths-III/Math IV/ Math V)/Science Based Open Elective	T	BS/ES	3	1	0	20	10	30	70	100	4
2	JAS401 / JVE401	Technical Communication / Universal Human Value and Professional Ethics	T	HS/VA	2	1	0	20	10	30	70	100	3
3	JEC401	Communication Engineering	T	PC	3	1	0	20	10	30	70	100	4
4	JEC402	Analog Circuits	T	PC	3	1	0	20	10	30	70	100	4
5	JEC403	Signal System	T	PC	3	1	0	20	10	30	70	100	4
6	JEC451	Communication Engineering Lab	P	PC	0	0	2		50	50	50	100	1
7	JEC452	Analog Circuits Lab	P	PC	0	0	2		50	50	50	100	1
8	JEC453	Signal System Lab	P	PC	0	0	2		50	50	50	100	1
9	JCC402 / JCC401	Python Programming/Cyber Security	P	VA	2	0	0	20	10	30	70	100	2
10	JVE451 / JVE452	Sports and Yoga - II / NSS-II	P	VA	0	0	3			100		100	0
11	MNPM401 /HTAC401	Minor Degree MT-1/Honors Degree HT-1	T	PC	3	1	0	30	20	50	100	150	4*
		Total			19	6	9						28*

*The Mini Project or internship (4 weeks) will be done during summer break after 4th Semester and will be assessed during V semester.

JEC-301	ELECTRONIC DEVICES	3L:1T:0P	4 Credits
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Unit	Topics	Lectures
I	Introduction to semiconductor physics: Review of quantum mechanics, electrons in periodic lattices, E-k diagrams, charge carriers in semiconductor: electrons & holes Effective mass, Intrinsic Material, Extrinsic Material.	8
II	Energy bands in intrinsic and extrinsic silicon, carrier transport, diffusion current, drift current, mobility and resistivity, sheet resistance, Generation and recombination of carriers, Poisson and continuity equation.	8
III	P-N junction characteristics, I-V characteristics, and small signal switching models, Avalanche breakdown, Zener diode, Schottky diode, LED, photodiode and solar cell.	8
IV	Bipolar Junction Transistor, various configurations (such as CE, CB & CC) and their features I-V characteristics, DC biasing schemes for BJT, bias stability, Ebers-Moll model.	8
V	Field Effect Transistor, configurations (such as CS, CD & CG), DC biasing schemes, MOSFET, I-V characteristics, MOS capacitor, C-V characteristics.	8

Text/Reference Books:

1. G. Streetman, and S. K. Banerjee, "Solid State Electronic Devices," 7th edition, Pearson, 2014.
2. D. Neamen, D. Biswas, "Semiconductor Physics and Devices," McGraw-Hill Education.
3. S. M. Sze and K. N. Kwok, "Physics of Semiconductor Devices," 3rd edition, John Wiley & Sons, 2006.
4. C.T. Sah, "Fundamentals of Solid State Electronics," World Scientific Publishing Co. Inc, 1991.
5. Y. Tsididis and M. Colin, "Operation and Modeling of the MOS Transistor," Oxford university press, 2011.
6. Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the principles of semiconductor Physics.
2. Understand the carrier transport in semiconductors.
3. Analyze and find application of special purpose diodes.
4. Understand the working principle and design of Bipolar Junction Transistor.
5. Realize the mathematical models of MOS transistors

JEC-302	DIGITAL SYSTEM DESIGN	3L:1T:0P	4 Credits
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Unit	Topics	Lectures
I	Logic simplification and combinational logic design: Number Systems, Binary arithmetic, signed magnitude representation, Binary codes, code conversion, review of Boolean algebra and Demorgans theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 5 variables, tabulation method. 1's compliment and 2's compliment. Subtraction using 1's complement and 2's complement. Canonical and Standard form of boolean function. Universal gates, don't care conditions. minimisation of boolean function with don't care condition.	8
II	Combinational circuits: Analysis and Design of combinational circuits, MSI devices like comparators, multiplexers, demultiplexers, encoder, decoder, circuit realization using Multiplexers and decoders, half and full adders, subtractors, serial and parallel adders, BCD adder, barrel shifter and ALU. Magnitude comparator. Carry look ahead adder and serial adder.	8
III	Sequential logic design: Building blocks like S-R, JK and Master-Slave JK FF, D FF, T FF, edge triggered FF, Flip flop conversion, Applications of Flip Flops: ripple and synchronous counters, Ring counter, Johnson counter, shift registers: SISO, SIPO, PISO, PIPO, Bidirectional shift register, Universal shift register; Finite state machines: Mealy and Moore machines, State diagrams, state reduction, Analysis of clocked sequential circuits, Design of clocked sequential circuits Analysis and synthesis of asynchronous sequential logic circuits..	8
IV	Logic families and semiconductor memories: TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out, tristate TTL, ECL, CMOS families and their interfacing, memory elements, concept of programmable logic devices like FPGA, logic implementation using programmable devices. Memory, binary cell ROM, RAM, simple PLD, PROM, PLA and PAL.	8
V	Digital-to-Analog converters (DAC): Specifications of DACs, Weighted resistor, R-2R ladder, Analog-to-digital converters (ADC): Specifications of ADCs, principle of ADC, switched capacitor circuits: Basic concept, practical configurations, ADC etc. ADC Types: dual slope, successive approximation, counting type, flash etc. Analog, discrete and digital signal.	8

Text/Reference Books:

1. R.P. Jain, "Modern Digital Electronics," Tata McGraw Hill, 4th edition, 2009.
2. A. Anand Kumar, "Fundamental of Digital Circuits," PHI 4th edition, 2018.
3. W.H. Gothmann, "Digital Electronics- An Introduction to Theory and Practice," PHI, 2nd edition, 2006.
4. D.V. Hall, "Digital Circuits and Systems," Tata McGraw Hill, 1989.
5. A. K. Singh, "Foundation of Digital Electronics & Logic Design," New Age Int. Publishers.
6. Subrata Ghosal, "Digital Electronics," Cengage publication, 2nd edition, 2018

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Perform numerous arithmetic and logic simplification using various methods.
2. Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder
3. Design & analyze synchronous sequential logic circuits
4. Analyze various logic families and design circuits using PLDs.
5. Design various ADCs and DACs according to the given specifications.

JEC-303	NETWORK ANALYSIS AND SYNTHESIS	3L:0T:0P	3 Credits
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Unit	Topics	Lectures
I	Node and mesh analysis, matrix approach of network containing voltage & current sources and reactances, source transformation and duality.	8
II	Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power transfer, compensation and Tellegen's theorem as applied to A.C. circuits.	8
III	Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions. Steady state response of a network to non-sinusoidal periodic inputs, Power factor, effective values.	8
IV	Network function for one-port and two-port, calculation of network function for ladder and general networks, poles and zeros with restrictions for driving point functions and transform functions. Two-Port Network: Introduction, Parameters, and Condition for reciprocity and symmetry, Relation between port parameters, Interconnection of two ports networks.	8
V	Sinusoidal response from pole-zero locations, convolution theorem, behaviour of series and parallel resonant circuits. Introduction to band pass, low pass, high pass and band reject filters.	8

Text/Reference Books:

1. Franklin F. Kuo, "Network Analysis and Synthesis," Wiley India Education, 2nd Ed., 2006.
2. Van, Valkenburg, "Network analysis," Pearson, 2019.
3. Sudhakar, A., Shyamamohan, S. P., "Circuits and Network," Tata McGraw-Hill New Delhi, 1994.
4. A William Hayt, "Engineering Circuit Analysis," 8th Edition, McGraw-Hill Education.
5. A. Anand Kumar, "Network Analysis and Synthesis," PHI publication, 2019.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Apply electrical network theorems.
3. Apply Laplace transform for analysis steady state and transient behaviour of network circuit.
4. Determine different network functions of Two Port network
5. Analyse the frequency response of various filters.

JEC351	ELECTRONIC DEVICES LAB	0L:0T:2P	1 Credits
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SUGGESTIVE LIST OF EXPERIMENTS

1. **Study of Lab Equipment and Components:** CRO, multimeter, and function generator, power supply- active, passive components and bread board.
2. **P-N Junction diode:** Characteristics of PN junction diode - static and dynamic resistance measurement from graph.
3. **Applications of PN Junction diode:** Half & Full wave rectifier- Measurement of V_{rms} , V_{dc} , and ripple factor.
4. **Characteristics of Zener diode:** V-I characteristics of Zener diode, graphical measurement of forward and reverse resistance.
5. **Characteristics of Photo diode:** V-I characteristics of photo diode, graphical measurement of forward and reverse resistance.
6. **Characteristics of Solar cell:** V-I characteristics of solar cell, graphical measurement of forward and reverse resistance.
7. **Application of Zener diode:** Zener diode as voltage regulator. Measurement of percentage regulation by varying load resistor.
8. **Characteristic of BJT:** BJT in CE configuration- graphical measurement of h- parameters from input and output characteristics. Measurement of A_v , A_i , R_o and R_i of CE amplifier with potential divider biasing.
9. **Field Effect Transistors:** Single stage common source FET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
10. **Metal Oxide Semiconductor Field Effect Transistors:** Single stage MOSFET amplifier –plot of gain in dB Vs frequency, measurement of, bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand working of basic electronics lab equipment.
2. Understand working of PN junction diode and its applications.
3. Understand characteristics of Zener diode.
4. Design a voltage regulator using Zener diode.
5. Understand working of BJT, FET, MOSFET and apply the concept in designing of amplifiers.

JEC352	DIGITAL SYSTEM DESIGN LAB	0L:0T:2P	1 Credits
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SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuits and other components.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Design and analyze combinational logic circuits.
2. Design & analyze modular combinational circuits with MUX/DEMUX, decoder, encoder.
3. Design & analyze synchronous sequential logic circuits.
4. Design & build mini project using digital ICs.

JEC353	NETWORK ANALYSIS AND SYNTHESIS LAB	0L:0T:2P	1 Credits
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SUGGESTIVE LIST OF EXPERIMENTS

1. Verification of Kirchhoff's laws.
2. Verification of Superposition theorem.
3. Verification of Thevenin's Theorem and Maximum power transfer theorem.
4. Verification of Tallegen's theorem.
5. Measurement of power and power factor in a single phase AC series inductive circuit and study improvement of power factor using capacitor.
6. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
7. Determination of parameters of AC single phase series RLC circuit.
8. To find poles and zeros of immittance function.
9. Design and find cut-off frequency of low pass and high pass filters.
10. Design and find the pass band frequencies of band pass filters.
11. Design and find the stop band frequencies of band reject filters.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand basics of electrical circuits with nodal and mesh analysis.
 2. Appreciate electrical network theorems.
 3. Analyse RLC circuits.
 4. Determine the stability of an electrical circuit.
 5. Design network filters.
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SEMESTER-IV

JEC401	COMMUNICATION ENGINEERING	3L:0T:0P	3 Credits
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Unit	Topics	Lectures
I	Review of signals and systems, frequency domain representation of signals, principles of amplitude modulation systems- DSB, SSB and VSB modulations.	8
II	Angle modulation, representation of FM and PM signals, spectral characteristics of angle modulated signals.	8
III	Review of probability and random process, Gaussian and white noise characteristics, noise in amplitude modulation systems, noise in frequency modulation systems, pre-emphasis and de-emphasis, threshold effect in angle modulation.	8
IV	Pulse modulation, sampling process, pulse amplitude and pulse code modulation (PCM), differential pulse code modulation. Delta modulation, noise considerations in PCM, time division multiplexing, digital multiplexers.	8
V	Digital modulation schemes- phase shift keying, frequency shift keying, quadrature amplitude modulation, continuous phase modulation and minimum shift keying.	8

Text/Reference Books:

1. Haykin S., "Communications Systems," John Wiley and Sons, 2001.
2. Proakis J. G. and Salehi M., "Communication Systems Engineering," Pearson Education, 2002.
3. Taub H. and Schilling D.L., "Principles of Communication Systems," Tata McGraw Hill, 2001.
4. Wozencraft J. M. and Jacobs I. M., "Principles of Communication Engineering," John Wiley, 1965.
5. Barry J. R., Lee E. A. and Messerschmitt D. G., "Digital Communication," Kluwer Academic Publishers, 2004.
6. Proakis J.G., "Digital Communications," 4th Edition, McGraw Hill, 2000.
7. Abhay Gandhi, "Analog and Digital Communication," Cengage publication, 2015.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Analyze and compare different analog modulation schemes for their efficiency and bandwidth.
2. Analyze the behavior of a communication system in presence of noise.
3. Investigate pulsed modulation system and analyze their system performance.
4. Investigate various multiplexing techniques.
5. Analyze different digital modulation schemes and compute the bit error performance.

JEC-402	ANALOG CIRCUITS	3L:1T:0P	4 Credits
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Unit	Topics	Lectures
I	Amplifier models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.	8
II	Frequency response of Amplifiers: High frequency transistor models, frequency response of single stage and multistage amplifiers, cascade amplifier, Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation, concept of stability, gain margin and phase margin.	8
III	Oscillators: Review of the basic concept, Barkhausen criterion, RC oscillators (phase shift, Wien bridge etc.), LC oscillators (Hartley, Colpitt, Clapp etc.), Crystal Oscillator.	8
IV	Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load, differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR, Op-Amp design: Design of differential amplifier for a given specification, design of gain stages and output stages, compensation.	8
V	Op-Amp applications: Review of inverting and non-inverting amplifiers, integrator and differentiator, summing amplifier, precision rectifier, Schmitt trigger and its applications. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues.	8

Text/Reference Books:

1. J.V. Wait, L.P. Huelsman and GA Korn, "Introduction to Operational Amplifier theory and applications," Mc Graw Hill, 1992.
2. J. Millman and A. Grabel, "Microelectronics," 2nd edition, McGraw Hill, 1988.
3. P. Horowitz and W. Hill, "The Art of Electronics," 2nd edition, Cambridge University Press, 1989.
4. A.S. Sedra and K.C. Smith, "Microelectronic Circuits," Saunder's College Publishing, 4th edition.
5. Paul R. Gray and Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits," John Wiley, 3rd edition.
6. Muhammad H. Rashid, "Electronic Devices and Circuits," Cengage publication, 2014.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand and design of the various amplifiers.
2. Understand the concept of feedback topologies.
3. Design the different types of oscillators.
4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
5. Apply the concept of Operational amplifier to design linear and non-linear applications.

JEC403	SIGNAL SYSTEM	3L:1T:0P	4 Credits
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Unit	Topics	Lectures
I	Signals and systems as seen in everyday life, and in various branches of engineering and science, energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals, system properties: linearity, additivity and homogeneity, shift-invariance, causality, stability, realizability.	8
II	Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input-output behaviour with aperiodic convergent inputs, characterization of causality and stability of linear shift invariant systems, system representation through differential equations and difference equations, Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response	8
III	Fourier series representation, Fourier transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality, Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier transform (DFT), Parseval's Theorem, the idea of signal space and orthogonal bases, the Laplace transform, notion of Eigen functions of LSI systems, a basis of Eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behaviour.	8
IV	The z-Transform for discrete time signals and systems-Eigen functions, region of convergence, z-domain analysis.	8
V	The sampling theorem and its implications- spectra of sampled signals, reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on, aliasing and its effects, relation between continuous and discrete time systems.	8

Text/Reference books:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems," Pearson, 2015.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete," 4th edition, Prentice Hall, 1998.
3. B.P. Lathi, "Signal Processing and Linear Systems," Oxford University Press, 1998.
4. Douglas K. Lindner, "Introduction to Signals and Systems," McGraw Hill International Edition: 1999.
5. Simon Haykin, Barry van Veen, "Signals and Systems," John Wiley and Sons (Asia) Private Limited, 1998.
6. V. Krishnaveni, A. Rajeswari, "Signals and Systems," Wiley India Private Limited, 2012.
7. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems," John Wiley and Sons, 1995.
8. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB," TMH, 2003.
9. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems," TMH New Delhi, 2001.
10. A. Anand Kumar, "Signals and Systems," PHI 3rd edition, 2018.
11. D. Ganesh Rao, K.N. Hari Bhat, K. Anitha Sheela, "Signal, Systems, and Stochastic Processes," Cengage publication, 2018.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Analyze different types of signals.
2. Analyze linear shift-invariant (LSI) systems.
3. Represent continuous and discrete systems in time and frequency domain using Fourier series and transform.
4. Analyze discrete time signals in z-domain.
5. Study sampling and reconstruction of a signal.

JEC451	COMMUNICATION ENGINEERING LAB	0L:0T:2P	1 Credits
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SUGGESTIVE LIST OF EXPERIMENTS

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector.
3. To study frequency modulation and determine its modulation factor.
4. To study sampling and reconstruction of pulse amplitude modulation system.
5. To study pulse amplitude modulation.
 - a) Using switching method
 - b) By sample and hold circuit
6. To demodulate the obtained PAM signal by 2nd order LPF.
7. To study pulse width modulation and pulse position modulation.
8. To study pulse code modulation and demodulation technique.
9. To study delta modulation and demodulation technique.
10. To construct a square wave with the help of fundamental frequency and its harmonic component.
11. Study of amplitude shift keying modulator and demodulator.
12. Study of frequency shift keying modulator and demodulator.
13. Study of phase shift keying modulator and demodulator.
14. Study of single bit error detection and correction using hamming code.
15. Study of quadrature phase shift keying modulator and demodulator.
16. To simulate differential phase shift keying technique using MATLAB software.
17. To simulate M-ary Phase shift keying technique using MATLAB software (8PSK,16PSK) and perform BER calculations.
18. Design a front end BPSK modulator and demodulator.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Analyze and compare different analog modulation schemes for their modulation factor and power.
 2. Study pulse amplitude modulation.
 3. Analyze different digital modulation schemes and can compute the bit error performance.
 4. Study and simulate the Phase shift keying.
 5. Design a front end BPSK modulator and demodulator.
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JEC452	ANALOG CIRCUIT LAB	0L:0T:2P	1 Credits
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SUGGESTIVE LIST OF EXPERIMENTS

1. Characteristic of BJT: Study of BJT in various configurations (such as CE/CS, CB/CG, CC/CD).
2. BJT in CE configuration: Graphical measurement of h-parameters from input and output characteristics, measurement of A_v , A_i , R_o and R_i of CE amplifier with potential divider biasing.
3. Study of Multi-stage amplifiers: Frequency response of single stage and multistage amplifiers.
4. Feedback topologies: Study of voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc.
5. Measurement of Op-Amp parameters: Common mode gain, differential mode gain, CMRR, slew rate.
6. Applications of Op-Amp: Op-Amp as summing amplifier, difference amplifier, integrator and differentiator.
7. Field effect transistors: Single stage common source FET amplifier –plot of gain in dB vs frequency, measurement of bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier.
8. Oscillators: Study of sinusoidal oscillators- RC oscillators (phase shift, Wien bridge etc.).
9. Study of LC oscillators (Hartley, Colpitt, Clapp etc.),
10. Study of non-sinusoidal oscillators.
11. Simulation of amplifier circuits studied in the lab using any available simulation software and measurement of bandwidth and other parameters with the help of simulation software.
12. ADC/DAC: Design and study of Analog to Digital Converter.
13. Design and study of Digital to Analog Converter.

Course Outcome

At the end of this course students will demonstrate the ability to:

1. Understand the characteristics of transistors.
 2. Design and analyze various configurations of amplifier circuits.
 3. Design sinusoidal and non-sinusoidal oscillators.
 4. Understand the functioning of OP-AMP and design OP-AMP based circuits.
 5. Design ADC and DAC.
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JEC453	SIGNAL SYSTEM LAB	0L:0T:2P	1 Credits
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SUGGESTIVE LIST OF EXPERIMENTS

1. Introduction to MATLAB
 - a. To define and use variables and functions in MATLAB.
 - b. To define and use Vectors and Matrices in MATLAB.
 - c. To study various MATLAB arithmetic operators and mathematical functions.
 - d. To create and use m-files.
2. Basic plotting of signals
 - a. To study various MATLAB commands for creating two and three dimensional plots.
 - b. Write a MATLAB program to plot the following continuous time and discrete time signals.
 - i. Step Function
 - ii. Impulse Function
 - iii. Exponential Function
 - iv. Ramp Function
 - v. Sine Function
3. Time and Amplitude transformations
Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
4. Convolution of given signals
Write a MATLAB program to obtain linear convolution of the given sequences.
5. Autocorrelation and Cross-correlation
 - a. Write a MATLAB program to compute autocorrelation of a sequence $x(n)$ and verify the property.
 - b. Write a MATLAB program to compute cross-correlation of sequences $x(n)$ and $y(n)$ and verify the property.
6. Fourier Series and Gibbs Phenomenon
 - a. To calculate Fourier series coefficients associated with Square Wave.
 - b. To Sum the first 10 terms and plot the Fourier series as a function of time.
 - c. To Sum the first 50 terms and plot the Fourier series as a function of time.
7. Calculating transforms using MATLAB
 - a. Calculate and plot Fourier transform of a given signal.
 - b. Calculate and plot Z-transform of a given signal.
8. Impulse response and Step response of a given system
 - a. Write a MATLAB program to find the impulse response and step response of a system from its difference equation.
 - b. Compute and plot the response of a given system to a given input.
9. Pole-zero diagram and bode diagram
 - a. Write a MATLAB program to find pole-zero diagram, bode diagram of a given system from the given system function.
 - b. Write a MATLAB program to find, bode diagram of a given system from the given system function.
10. Frequency response of a system
Write a MATLAB program to plot magnitude and phase response of a given system.
11. Checking linearity/non-linearity of a system using SIMULINK
 - a. Build a system that amplifies a sine wave by a factor of two.
 - b. Test the linearity of this system using SIMULINK.

Course outcomes:

At the end of this course students will demonstrate the ability to:

1. Understand the basics operation of MATLAB.
 2. Analysis the time domain and frequency domain signals.
 3. Implement the concept of Fourier series and Fourier transforms.
 4. Find the stability of system using pole-zero diagrams and bode diagram.
 5. Design frequency response of the system.
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Bundelkhand Institute of Engineering & Technology, Jhansi



**Evaluation Scheme & Syllabus
For
B.Tech. 2nd Year**

Electrical Engineering

(Effective from session 2025-26)

Bundelkhand Institute of Engineering & Technology, Jhansi

SEMESTER –III

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA	CT+TA	TE/PE		
1	JOE3** / JAS303	Science Based Open Elective/BSC (Maths-III/Math IV/ Math V)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	JVE301 / JAS301	Universal Human Value and Professional Ethics/ Technical Communication	T	VA/HS	2	1	0	20	10	30	70	100	3
3	JEE301	Electromagnetic Field Theory	T	PC	3	1	0	20	10	30	70	100	4
4	JEE302	Electrical Measurements & Instrumentation	T	PC	3	1	0	20	10	30	70	100	4
5	JEE303	Basic Signals & Systems	T	PC	3	1	0	20	10	30	70	100	3
6	JEE351	Circuit Simulation Lab	P	PC	0	0	2		50	50	50	100	1
7	JEE352	Electrical Measurements and Instrumentation Lab	P	PC	0	0	2		50	50	50	100	1
8	JEE353	Electrical Workshop	P	PC	0	0	2		50	50	50	100	1
10	JCC301 / JCC302	Cyber Security/Python programming	T	VA	2	0	0	20	10	30	70	100	2
11	JSSSCC351	Internship Assessment /Mini Project*	P							100		100	2
		Total			15	5	6						25

- **Mathematics –III** for CE / ENV and allied branches
- **Mathematics-IV** for Computer/Electronics/Electrical & allied Branches, Mechanical & Allied Branches Textile/Chemical & allied Branches
- **Mathematics-V** for Bio Technology / Agriculture Engineering

SEMESTER –IV

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ ESE	Credit Cr
					L	T	P	CT	TA				
1	JAS403 / JOE4**	BSC(Maths-III/Math IV/ Math V)/Science Based Open Elective	T	BS/ES	3	1	0	20	10	30	70	100	4
2	JAS401 / JVE401	Technical Communication / Universal Human Value and Professional Ethics	T	HS/VA	2	1	0	20	10	30	70	100	3
3	JEE401	Digital Electronics	T	PC	3	1	0	20	10	30	70	100	4
4	JEE402	Electrical Machines-I	T	PC	3	1	0	20	10	30	70	100	4
5	JEE403	Networks Analysis & Synthesis	T	PC	3	1	0	20	10	30	70	100	3
6	JEE451	Network Analysis & Synthesis Lab	P	PC	0	0	2		50	50	50	100	1
7	JEE452	Electrical Machines-I Lab	P	PC	0	0	2		50	50	50	100	1
8	JEE453	Digital Electronics Lab	P	PC	0	0	2		50	50	50	100	1
9	JCC402 / JCC401	Python Programming/Cyber Security	P	VA	2	0	0	20	10	30	70	100	2
10	JVE451 / JVE452	Sports and Yoga - II / NSS-II	P	VA	0	0	3			100		100	0
		Total			15	5	9						23
		Minor Degree/ Honors Degree MT-1/HT-1											

*The Mini Project or internship (4 weeks) will be done during summer break after 4th Semester and will be assessed during V semester.

SYLLABUS

JEE301- ELECTROMAGNETIC FIELD THEORY

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Apply different coordinate systems and their application in electromagnetic field theory, establish a relation between any two systems and also understand the vector calculus.	K ₃
CO2	Understand the concept of static electric field. Understand the concept of current and properties of conductors. Establish boundary conditions and to calculate capacitances of different types of capacitors	K ₄
CO3	Understand the concept of static magnetic field, magnetic scalar and vector Potential	K ₄
CO4	Understand the forces due to magnetic field, magnetization, magnetic boundary conditions and inductors.	K ₄
CO5	Understand displacement current, time varying fields, propagation and reflection of EM waves and transmission lines.	K ₃

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

Detailed Syllabus:

UNIT I

Coordinate Systems and Transformation: Basics of Vectors: Addition, subtraction and multiplications; Cartesian, Cylindrical, Spherical transformation. Vector calculus: Differential length, area and volume, line surface and volume integrals, Del operator, Gradient, Divergence of a vector, Divergence theorem, Curl of a vector, Stokes's theorem, Laplacian of a scalar.

Unit II

Electrostatic fields: Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gauss's Law- Maxwell's equation, Electric Potential, Relation between E and V- Maxwell's equation Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric- constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson's and Laplace's equations., Methods of Images.

Unit III

Magneto statics : Magneto-static fields, Biot - Savart's Law, Ampere's circuit law, Maxwell's equation, Application of ampere's law, Magnetic flux density- Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential.

Unit IV

Magnetic forces: Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Classification of materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

Unit V

Waves and Applications: Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form Electromagnetic wave propagation: Wave propagation in loss dielectrics, Plane waves in lossless dielectrics Plane wave in free space. Plain waves in good conductors, Power and the pointing vector, Reflection of a plain wave in a normal incidence. Transmission Lines and Smith Chart.

Text Book: 1. MNO Sadiku, "Elements of Electromagnetic", Oxford University Press.

Reference Books: 1. WH Hayt and JA Buck, "Engineering Electromagnetic", McGraw- Hill Education.

JEE302- ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Pre-requisites of course: Basic Electrical Engineering

Course Outcomes:		Knowledge Level, KL
At the end of this course students will demonstrate the ability to:		
CO 1	Evaluate errors in measurement as well as identify and use different types of instruments for the measurement of voltage, current.	K ₁
CO2	Demonstrate the construction and working of different measuring instruments for Power, energy and frequency measurements.	K ₂
CO3	Demonstrate the construction and working of different AC and DC bridges, along with their applications.	K ₂
CO4	Demonstrate the working of instrument transformers as well as calculate the errors in current and potential transformers, Manifest the working of electronic instruments like voltmeter, multi-meter, frequency meter and CRO and ability to measure electrical engineering parameters like voltage, current, power, phase difference and frequency.	K ₂
CO5	Display the knowledge of transducers, their classifications and their applications for the measurement of physical quantities like motion, force, pressure, temperature, flow and liquid level.	K ₃

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

Detailed Syllabus:

UNIT I

ELECTRICAL MEASUREMENTS & INTRODUCTION TO MEASURING INSTRUMENTS: Measurement system, Characteristics of instruments, Methods of measurement, Errors in Measurement & Measurement standards, Classification of Instrument – deflecting, controlling and damping torques – Ammeters and Voltmeters – PMMC, moving iron, Electrostatic, induction type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range of instruments.

UNIT II

MEASUREMENT OF POWER & ENERGY: Types of watt meters, Single phase dynamometer & induction type wattmeter, Expression for deflecting and control torques. Measurement of active and reactive power in balanced and unbalanced three phase systems, theory and operation of single & three phase induction type energy meter, power factor meter & analog frequency meter.

UNIT III

POTENTIOMETERS, DC & AC BRIDGES: Principle and operation of D.C. Crompton's potentiometer standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers. Method of measuring low, medium and high resistance – sensitivity of wheat-stone's bridge – Kelvin's double bridge for measuring low resistance. Measurement of inductance-Maxwell's bridge, Hay's bridge, Anderson's bridge, Owens's bridge. Measurement of capacitance and loss angle – Desauty's bridge, Wien's bridge, Schering Bridge.

UNIT IV

INSTRUMENT TRANSFORMER & ELECTRONIC MEASUREMENTS: CT and PT Construction and working, Ratio and phase angle errors, testing and design considerations. Electronic Voltmeter- Ammeter, Multimeter, Wattmeter & Energy meter, Principle of CRO, Time, Frequency and phase angle measurements using CRO, Storage type oscilloscope, Spectrum & Wave analyzer and Digital Voltmeter.

UNIT V

TRANSDUCERS: Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principal operation of LVDT and capacitor transducers, LVDT Applications, Strain and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, and photo diodes.

Text Book:

1. A K Sawhney, "Electrical & Electronic Measurement & Instrument", Dhanpat Rai & Sons, India
2. BC Nakra & K. Chaudhary, "Instrumentation, Measurement and Analysis," Tata McGraw Hill 2nd Edition
3. Purkait, "Electrical & Electronics Measurement & Instrumentation", TMH

Reference Books:

1. Forest K. Harris, "Electrical Measurement", Wiley Eastern Pvt. Ltd. India
2. M. Stout, "Basic Electrical Measurement", Prentice Hall of India
3. WD Cooper, "Electronic Instrument & Measurement Technique", Prentice Hall International
4. EW Golding & F.C. Widdis, "Electrical Measurement & Measuring Instrument", AW Wheeler & Co. Pvt. Ltd. India

JEE303- BASIC SIGNAL & SYSTEMS

Pre-requisites of course: Basic Electrical Engineering, Engineering Mathematics

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO 1	Represent the various types of signals & systems and can perform mathematical operations on them.	K ₂
CO2	Analyze the response of LTI system to Fourier series and Fourier transform and to evaluate their applications to network analysis.	K ₄
CO3	Analyze the properties of continuous time signals and system using Laplace transform and determine the response of linear system to known inputs.	K ₄
CO4	Implement the concepts of Z transform to solve complex engineering problems using difference equations.	K ₃
CO5	Develop and analyze the concept of state-space models for SISO & MIMO system.	K ₄

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

Detailed Syllabus:

UNIT I

Pre- Requisites: *Differential Equations.*

Introduction to Continuous Time Signals and Systems: Introduction to continuous time and discrete time signals, Classification of signals with their mathematical representation and characteristics. Transformation of independent variable, Introduction to various type of system, basic system properties.

Analogous System: Linear & Rotational mechanical elements, force-voltage and force-current analogy, modeling of mechanical and electro-mechanical systems: Analysis of first and second order linear systems by classical method.

UNIT II

Pre- Requisites: *Fourier Series & Fourier Transform*

Fourier Transform Analysis:, Fourier symmetry, Fourier transform: Properties, application to network analysis. Definition of DTFS, and DTFT, Sampling Theorem.

UNIT III

Pre- Requisites: *Laplace Transform*

Laplace Transform Analysis: Review of Laplace Transform, Properties of Laplace Transform, Initial & Final value Theorems, Inverse Laplace Transform, Convolution Theorem, Impulse response, Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform to complex waveforms. ROC Region of convergence.

UNIT IV

Pre- Requisites: *Matrix Calculations.*

State – Variable analysis: Introduction, State Space representation of linear systems, Transfer function and state Variables, State Transition Matrix, Solution of state equations for homogeneous and non-homogeneous systems, Applications of State – Variable technique to the analysis of linear systems.

UNIT V

Pre- Requisite: *Z-Transforms.*

Z – Transform Analysis: Concept of Z – Transform & ROC, Z – Transform of common functions, Inverse Z – Transform, Initial & Final value Theorems, Applications to solution of difference equations, Properties of Z-transform.

Text Books:

1. Oppenheim, Wilsky, Nawab, "Signals & Systems", Pearson Education, 2015
2. Anand Kumar, "Signals & Systems", PHI
3. Choudhary D. Roy, "Network & Systems", Wiley Eastern Ltd.

Reference Books:

1. David K. Cheng; "Analysis of Linear System", Narosa Publishing Co
2. Donald E. Scott, "Introduction to circuit Analysis" Mc. Graw Hill
3. BP Lathi, "Linear Systems & Signals" Oxford University Press, 2008.
4. IJ Nagrath, S.N. Saran, R. Ranjan and S. Kumar, "Signals and Systems", TataMc.Graw Hill, 2001.
5. ME Van-Valkenberg; " Network Analysis", Prentice Hall of India

JEE351- CIRCUIT SIMULATION LAB

Pre-requisites of course: Basic Electrical Engineering

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO 1	Apply the knowledge of basic circuit law, nodal and mesh analysis for given circuit.	K2
CO2	Analysis of the AC and DC circuits using simulation techniques.	K3
CO3	Analysis of transient response of AC circuits.	K3
CO4	Evaluation and analysis of two-port network parameters.	K2
CO5	Estimation of parameters of different filters.	K2

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

List of Experiments

Ten experiments to be performed

1. Verification of principle of Superposition with AC sources using Multisim/ PSPICE.
2. Verification of Thevenin and Maximum Power Transfer theorems in AC Circuits using Multisim/ PSPICE.
3. Verification of Norton theorems in AC Circuits using Multisim/ PSPICE.
4. Verification of Tellegen's theorem for two networks of the same topology using Multisim/ PSPICE.
5. Determination of Z and h-parameters (DC only) for a network and computation of Y and ABCD Parameters using Multisim/ PSPICE.
6. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values using Multisim/ PSPICE.
7. Determination of transient response of current in RL and RC circuits with step voltage input.
8. Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases.
9. Determination of image impedance and characteristic impedance of T and Π networks, using O.C. and S.C. tests.
10. Verification of parameter properties in inter-connected two port networks: series, parallel and cascade using Multisim/ PSPICE.
11. Determination of frequency response of a Twin – T-notch filter.
12. To determine attenuation characteristics of a low pass / high pass active filters.

Note: Any two experiments from above list should also be performed by students on Virtual Lab.

JEE352- ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB

Pre-requisites of course: Basic Electrical Engineering

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO 1	Understand the importance of calibration of measuring instruments.	K2
CO2	Demonstrate the construction and working of different measuring instruments.	K3
CO3	Demonstrate the construction and working of different AC and DC bridges, along with their applications.	K3
CO4	Ability to measure electrical engineering parameters like voltage, current, power & phase difference in industry as well as in power generation, transmission and distribution sectors.	K2
CO5	Capability to analyze and solving the variety of problems in the field of electrical measurements.	K2

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

Note : Minimum ten experiments are to be performed from the following list:

1. Calibration of AC voltmeter and AC ammeter.
2. Measurement of inductance using Maxwell's Bridge.
3. Measurement of capacitance using Schering Bridge.
4. Measurement of low resistance using Kelvin's Double Bridge.
5. Measurement of Power using CT and PT.
6. Measuring displacement using LVDT.
7. Measuring temperature using thermocouple.
8. Measuring pressure using piezoelectric pick up.
9. Measurement of speed of DC motor by photoelectric pick up.
10. Speed measurement using Hall Effect sensor.
11. PC based data logging of temperature sensor using LabVIEW/ MATLAB.
12. Signal conditioning of analog signal using LabVIEW/ MATLAB.

Note: Any two experiments from above list should also be performed by students on Virtual Lab.

JEE353- ELECTRICAL WORKSHOP

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO 1	Perform various types of Electrical connections.	K ₃
CO2	Develop small circuits on PCB	K ₆
CO3	Differentiate between various electrical wires, cables and accessories.	K ₃
CO4	Demonstrate the layout of electrical substation & various safety measures.	K ₂

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

Detailed Syllabus:

Note: Minimum ten experiments are to be performed from the following list:

1. To study the working and Control of two lamps in series and in parallel
2. To perform the stair case working and it's testing.
3. To study the working principle and wiring of fluorescent lamp.
4. To study and wiring of distribution board including power plug using isolator, MCB, ELCB.
5. To study and estimate a typical, BHK house wiring.
6. Familiarization, soldering, testing and observing the wave forms on CRO of a HW and FW uncontrolled rectifier (using diodes) with capacitor filter.
7. Visit your college substation and familiarize the supply system, Transformer, HT Panel and Distribution etc.
8. To study construction, working and application of workshop tools. Also study the Electrical and Electronics Symbols.
9. To study the wires, cables and their gauges, Domestic Electrical Accessories.
10. Mini Project on PCB.
11. To study fault, Remedies in Domestic Installation and Indian Electricity Rules.
12. To study the different types of earthing system and measure the earth resistance.

SEMESTER –IV

JEE401- DIGITAL ELECTRONICS

Course Outcomes:		Knowledge Level, KL
At the end of this course students will demonstrate the ability to:		
CO 1	Perform number style arithmetic and logic simplification using various methods.	K ₃
CO2	Design and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder	K ₄
CO3	Design & analyze synchronous sequential logic circuits	K ₄
CO4	Analyze various logic families and design circuits using PLDs.	K ₃
CO5	Design various ADCs and DACs according to the given specifications.	K ₃

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

Detailed Syllabus

UNIT I

Logic simplification and combinational logic design: Number Systems, Binary arithmetic, signed magnitude representation, Binary codes, code conversion, review of Boolean algebra and Demorgan's theorem, SOP & POS forms, Canonical forms, Karnaugh maps up to 5 variables, tabulation method.

UNIT II

Analysis and Design of combinational circuits, MSI devices like comparators, multiplexers, demultiplexers, encoder, decoder, circuit realization using Multiplexers and decoders, half and full adders, subtractors, serial and parallel adders, BCD adder, barrel shifter.

UNIT III

Sequential logic design: Building blocks like S-R, JK and Master-Slave JK FF, D FF, T FF, edge triggered FF, Flip flop conversion, Applications of Flip Flops: ripple and synchronous counters, Ring counter, Johnson counter, shift registers: SISO, SIPO, PISO, PIPO, Bidirectional shift register, Universal shift register; Finite state machines: Mealy and Moore machines, State diagrams, state reduction, Analysis of clocked sequential circuits, Design of clocked sequential circuits,

UNIT IV

Logic families and semiconductor memories: A TTL NAND gate, specifications, noise margin, propagation delay, fan-in, fan-out, tristate TTL, ECL, CMOS families and their interfacing, memory elements, concept of programmable logic devices like FPGA, logic implementation using programmable devices.

UNIT V

Memory & Programmable Logic Devices: Specifications of DACs, Weighted resistor, R-2R ladder, Analog-to-digital converters (ADC): Specifications of ADCs, principle of ADC, switched capacitor circuits: Basic concept, practical configurations, ADC etc. ADC Types: dual slope, successive approximation, counting type, flash etc.

Text Books:

1. M. Morris Mano and M. D. Ciletti, "Digital Design", Pearson Education.
2. David J. Comer, "Digital Logic & State Machine Design", Oxford University Press.
3. RP Jain, "Modern Digital Electronics", Tata McGraw Hill Publication.
4. A. Anand Kumar, "Fundamental of Digital Circuits," PHI 4th edition, 2018.

JEE402- ELECTRICAL MACHINES – I

Pre-requisites of course: Basic Electrical Engineering, Engineering Mathematics

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO 1	Analyze the various principles & concepts involved in Electromechanical Energy conversion.	K ₄
CO2	Demonstrate the constructional details of DC machines as well as transformers, and principle of operation of brushless DC motor, Stepper and DC Servo motors.	K ₂
CO3	Evaluate the performance and characteristics of DC Machine as motor and as well as generator.	K ₄
CO4	Evaluate the performance of transformers, individually and in parallel operation.	K ₄
CO5	Demonstrate and perform various connections of three phase transformers.	K ₃

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

Detailed Syllabus:

UNIT I

Pre- Requisites: *Magnetic Materials, BH characteristics, comparison between magnetic and electric circuits.*

Principles of Electro-mechanical Energy Conversion: Introduction, Review of magnetic system, Energy in Magnetic system, Force and torque in magnetic field system, Energy balance equation, Energy conversion via electrical field, Energy in a singly excited system, Determination of the Force and Torque from energy and co-energy, Generation of EMF in Machines, Torque in machine with cylindrical air gap.

UNIT II

Pre- Requisites: *Principle & Construction, Classification and circuit model, EMF equation of generator and torque equation of motor*

DC Machines: Armature winding (Concentrated and Distributed), Winding Factor, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of DC generators, Applications.

UNIT III

DC Machines (Contd.): Performance characteristics of DC motors, Starting of DC motors; 3 point and 4 point starters, Speed control of DC motors; Field control, Armature control and Voltage control (Ward Leonard method); Efficiency and Testing of DC machines (Hopkinson's and Swinburne's Test), Applications, stepper motor and DC Servo motor and their applications.

UNIT IV

Pre- Requisites: *Construction & Principle, Ideal and practical transformer, equivalent circuit & phasor diagram, losses in transformers.*

Single Phase Transformer: Efficiency and voltage regulation, all day efficiency, Excitation phenomenon and harmonics in transformers.

Testing of Transformers- O.C. and S.C. tests, Polarity test, Sumpner's test.

Auto Transformer- Single phase and three phase autotransformers, Volt-amp relation, Copper saving in autotransformer Efficiency, Merits & demerits and applications.

UNIT V

Pre- Requisite: *Three-phase connections – Star/Delta.*

Three Phase Transformers: Construction, Three phase transformer, phasor groups and their connections, open delta connection, three phase to 2 phase and their applications, Three winding transformers. Parallel operation of single phase and three phase transformers and load sharing.

Text Books:

1. IJ Nagrath & D.P. Kothari, "Electrical Machines", Tata McGraw Hill
2. Rajendra Prasad , "Electrical Machines", PHI
3. PS Bimbhra, "Electrical Machinery", Khanna Publisher
4. AE Fitzgerald, C. Kingsley Jr and Umans, "Electric Machinery", McGraw Hill, International Student Edition.

Reference Books:

1. H. Cotton, "Electrical Technology", CBS Publication.
2. MG Say, "The Performance and Design of AC machines", Pit man& Sons.
3. PS Bimbhra, " Generalized Theory.

JEE403- NETWORK ANALYSIS & SYNTHESIS

Pre-requisites of course: Basic Electrical Engineering, Basic signal & systems.

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO 1	Apply the knowledge of basic circuit law, nodal and mesh methods of circuit analysis and simplify the network using Graph Theory approach.	K ₃
CO2	Analyze the AC and DC circuits using Kirchhoff's law and Network simplification theorems.	K ₄
CO3	Analyze steady-state responses and transient response of DC and AC circuits using classical and Laplace transform methods.	K ₄
CO4	Demonstrate the concept of complex frequency and analyze the structure and function of one and two port network. Also evaluate and analysis two-port network parameters.	K ₄
CO5	Synthesize one port network and analyze different filters.	K ₄

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

Detailed Syllabus:

UNIT I

Graph Theory:

Pre- Requisites: Basic circuit law, Mesh & Nodal analysis.

Importance of Graph Theory in Network Analysis, Graph of a network, Definitions, planar & Non-Planar Graphs, Isomorphism, Tree, Co Tree, Link, basic loop and basic cutset, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analysis.

Unit II

AC Network Theorems (Applications to dependent & independent sources):

Pre- Requisites: Concepts of DC Network Theorems, Electrical Sources & Basic circuit law. Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem. Millman's theorem, Compensation theorem, Tellegen's Theorem.

Unit III

Transient Circuit Analysis:

Pre- Requisites: Laplace Transform & Concept of Initial conditions.

Natural response and forced response, Transient behaviour of RL, RC and RLC networks, Evaluation of initial conditions, Transform Impedance, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response of RL, RC and RLC networks with and without initial conditions both through classical and Laplace transform methods.

Unit IV

Network Functions:

Pre- Requisites: *Concept of basic circuit law, parallel, series circuits.*

Concept of complex frequency, Network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions. Two Port Networks- Characterization of LTI two port networks; Z, Y, ABCD, g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter- connections of two port networks, Ladder and Lattice networks: T & Π representation, terminated two Port networks.

Unit V

a. Network Synthesis:

Pre- Requisites: *Laplace Transform, Concept of immittance functions.*

Positive real function; definition and properties, Properties of LC, RC and RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

b. Filters

Pre- Requisites: *Concept of Passive & active elements.*

Image parameters: Image impedance, characteristics impedance, image transfer parameter, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introduction to active filters.

Text Books:

1. ME Van Valkenburg, "Network Analysis", 3rd edn, Pearson Education.
2. Alexander, Sadiku, "Fundamentals of Electric Circuits", McGraw Hill.
3. D. Roy Choudhary, "Networks and Systems", Wiley Eastern Ltd.
4. CL Wadhwa, "Network Analysis and Synthesis", New Age International Publishers.
5. A. Chakrabarti, "Circuit Theory", Dhanpat Rai & Co.

Reference Books:

1. Hayt, Kimmerly, Durbin, "Engineering Circuit Analysis", McGraw Hill.
2. Donald E. Scott, "An Introduction to Circuit analysis: A System Approach", McGraw Hill.
3. ME Van Valkenburg, "An Introduction to Modern Network Synthesis", Wiley Eastern Ltd.
4. T.S.K.V. Iyer, "Circuit Theory", Tata McGraw Hill.
5. Samarjit Ghosh, " Network Theory: Analysis & Synthesis" Prentice Hall India.

JEE451- NETWORK ANALYSIS AND SYNTHESIS LAB

Pre-requisites of course: Basic Electrical Engineering

Course Outcomes:		Knowledge Level, KL
At the end of this course students will demonstrate the ability to:		
CO 1	Understand basics of electrical circuits with nodal and mesh analysis.	K2
CO2	Appreciate electrical network theorems.	K3
CO3	Analyse RLC circuits.	K3
CO4	Determine the stability of an electrical circuit.	K2
CO5	Design network filters.	K2

KL- Bloom's Knowledge Level ($K_1, K_2, K_3, K_4, K_5, K_6$)

K_1 – Remember K_2 – Understand K_3 – Apply K_4 – Analyze K_5 – Evaluate K_6 – Create

List of Experiments

Ten experiments to be performed:

1. Verification of Maximum power transfer theorem.
2. Verification of Tellegen's theorem.
3. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
4. Design and find cut-off frequency of low pass and high pass filters.
5. Design and find the pass band frequencies of band pass filters.
6. Design and find the stop band frequencies of band reject filters.
7. Determination of two port network Z and h parameters.
8. Verification of parameters properties in interconnection of 2, two port networks in series-series interconnection.
9. Verification of parameters properties in interconnection of 2, two port networks in parallel-parallel interconnection.
10. Determination of Z parameters of a T network and Computation of corresponding parameters to equivalent π network.
11. To perform the transient response of RL circuit.
12. Verification of parameters properties in interconnection of 2, two port networks in cascade interconnection.

Note: Any two experiments from above list should also be performed by students on Virtual Lab.

JEE452- ELECTRICAL MACHINES-I LAB

Pre-requisites of course: Basic Electrical Engineering

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO1	Analyze and conduct basic tests on DC Machines and single-phase Transformer	K2
CO2	Obtain the performance indices using standard analytical as well as graphical methods.	K3
CO3	Determine the magnetization, Load and speed-torque characteristics of DC Machines.	K3
CO4	Demonstrate procedures and analysis techniques to perform electromagnetic and electromechanical tests on electrical machines.	K2

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

List of Experiments

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software-based experiments.

1. To obtain magnetization characteristics of a DC shunt generator.
2. To obtain load characteristics of a DC shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded.
3. To obtain efficiency of a DC shunt machine using Swinburne's test.
4. To perform Hopkinson's test and determine losses and efficiency of DC machine.
5. To obtain speed- torque characteristics of a DC shunt motor.
6. To obtain speed control of DC shunt motor using (a) armature resistance control (b) field control
7. To obtain speed control of DC separately excited motor using Ward-Leonard.
8. To obtain equivalent circuit, efficiency and voltage regulation of a single-phase transformer using O.C. and S.C. tests.
9. To obtain efficiency and voltage regulation of a single-phase transformer by Sumpner's test.
10. To obtain 3-phase to 2-phase conversion by Scott connection.
11. To demonstrate the parallel operation of three phase transformer and to obtain the load sharing at a load.

Note: Any two experiments from above list should also be performed by students on Virtual Lab.

JEE453- DIGITAL ELECTRONICS LAB

Course Outcomes:		Knowledge Level, KL
Upon the completion of the course, the student will be able to:		
CO 1	Understanding of Digital Binary System and implementation of Gates.	K ₂ , K ₃
CO2	Design the Sequential circuits with the help of combinational circuits and feedback element.	K ₃ , K ₄
CO3	Design data selector circuits with the help of universal Gates.	K ₃ , K ₄
CO4	Design the counters with the help of sequential circuit and basic Gates.	K ₃ , K ₄
CO5	Implement the projects using the digital ICs and electronics components.	K ₃ , K ₅

KL- Bloom's Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)

K₁ – Remember K₂ – Understand K₃ – Apply K₄ – Analyze K₅ – Evaluate K₆ – Create

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
6. Implementation of 4:1 multiplexer using logic gates.
7. Implementation of 1:4 demultiplexer using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuit's and other components.

Note: Any two experiments from above list should also be performed by students on Virtual Lab.

BUNDELKHAND INSTITUTE OF ENGINEERING & TECHNOLOGY, JHANSI
UTTAR PRADESH



EVALUATION SCHEME

FOR

B.TECH. 2nd YEAR

MECHANICAL ENGINEERING

[Effective from Session:2026-27]

B. Tech. 2nd Year
Mechanical Engineering
Evaluation Scheme
Effective in Session-2026-27
SEMESTER–III

S.NO.	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional(SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA				
1	JOE3**/ JAS302	Science Based Open Elective/BSC (Maths-III/MathIV/ Math V)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	JVE301/ JAS301	Universal Human Value and Professional Ethics/Technical Communication	T	VA/HS	2	1	0	20	10	30	70	100	3
3	JME301	Thermodynamics	T	PC	3	1	0	20	10	30	70	100	4
4	JME302	Fluid Mechanics& Fluid machines	T	PC	3	1	0	20	10	30	70	100	4
5	JME303	Materials Engineering	T	PC	3	1	0	20	10	30	70	100	4
6	JME351	Fluid Mechanics Lab	P	PC	0	0	2		50	50	50	100	1
7	JME352	Material Testing Lab	P	PC	0	0	2		50	50	50	100	1
8	JME353	Computer Aided Machine Drawing-I Lab	P	PC	0	0	2		50	50	50	100	1
9	JCC301/ JCC302	Cyber Security/Python programming	T	VA	2	0	0	20	10	30	70	100	2
10	JCC351	Internship Assessment /Mini Project*	P							100		100	2
		Total			16	5	6					1000	26

- **Mathematics–III** for CE/ENV and allied branches
- **Mathematics-IV** for Computer/Electronics/Electrical&alliedBranches,Mechanical&AlliedBranchesTextile/Chemical&alliedBranches
- **Mathematics-V** for Bio Technology/Agriculture Engineering

SEMESTER–IV

S.NO.	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA				
1	JAS402/ JOE4**	BSC (Maths -III/Math IV/ Math V)/Science Based Open Elective	T	BS/ES	3	1	0	20	10	30	70	100	4
2	JAS401/ JVE401	Technical Communication/ Universal Human Value and Professional Ethics	T	HS/VA	2	1	0	20	10	30	70	100	3
3	JME401	Applied Thermodynamics	T	PC	3	1	0	20	10	30	70	100	4
4	JME402	Engineering Mechanics & Strength Material	T	PC	3	1	0	20	10	30	70	100	4
5	JME403	Manufacturing Processes	T	PC	3	1	0	20	10	30	70	100	4
6	JME451	Applied Thermodynamics Lab	P	PC	0	0	2		50	50	50	100	1
7	JME452	Manufacturing Processes Lab	P	PC	0	0	2		50	50	50	100	1
8	JME453	Computer Aided Machine Drawing-II Lab	P	PC	0	0	2		50	50	50	100	1
9	JCC402/ JCC401	Python Programming/Cyber Security	P	VA	2	0	0	20	50	50	50	100	2
10	JVE451/ JVE452	Sports and Yoga-II/NSS-II &NCC-II	P	VA	0	0	3			50*		50*	0
		Minor Degree MT-1/Honors Degree HT-1	T	PC	3	1	0	20	10	30	70	100	4**
		Total			16+3	5+1	9					900 + 50*+*100	24

- The Mini-Project or intern ship (4weeks)will be done during summer break after 4th Semester and will be assessed during Vth semester.

SYLLABUS
JME 301-THERMODYNAMICS

Objectives:

CO1: To understand the basic concepts and basic terms of related to thermodynamics:	K2
CO2: To apply the first law of thermodynamics for different non flow and flow systems	K3
CO3: To understand and apply the concepts of second law of thermodynamics for different devices	K2
CO4: To evaluate the different thermodynamics relations	K3
CO5: To evaluate the different properties of pure substance by using steam table and Mollier chart	K3

UNIT I (08Lecture)

Review of Fundamental Concepts and Definitions:

Introduction- Basic Concepts: System, Types of System, Control Volume, Surrounding, Boundaries, Universe, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Change of State, Process, Path, Property, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Exact & Inexact Differentials, Path function and Point Function, Comparison between Heat and Work, Different Gas laws, Ideal gas, Real gas, Law of corresponding states, Property of mixture of gases, electrical, magnetic, gravitational, spring and shaft work, Pressure and relations between different types of pressures, Simple numerical related to Pressure Measurement

Zeroth law of thermodynamics: Concept of Temperature and its’ measurement, Thermometric Properties, Types of Thermometers, Different Temperature scales. Zeroth Law of Thermodynamics

UNIT II (08 Lecture)

First law of thermodynamics:

First Law of Thermodynamics for closed system (Non flow process and Change of State), Work and Heat Transfer in various processes, Internal Energy, Internal Energy- A property of System, Enthalpy, Specific heats, Application of First law of thermodynamics for Open System; Steady Flow Energy Equation, Applications of Steady Flow Energy Equation for different devices such as: Boilers, Nozzles, Condensers, Turbine, Throttling Device, Pumps etc.; Unsteady processes and its examples, Limitations of first law of thermodynamics, PMM-I.

UNIT III (08 Lecture)

Second law of thermodynamics:

Thermal Energy reservoirs (TER), Energy conversion, Heat engines, Thermal efficiency of Heat engine, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance of Heat pump and Refrigerator, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and it’s corollaries, Derivation of Carnot theorem and it’s corollaries, Thermodynamic Temperature Scale, PMM-II.

Entropy: Clausius inequality, Derivation of Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, TdS equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

UNIT V (08 Lecture)

Availability and Irreversibility:

Available and unavailable energy, Availability and Irreversibility, Second law efficiency

Thermodynamic Relations:

Mathematical Conditions for exact differential, Helmholtz & Gibb’s function, Derivation of Maxwell relations, Clapeyrone equation and their applications, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility, Derivation of difference in Specific heat capacities, Energy Equations

UNIT V (08 Lecture)

Properties of steam and Rankine cycle:

Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Sub- cooled liquid state, Super heated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P- T, P-V and P-h diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables & Moiller chart, Calculation of different properties of steam by using Steam Table and Mollier chart, Dryness factor and it’s measurement, processes involving steam in closed and open systems. Simple Rankine cycle, Simple numerical related to Rankine Cycle

Books and References:

1. Basic and Applied Thermodynamics by P. K. Nag, MCGRAWHILLINDIA.
2. Thermodynamics for Engineers by Kroos & Potter, Cengage Learning.
3. Thermodynamics by Shavit and Gutfinger, CRCPress.
4. Thermodynamics-An Engineering Approach by Cengel, MCGRAW HILL INDIA.
5. Thermodynamics by Prasanna Kumar, Pearson Education
6. Engineering Thermodynamics by Dhar, Elsevier.
7. Engineering Thermodynamics by Onkar Singh, New Age International.
8. Engineering Thermodynamics by CP Arora.
9. Engineering Thermodynamics by Rogers, Pearson.
10. Fundamental of Engineering thermodynamics by R. Yadav, Central Publishing house.
11. Engineering Thermodynamics by Mishra, Cengage Learning

JME 302-FLUID MECHANICS AND FLUID MACHINES		
Course Outcome(CO)		Bloom's Knowledge Level(KL)
At the end of course, the student will be able to		
CO 1	Understand the application of mass and momentum conservation laws for fluid flows.	K2
CO 2	Understand the importance of dimensional analysis.	K2
CO 3	Evaluate the velocity and pressure variations in various types of simple flows.	K3
CO 4	Mathematically analyze the flowing water pumps and turbines.	K3
CO 5	Understand about the functioning of centrifugal and reciprocating pumps.	K2
DETAILED SYLLABUS		3-1-0
Unit	Topic	Proposed Lecture
I	Definition of fluid, Newton's law of viscosity, Units and dimensions-Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, Incompressible flow, Bernoulli's equation and its applications - Pitot tube, orifice meter, and venturi meter, Velocity measurement by hot wire.	08
II	Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two- and three dimensional flows, streamlines, continuity equation for 3D and 1D flows.	08
III	Equation of motion for laminar flow through pipes resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer. Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, Turbulent boundary layer, laminar sub layer, separation and its control, Drag and lift.	08
IV	Introduction to hydrodynamic thrust of jet on a fixed and moving surface, Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel. Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency Selection of water turbines.	08
V	Classifications of centrifugal pumps, Vector diagram, Work done by impeller, Efficiencies of centrifugal pumps, Specific speed, Cavitations & separation, reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps.	08
Book and References: 1. Introduction to fluid mechanics and Fluid machines by S.K Som, Gautam Biswas, S Chakraborty. 2. Fluid mechanics and machines by R.K Bansal. 3. F.M.White, Fluid Mechanics, 6th Ed., Tata McGraw-Hill, 2008. 4. Fluid Mechanics and Its Applications by V.K. Gupta et al. 5. Fluid Mechanics by Yunus Cengel. 6. Batchelor, G.K. (1999). Introduction to fluid dynamics. New Delhi, India: Cambridge University Press. 7. Acheson, D.J. (1990). Elementary fluid dynamics. New York, USA: Oxford University Press. 8. R.W.Fox, A.T.McDonald and P.J.Pritchard, Introduction to Fluid Mechanics, 6th Ed., John Wiley, 2004. 9. Fluid Mechanics and Hydraulic Machines, 5th ed by Mahesh Kumar, Pearson Education 9. Fluid Mechanics, 2nd ed in SI Units, by R.C Hibbeler, Pearson Education		

JME303-MATERIALS ENGINEERING

Course Outcome (CO)	Bloom's Knowledge Level(KL)
CO-1: Students will be able to identify the crystal structure and measure the mechanical properties of materials.	(K3)
CO-2: Students will be able to identify the mechanical properties based on the composition of micro-constituents depicted in the phase diagram.	(K3)
CO-3: Students will understand the concept of improving mechanical properties through heat treatment.	(K2)
CO-4: Students will learn the structure and properties of alloys and composites.	(K2)
CO5: students will be able to explain creep and failure mechanisms, non-destructive testing (NDT) methods, characterization technique	(K3)

UNIT-I(08Lecture) Introduction to crystallography and Mechanical Properties (08 Lecture)

Crystal Structure: Classification of Engineering Materials, Single crystal and Polycrystalline material, Lattice, Unit cell, Bravais lattice, crystal System, crystal structures, Miller Indices. Linear and Planar densities. Grain size number. Imperfection in solids: Point, line, interfacial and volume defects;. Mechanical Properties and its measurement: Tensile, compression and torsion tests; Young's modulus, true and Engineering stress-strain curves, generalized Hooke's law, yielding and yield strength, ductility, resilience, toughness; Hardness: Rockwell, Brinell and Vickers.

UNIT-II(08Lecture) Principles of alloy formation (Phase Diagram)

Alloys, substitutional and interstitial solid solutions- Hume-Rothery Rule, Phase diagrams: Interpretation of binary phase diagrams and micro-structure development; Lever Rule, eutectic, eutectoid, peritectic, peritectoid and monotectic reactions. Iron and Iron-carbide phase diagram,

UNIT-III(08Lecture) Heat Treatment of Metals

TTT-diagram (Isothermal transformation diagrams) for Fe-C alloys and microstructure development. Continuous cooling transformation curves

Heat treatment of Steel: Annealing, tempering, normalizing and Spheroidizing, Tempering, Austempering, Martempering, Surface Hardening Treatment: flame and induction hardening, vacuum and Chemical Heat treatment: case hardening, carburizing, nitriding,

UNIT-IV (08Lecture) Ferrous and Non-Ferrous Alloys, Ceramic, Composite and Polymeric Materials

Alloys: Alloying Elements of steel and their effect on alloy, Classification, properties and application of stainless-steel, High-Speed Steel and tool steels, Properties of cast irons; grey, white, and malleable cast irons-

Aluminum alloys, copper and copper alloys; major classes of super alloys, Carbon Fiber and alloys, ~~Structure and properties of Graphene Material,~~

Ceramics: Types of ceramics, Fabrication and Processing of Ceramics: (i) Glass forming processes (ii) Particulate forming processes (iii) Cementation

Composite Materials, Reinforcement, Types of Composites and Applications

Polymers: Hydrocarbon and Polymer molecules Thermoplastic and Thermosetting polymers

UNIT-V (08Lecture) NDT, Failure Analysis, Characterization Techniques

Introduction to non-destructive testing (NDT): Visual Inspection, Liquid Penetrate Testing, Magnetic Particle Inspection, Ultra-sonic Testing, Radiography, Fatigue Failure, Creep failures, Fracture: Mode of Fracture. Fractography, Introduction to Optical & Electron Microscopy

Bookstand References:

1. W.D. Callister, 2006, "Materials Science and Engineering-An Introduction", 6th Edition, Wiley
2. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.
3. V. Raghavan, "Material Science and Engineering", Prentices Hall of India Private Limited, 1999.
4. Mechanics of materials by James M. Gere.
5. Introduction to engineering materials by B.K. Agarwal.
6. Physical metallurgy and advanced materials by R.E. Smallman.
7. Engineering mechanics of composite materials by Isaac M. Daniel.
8. U.C. Jindal, "Engineering Materials and Metallurgy", Pearson, 2011.
9. Introduction to Materials Science For Engineers by Shackelford, 9th edn, 2023, Pearson Education
10. Engineering Materials: Properties and Selection, 9edn by Budinski, Pearson Education

JME351-FLUID MECHANICS LAB

Course Outcome(CO)

Bloom's Knowledge Level(KL)

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

CO 1	Understand the principles and performance characteristics of flow and thermal devices.	K2
CO 2	Know about the measurement of the fluid properties	K1
CO 3	Understand and analyze various properties of fluids	K3
CO 4	Evaluate the performance characteristics of fluid/thermal machinery	K3
CO 5	Evaluate the velocity and pressure variation in various types of simple flows.	K3

DETAILED SYLLABUS

0-0-2

List of Experiments:(Atleast8of the following)

1. To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orifice meter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturimeter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoulli's Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vortex flow.

JME352-MATERIALS TESTING LAB

CO-1: Students will be able to perform different destructive and non-destructive testing methods to measure various mechanical properties.	K2)
CO-2: Students will be able to analyse the effect of different heat-treatment processes on the Hardness	(K4)
CO-3: Students will be able to simulate the material using simulating software /measure the mechanical properties of 3-D printed components.	(K3)

List of Experiments: (At least 8 of the following)

1. Tensile Test on Mild Steel Specimen using Universal Testing Machine (UTM) to determine the mechanical properties of a mild steel specimen—such as yield strength, ultimate tensile strength (UTS), percentage elongation, and Young's modulus—by performing a tensile test on a Universal Testing Machine (UTM) and to plot the engineering stress–strain curve from the recorded data.
2. Shear Test/Bend Test on Mild Steel Specimen using UTM To determine the shear strength/flexural strength (modulus of rupture) respectively
3. Impact Test (Charpy and Izod) on Impact Testing Machine to determine the impact resistance (toughness) of a material by measuring the energy absorbed during fracture under high-strain-rate loading condition
4. Determination of Hardness of Mild Steel Specimen by Rockwell and Vickers/Brinell Tests
5. To Study the Fatigue test on fatigue testing machine.
6. To Study Creep test on creep testing machine.
7. Study of NDT (non-destructive testing) methods like magnetic flaw detector, ultrasonic flaw detector, eddy current testing machine, dye penetrant tests.
8. Modeling of Graphene/another materials structure using LAMMPs (LAMMPS Molecular Dynamics Simulator) or another simulation software and studying the mechanical properties.
9. Measurement of mechanical properties (tensile test, compression test, hardness test / flexural test) of specimen made by 3-D printing
10. To See the microstructure of plain carbon steel specimen in Optical microscope
11. To conduct the heat treatment of mild steel specimen: Annealing/Quenching or normalizing also determine the hardness of Mild Steel Specimen by Vickers/Brinell Tests after these treatments

JME353-COMPUTER AIDED MACHINE DRAWING-I LAB

Course Outcome (CO)

Bloom's Knowledge Level(KL)

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

CO 1	Understand and apply 2D software to develop a part model	K3
CO 2	Understand about temporary and permanent fasteners	K2
CO 3	Understand the need for free hand sketching, Free hand sketching of foundation bolts etc.	K2
CO 4	Create assembly drawing of simple machine elements like rigid or flexible coupling	K3
CO 5	Create 2D drawings and assemblies of various machine components	K3

DETAILED SYLLABUS

0-0-2

UNIT-I

Computer aided drafting (1 drawing) Introduction to computer aided drafting; advantages and applications of CAD, concepts of computer aided 2D drafting using any drafting software like AutoCAD, Pro-E, Solid Edge, Draft Sight etc., basic draw and modify commands, making 2D drawings of simple machine parts. Course Outcomes: Upon completion of this course, the students can use computer and CAD software for modeling mechanical components.

UNIT-II

Fasteners (2 drawing sheets) Temporary and permanent fasteners, thread, welding and rivets nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints.

UNIT-III

Riveted joints (1 drawing sheet) Introduction, rivets and riveting, types of rivets, types of riveted joints, drawing of boiler joints etc. Free hand sketching (1 drawing sheet) Introduction, need for free hand sketching, Free hand sketching of foundation bolts, studs, pulleys, couplings etc.

UNIT-IV

Assembly drawing (2 drawing sheets) Introduction to assembly drawing, drawing assembly drawing of simple machine elements like rigid or flexible coupling, muff coupling, Plummer block, footstep bearing, bracket etc.

Bookstand References:

1. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI.
2. Engineering Drawing by Bhat, & Panchal, Charotar Publishing House.
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson.
4. Machine Drawing-KL Narayana, PK annaiah, KV Reddy, New Age.
5. Machine Drawing, N. Siddeshwar, PKannaiah, VVSShastry, Tata McGraw Hill.
6. Engineering Drawing, Pathak, Wiley.
7. Textbook of Machine Drawing, KC John, PHI.
8. AutoCAD 2014 for Engineers & Designers, Bhatt, WILEY
9. Engineering Drawing, 2nd edn by Shah & Rana
10. Fundamentals of Engineering Drawing, 11th edn by Warren J. Luzzadder, Pearson Education

SEMESTER-IV
BME401-APPLIED THERMODYNAMICS

Course Outcome (CO)

Bloom's Knowledge Level(KL)

CO1: To analyze and calculate the performance parameters of Air Standard Cycle.	K2
CO2: To analyze the Rankine vapor power cycle and their variation and law of reacting systems and heating value of fuels.	K3
CO3: To analyze the performance of Boilers and Condensers	K3
CO4: To learn about gas dynamics of airflow and steam through nozzles and Steam turbines	K2
CO5: To analyze the performance of Gas turbines and Jet propulsion	K3

UNIT I

Introduction to Air Standard Cycles-Otto, Diesel and Dual cycles and analysis, P-V and T-S diagrams of Otto, Diesel and Dual cycles, Comparison between Otto, Diesel and Dual cycles, Introduction to Turbocharger & Supercharger

Introduction to Fuel and Combustion: Introduction to solid, liquid and gaseous fuels– Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flame temperature,

UNIT II

Vapour Power cycles:

Introduction to Simple Rankine cycle, Effect of boiler and condenser pressure and temperature on Rankine cycle, Rankine cycle with superheat, reheat and regeneration, Reheat Rankine cycle, Regenerative Rankine cycle, Feed water heaters, Binary vapour cycle, Combined cycles,

Fuels and Combustion: Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation,

UNIT III

Boilers: Classifications and working of boilers, boiler mountings and accessories, Difference between fire tube and water tube boilers, Draught and its calculations, air pre-heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

Condenser: Classification of condenser, working of Jet and surface condensers, airleakage phenomenon in condensers, condenser performance parameters. Condensers efficiency, vacuum efficiency

UNIT IV

Steam Nozzles: Introduction to Nozzles, Types of Nozzles, Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, choked flow, throat area, Nozzle efficiency, Effect of friction on nozzle, Super saturated flow.

Steam Turbines: Classification of steam turbine, Impulse and Reaction turbines, Staging, Pressure and Velocity Compounded Steam Turbines, Stage and Overall efficiency, reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction, Impulse reaction turbines, state point locus, Losses in steam turbines, Governing of turbines,

UNIT V

Gas Turbine: Gas turbine classification, Brayton cycle, Principle of gas turbine, Gas turbine cycles with inter cooling, reheat and regeneration and their combinations, Stage efficiency, Deviation of actual cycles from ideal cycles.

Jet Propulsion: Introduction to the principles of jet propulsion, Turbojet and turbo prop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

Learning from the course:

- After completing this course, the students will get a good understanding of various practical air standard cycles and vapour power cycles.
- They will be able to analyze energy conversion in various thermal devices such as combustors, nozzles, diffusers, steam turbines
- They will be able to understand and phenomena of Steam and Gas Turbine and jet propulsion engine

Books and References:

1. Basic and Applied Thermodynamics by P.K.Nag ,Mcgraw hill India.
2. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education.
3. Applied Thermodynamics by Venkanna And Swati, PHI.
4. Sonntag,R.E,Borgnakke,C.andVanWylen, G .J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley and Sons.
5. Jones,J. B. and Duggan,R.E.,1996,EngineeringThermodynamics,Prentice-HallofIndia
6. Applied Thermodynamics by R. Yadav, Central Publishing house.
7. Applied thermodynamics by Onkar Singh,New Age International.
8. Theory of steam turbine by WJ Kear
9. Moran, M.J. and Shapiro, H. N.,1999,Fundamentals of Engineering Thermodynamics,

JME-402 - ENGINEERING MECHANICS & STRENGTH OF MATERIAL

Course Outcomes: The student will be able to		Bloom's Taxonomy
CO1	Understand the force systems and application of force equilibrium to various two-dimensional problems.	K3
CO2	Understand the concept of stress and strain under different loading conditions.	K3
CO3	Determine the principal stresses and strains in structural members	K3
CO4	Understand and determine the stresses, slope, and deflection of the transversely loaded members	K3
CO5	Apply the concepts of stresses and strain in solving problems related to springs ,buckling of columns and thin and thick cylinders.	K3

Unit I(10 Hours)

Introduction: Review of two-dimensional force systems, free body diagram, equilibrium of force systems, laws of friction, equilibrium analysis of simple systems involving friction, wedge, screw jack, belt friction

Trusses: Introduction, simple truss and solution of a simple truss ,methods of joints, method of sections.

Beam:Introduction,shearforceandbendingmoment,differentequationsofequilibrium,shearforceandbendingmomentdiagramfor statically determine at a beams.

Unit II(8 Hours)

Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem,.

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stress on inclines sections, state of plane stress, principal stress and strain, maximum shear stress, Mohr's circle for plane stress, theories of failure, strain energy, impact loads and stresses, thermal Stresses, introduction to three-dimensional stresses.

UnitIII(8Hours)

Stresses in Beams: Pure Bending, normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams. Concept of shear centre

DeflectionofBeams:Differentialequationoftheelasticcurve,cantileverandsimplysupportedbeams,Macaulay'smethod,areamoment method, fixed and continuous beams.

Torsion: Torsion, combined bending and torsion of solid and hollow shafts.

Unit IV(8 Hours)

HelicalandLeafSprings:Deflectionofsprings,helicalspringsunderaxialloadandunderaxialtwist(forcircularcrosssections),axialloadand twisting moment acting simultaneously both for open and closed coiled springs, concept of laminated springs.

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin-ended columns, effect of end conditions on column buckling, Ranking Gordon formulae.

UnitV(8 Hours)

Thincylinders&spheres:Introduction,differencebetweenthin-walledandthick-walledpressurevessels,thin-walledspheresandcylinders, hoop and axial stresses and strain, and volumetric strain.

Thickcylinders:Radial,axialandcircumferentialstressesinthickcylinderssubjectedtointernalorexternalpressures,compoundcylinders, stresses in rotating shafts and cylinders.

Books:

1. Bansal, A Textbook of Engineering Mechanics, Laxmi Publications.
2. Bhavikatti and Rajash ekarappa, " Engineering Mechanics", New Age International (P) Limited Publishers.
3. MeriamandKraige, "EngineeringMechanics-Statics-Volume1,3ed.,JohnWiley&Sons.
4. GuptaS C, Strength of Materials, PearsonEducation
5. Jindal, Strength of Materials, Pearson Education
6. Hibbeler, Mechanics of Materials, Pearson education.
7. Gere, Mechanics of Materials, Cengage learning.
8. Bere, Johnston, Mechanics of Materials, McGraw Hill.
9. Pytel, Mechanics of Materials, Cengage learning
10. Engineering Mechanics, Manoj,K. Harbola,Cengage learning
11. Strength of Material, J.K. Gupta, S.K.Gupta, Cengage learning

JME403-MANUFACTURING PROCESSES

CO-1 : Students will learn the various conventional manufacturing processes / casting and forming processes.	K2
CO-2: Students will understand and the concepts of metal cutting and CNC machining.	K2
CO-3: Students will comprehend the knowledge of grinding and super finishing processes.	K2
CO-4: Students will understand the concepts of metal joining processes.	K2
CO-5: Students will learn the concepts of unconventional machining processes.	K2

UNIT-I (08 Lecture)

Conventional Manufacturing processes:

Introduction, definition, classification of manufacturing processes, Casting and moulding: Metal casting processes and equipment, Types of Patterns and Pattern Allowance, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses. Introduction to bulk and sheet metal forming, plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk forming (forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending), principles of powder metallurgy.

UNIT-II (08Lecture)

Metal cutting:

Mechanics of metal cutting , Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life, Surface finish and integrity, Machinability, cutting tool materials, cutting fluids, Coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining, Additive manufacturing, Rapid prototyping and rapid tooling
Mechanics of metal cutting, Single and multi-point cutting; Geometry of tool and nomenclature, Orthogonal vs oblique cutting, various force components: Chip formation, types of chips, Merchant's force circle diagram, Tool wear and tool life, Surface finish and integrity, Machinability, cutting tool materials, cutting fluids, Coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining

UNIT-III (08 Lecture)

Grinding & Super finishing:

Grinding: Grinding wheels, abrasive & bonds, cutting action. Grinding wheel specification. Grinding wheel wear-attritions wear, fracture wear. Dressing and Truing. Max chip thickness and Guest criteria. Surface and cylindrical grinding. Centre less grinding.
Super finishing: Honing, lapping and polishing.

UNIT-IV (08 Lecture)

Metal Joining(Welding):

Joining/fastening processes: Physics of welding, Classifications of welding processes, brazing and soldering; design considerations in welding, Solid and liquid state joining processes, Survey of welding and allied processes., Gas welding and cutting, process and equipment. Arc welding: Power sources and consumables. TIG & MIG processes and their parameters. Resistance welding - spot, seam projection etc. Other welding processes such as atomic hydrogen, submerged arc, electro slag, friction welding. Weld decay in HAZ.

UNIT-V (08Lecture)

Unconventional Machining Processes:

Introduction: need and classification, Comparison of conventional and unconventional machining process, Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining, Ultrasonic Machining, principles and process parameters. Electrical Discharge Machining, principle and processes parameters, MRR, surface finish, tool wear, dielectric, power and control circuits, wire EDM; Electrochemical machining (ECM), Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining.

Books and References:

1. Kalpak ji anand Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems.
3. Manufacturing Technology by P.N. Rao., MCGRAWHILL INDIA.
4. Materials and Manufacturing by Paul Degarmo.
5. Manufacturing Processes by Kaushish, PHI.
6. Principles of Foundry Technology, Jain, MCGRAWHILL INDIA
7. Production Technology by RK Jain.
8. Degarmo, Black & Kohser, Materials and Processes in Manufacturing.
9. Manufacturing Science, Ghosh & Mallik, East West Press
10. P. K. Mishra Non Conventional Machining Narosa Publishing House, New Delhi

JME451-APPLIED THERMODYNAMICS LAB

Objectives:

CO1: To understand the principles of various boilers:

K2

CO2: To understand the basic principles IC engines and determination of various performance parameters of IC Engines:

K3

CO3: To understand the principles of steam engine and Steam & Gas Turbine:

K2

List of Experiments:(At least 8 of the following)

1. Study of Fire Tube boiler.
2. Study of Water Tube boiler.
3. Study and working of Two stroke petrol Engine.
4. Study and working of Four stroke petrol Engine.
5. Determination of Indicated H.P. of I.C. Engine by Morse Test.
6. Prepare the heat balance sheet for Diesel Engine test rig.
7. Prepare the heat balance sheet for Petrol Engine test rig.
8. Study and working of two stroke Diesel Engine.
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine.
11. Study of Pressure compounded steam turbine.
12. Study of Impulse & Reaction turbine.
13. Study of steam Engine model.
14. Study of Gas Turbine Model.
15. Demonstrations of Steam power plant model

JME 452-MANUFACTURING PROCESSES LAB

CO-1 : Students will be able to make the component using casting and finishing methods.

K2

CO-2 : Students will be able to make the component using metal cutting / unconventional machining methods.

K2

CO-3: Students will be able to make the component using metal joining processes.

K2

List of Experiments:(At least 8 of the following along-with study of the machines/processes)

1. Making of Pattern(Wax/ Wooden)
2. Preparation of Mould and Casting
3. Shear-angle determination(using formula) with tube cutting(for orthogonal)on lathe machine.
4. Bolt(thread) making on Lathe machine.
5. Tool grinding (to provide tool angles) on tool-grinder machine.
6. Gear cutting on Milling machine.
7. Finishing of a surface on surface-grinding machine.
8. Drilling holes on drilling machine and study of twist-drill.
9. Study of different types of tool sandit sangles & materials.
10. Experiment on tool wear and tool life.
11. Experiment on jigs/Fixtures and its uses.
12. Gas welding experiment.
13. Arc welding experiment.
14. Resistance welding experiment.
15. Soldering & Brazing experiment.
16. Experiment on Unconventional Machining(any one among-Laser Cutting, CO2 Cutting ,ECM,EDM etc.)
17. Measurement of cutting and thrust force during machining by dynamometer force

JME453-COMPUTER AIDED MACHINE DRAWING-II LAB

Course Outcome(CO)

Bloom's Knowledge Level (KL)

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

CO 1	Understand and apply 3D software to develop a part model	K3
CO 2	Understand conventional representation of machine components, and welded joints	K2
CO 3	Understand and apply the basis of fit or limit system	K3
CO 4	Understand about Plummer Block Bearing, Machine Vice, Screw Jack, Engine Stuffing box.	K2
CO 5	Create 3D part models and assemblies of various machine components	K3

DETAILED SYLLABUS

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Unit I

Introduction to Part Modeling :Introduction to part modeling of simple machine component using any 3D software(like CATIA,PRO E, UGNX, Autodesk Inventor or SOLIDWORKS) covering all commands/ features to develop a part model (Minimum 24 machine components need to be developed).

Unit II

Introduction: Conventional representation of machine components and materials, Conventional representation of surface finish, Roughness number symbol, Symbols of Machine elements and welded joints. Classification of Drawings: Machine drawings, Production drawing, part drawing and assembly drawing. Introduction to detail drawing and bill of materials (BOM).

Unit III

Limits, Fits and Tolerances: General aspects, Nominal size and basic dimensions, Definitions, Basis of fit or limit system, Systems of specifying tolerances, Designation of holes, Shafts and fits, commonly used holes and shafts. List of Standard Abbreviation used.

Unit IV

Part Modeling & Assemblies of: Plummer Block Bearing, Machine Vice, Screw Jack, Engine Stuffing box, Lathe Tailstock, Feed Check Valve and Rams Bottom Safety Valve.

Note :All drawing conforms to BIS Codes.

Books and References:

1. Textbook of Machine Drawing, K C John, PHI.
2. Machine Drawing by K.R. Gopala krishna, Subhas Stores.
3. A Textbook of Machine Drawing by PS Gill from S.K. Kataria & Sons.
4. Machine Drawing-KL Narayana, PK annaiah ,KV Reddy, New Age publications.
5. Engineering Graphics with Auto CAD, Bethune, PHI.
6. Machine Drawing ,N. Siddeshwar, PK annaiah, VVS Shastry, Tata McGraw Hill.
7. Fundamentals of Machine Drawing, Dr Sadhu Singh & PL Shah, Prantice Hall India.
8. Autodesk Inventor by Examples, Sam Tikoo, Wiley.

**B Tech Second Year, Semester -3
(Civil Engineering)**

Sr. No.	Subject Code	Subject Name	Type	Category	Period/ Week			Sessional Component		Evaluation Scheme			Credit
										Sessional (SW)	ESE	Total	
					L	T	P	CT	TA	CT+ TA	TE/P E	SW+ ESE	C
1.	JOE 3** / JAS 301	Science Based Open Elective/Mathematics III/IV/V	T	BS/ BS	3	1	0	20	10	30	70	100	4
2.	JVE 301/ JAS 301	Universal Human Values and Professional Ethics/Technical Communication	T	VA/ HS	2	1	0	20	10	30	70	100	3
3.	JCE 301	Engineering Mechanics	T	PC	3	1	0	20	10	30	70	100	4
4.	JCE 302	Surveying and Geometrics	T	PC	3	1	0	20	10	30	70	100	4
5.	JCE 303	Fluid Mechanics	T	PC	3	1	0	20	10	30	70	100	4
6.	JCE 351	Building Planning and Drawing Lab	P	PC	0	1	2	0	20	20	30	100	1
7.	JCE 352	Surveying and Geo-matics Lab	P	PC	0	0	2	0	20	20	30	100	1
8.	JCE 353	Fluid Mechanics Lab	P	PC	0	0	2	0	20	20	30	100	1
9.	JCC 301/ JCC 302	Cyber Security / Python Programming	T	VA	2	0	0	20	10	30	70	100	2
10.	JCC 351	Internship Assessment/Mini-Project*	P							50		100	2
					13	5	12			---	---	800	26

**B Tech Second Year, Semester -4
(Civil Engineering)**

Sr. No.	Subject Code	Subject Name	Type	Category	Period/ Week			Sessional Component		Evaluation Scheme			Credit
										Sessional (SW)	ESE	Total	
					L	T	P	CT	TA	CT+ TA	TE/P E	SW+ ESE	C
1.	JAS 402/ JOE 4**	Mathematics III/IV/V or Science Based Open Elective	T	BS/ BS	3	1	0	20	10	30	70	100	4
2.	JAS 401/JVE 401	Technical Communication/ Universal Human Value and Professional Ethics	T	HS/ VA	2	1	0	20	10	30	70	100	3
3.	JCE 401	Building Materials and Construction Practice	T	PC	3	1	0	20	10	30	70	100	4
4.	JCE 402	Mechanics of Solids	T	PC	3	1	0	20	10	30	70	100	4
5.	JCE 403	Open Channel Flow	T	PC	3	1	0	20	10	30	70	100	4
6.	JCE 451	Building Materials Testing Lab	P	PC	0	0	2	0	20	20	30	50	1
7.	JCE 452	Mechanics of Solids Lab	P	PC	0	0	2	0	20	20	30	50	1
8.	JCE 453	Open Channel Flow Lab	P	PC	0	0	2	0	20	20	30	50	1
9.	JCC 402/JCC 401	Python Programming/Cyber Security	T	VA	2	0	0	20	10	30	70	100	2
10.	JVA 451/JVA 452	Sports and Yoga II/ NSS and NCC-II	P	VA	0	0	3			*50		*50	0
11.	JCEM 401/JC EH 401	Minor Degree MT-1/ Honours Degree HT-1	T	PC	3	1	0	20	10	30	70	100	4**
					16	5	9			---	---	750+ *50	24

JCE301 Engineering Mechanics

Course Outcomes: At the end of this course the student will be able to-

- 1. Use scalar and vector analytical techniques for Analysing forces in statically determinate structures**
- 2. Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems.**
- 3. Apply basic knowledge of mathematics and physics to solve real-world problems.**
- 4. Apply basic dynamics concepts – force, momentum, work and energy.**
- 5. Apply Newton's laws of motion for solving the problems.**

Content	Contact Hours
UNIT - 1 Introduction to Engineering Mechanics:	8
Rigid Body equilibrium; System of Forces: Coplanar Concurrent Forces, Resultant of forces, Moment of Forces and couples with applications; Free body diagrams, Equations of Equilibrium of Coplanar Systems. Friction: Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack and differential screw jack	
UNIT- 2 Centroid and Centre of Gravity	8
Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia Definition, Moment of inertia of plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.	
UNIT - 3 Basic Structural Analysis	8
Equilibrium conditions in three dimensions; Analysis of simple trusses in 2 dimension by method of sections and method of joints, Zero force members. Analysis of simple beams(Cantilever and Simply supported) for support reactions, shear force and bending moment at a section due to loading (Point load, udl and combination of both)	
UNIT - 4 Review of particle dynamics	8
Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique).	
UNIT - 5 Introduction to Kinetics of Rigid Bodies	8
Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation. Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies.	

Books and References

1. Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall
2. F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, – Dynamics, 9th Ed, Tata McGraw Hill
3. R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
4. Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press
5. Shames and Rao (2006), Engineering Mechanics, Pearson Education,
6. Hibler and Gupta (2010), Engineering Mechanics (Statics, Dynamics) by Pearson Education
7. Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singer's Engineering Mechanics 8. Bansal R.K.(2010), A Text Book of Engineering Mechanics, Laxmi Publications 9. Khurmi R.S. (2010), Engineering Mechanics, S. Chand and Co.
8. Tayal A.K. (2010), Engineering Mechanics, Umesh Publications
9. Strength of Materials by Timoshenko and Youngs, East West Press.
10. Textbook of Applied Mechanics-Dynamics and Statics by Prasad I.B, Khanna Publications.
11. Link for aicte book portal : <https://ekumbh.aicte-india.org/allbook.php>.

JCE302 Surveying and Geomatics

Course Outcomes: At the end of this course the student will be able to-

1. **Apply concepts of survey to prepare plan, profile, and cross-section for computations.**
2. **Calculate, design and layout horizontal and vertical curves.**
3. **Operate modern survey instrument for recording of data for scientific uses.**
4. **Apply principles of photogrammetry for surveying.**
5. **Apply principles of Remote Sensing and Digital Image Processing for Civil Engineering problems.**

Content	Contact Hours
UNIT - I Introduction to Surveying	8
Definition, Classification, Principles, Survey stations and Survey lines; Introduction to measurement of distance, direction and elevation; Ranging and its methods, Meridians and Bearings. Methods of levelling, Booking and reducing levels, Profile levelling and cross sectioning, Contouring: Characteristics, methods, uses, computation of areas and volumes. Triangulation: Figures or systems, Signals, Satellite station, Baseline and its importance, tape corrections.	
UNIT - II Curves	8
Elements of simple circular curves, Theory and methods of setting out simple circular curves, Transition curves- types, characteristics and equations of various transition curves; Introduction to vertical curves.	
UNIT - III Modern Field Survey Systems	8
Principle and types of Electronic Distance Measurement systems and instruments, Total Station- its advantages and applications; Global Positioning Systems Segments, working principle, errors and biases. Geographic Information System: Concepts and data types, data models, data acquisition. GIS applications in civil engineering.	
UNIT - IV Photogrammetry	8
aerial and terrestrial, types and geometry of aerial photograph, scale and flying height, relief (elevation) displacement, parallax, stereo pair and stereovision, stereoscopes, 3D mapping, height determination, digital photogrammetry, photogrammetric mapping, applications of photogrammetry	
UNIT - V Remote Sensing	8
Basic/ Ideal remote sensing, interaction mechanism with atmospheric and earth surface, atmospheric windows, multi concept of remote sensing, spectral signatures, various platforms and sensors, Digital image analysis: Supervised and unsupervised image classification methods, Accuracy assessment. Applications of remote sensing to civil engineering. Introduction to LIDAR and Drone survey	

Books and References:

1. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
2. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand and Bros, 2011
3. Bhavikatti, S.S., Surveying and Levelling, Vol. I and II, I.K. International, 2010
4. Chandra, A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
5. Anji Reddy, M., Remote sensing and Geographical information system, B.S. Publications, 2001.
6. Arora, K.R., Surveying, Vol-I, II and III, Standard Book House.
7. Punmia BC et al: Surveying Vol. I, II, Laxmi Publication
8. Chandra AM and Ghosh SK: Remote Sensing and Geographical Information System, Alpha Science
9. Ghosh SK: Digital Image Processing, Alpha Science
10. Lillesand T M et al: Remote Sensing and Image Interpretation, John Wiley and Sons
11. Bhatta B: Remote Sensing and GIS, Oxford University Press, 2008
12. Link for aicte book portal : <https://ekumbh.aicte-india.org/allbook.php>

JCE303-Fluid Mechanics

Course Outcomes: At the end of this course the student will be able to-

1. **Explain principles of fluid statics, kinematics and dynamics.**
2. **Explain the terms used in fluid mechanics to describe fluid and flow properties.**
3. **Explain classifications of fluid flow.**
4. **Apply the continuity, momentum and energy principles**
5. **Apply dimensional analysis**

Content	Contact Hours
UNIT I	8
Fluid and Continuum, Physical properties of fluids, Rheology of fluids. Pressure-density height relationship, manometers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies.	
UNIT II	8
Types of fluid flows: Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and ir-rotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows one, two and three dimensional flows, streamlines, path lines, streak lines, stream tube, continuity equation for 1-D, 2-D and 3-D flows, circulation, stream function and velocity potential function	
UNIT III	8
Potential Flow: source, sink, doublet. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation and its application to pipe bends. resistance to flow, Minor losses in pipe in series and parallel, power transmission through a pipe, siphon, water hammer	
UNIT IV	8
Equation of motion for laminar flow through pipes, Stokes' law,, Boundary layer thickness, boundary layer over a flat plate, displacement, momentum and energy thickness. Application of momentum equation. Laminar boundary layer, turbulent boundary layer, laminar sub-layer, separation and its control. Mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces.	
UNIT V	8
Drag and lift, drag on a sphere, aerofoil, Similarity Laws; geometric, kinematics and dynamic similarity, undistorted and distorted model studies, Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance. Introduction to Computational Fluid Dynamics (CFD).	

Books and References

1. Hibbler, "Fluid Mechanics in SI Units" 1/e Pearson Education, Noida.
2. Fox and Donald, "Introduction to Fluid Mechanics" John Wiley and Sons Pvt Ltd,
3. Cengel and Cimbala, "Fluid Mechanics" TMH, New Delhi.
4. Katz, "Introductory Fluid Mechanics" Cambridge University Press
5. Pnueli and Gutfinger, "Fluid Mechanics" Cambridge University Press
6. Modi and Seth "Hydraulics and Fluid Mechanics" Standard Publications.
6. Gupta, "Fluid Mechanics and Hydraulic Machines" Pearson Education, Noida
7. Graebel, "Engineering Fluid Mechanics", CRC Press Taylor and Francis Group.
8. Janna, "Introduction to Fluid Mechanics" 4/e, CRC Press Taylor and Francis Group.
9. White, F.M. "Fluid Mechanics" TMH, New Delhi.
10. Munson et al, "Fundamental of Fluid Mechanics" Wiley Newyork Ltd
11. Garde, R.J., "Fluid Mechanics", SciTech Publications Pvt. Ltd
13. I.H. Shames, "Mechanics of Fluids", McGraw Hill, Int. Student.
12. RK Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publication
13. Jagdish Lal "Fluid Mechanics"
14. N Narayan Pillai "Principles of Fluid Mechanics and Fluid Machines" Universities Press.

15. Esposito, Fluid Power and Applications” 7/e Pearson Education, Noida. DR Malhotra and Malhotra, “Fluid Mechanics Hydraulics and Hydraulic Machines” Satya Prakash
16. Fluid Mechanics: Dr Shreenivas Londhe (Available on aicte ekumbh portal) Link for aicte book portal:
<https://ekumbh.aicte-india.org/allbook.php>

JCE351- Building Planning and Drawing Lab

Introduction to commands and tools of BIM software

Introduction to commands and tools of Auto CAD software

Drawing and drafting of following with CAD/BIM software

1. Introduction to the tools and commands of drafting software.
2. Working in layers, blocks, x-ref, drawing layout and print setup.
3. 3D drafting and rendering
4. Planning and drafting of elevation and cross section of door and window
5. Planning and drafting of plan and cross section of Dog legged and open well staircase.
6. Planning, drawing and modelling of residential building of 1 room set.
7. Planning, drawing and modelling of 3 room residential building with staircase.
8. Preparation of details general arrangement drawing of 4 room duplex house including planning and drafting.

JCE352- Surveying and Geomatics Lab

1. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
2. To find out reduced levels of given points using Auto/dumpy level.
3. To study parts of a Vernier and electronic theodolite and measurement of horizontal and vertical angle.
4. To measure horizontal angle between two objects by repetition/reiteration method.
5. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrically levelling by taking observations in single vertical plane.
6. To set out a simple circular curve by Rankine's method.
7. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal and vertical angles, coordinates and area of a land parcel.
8. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
9. Visual Interpretation of standard FCC (False colour composite).
10. Digitization of physical features on a map/image using GIS software.
11. Coordinates measurement using GPS.
12. Demonstrate working of a Drone for survey of given field.

JCE353- Fluid Mechanics Lab

Note: Students will perform minimum 10 experiments from the following:

1. To verify the momentum equation using the experimental set-up on impact of jet
 2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece
 3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
 4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
 5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number. Verification of Bernoulli's Theorem
 6. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
 7. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
 8. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
 9. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
 10. To determine Meta-centric height of a given ship model.
 11. To determine coefficient of discharge for given rectangular notch and V-notch.
 12. To determine the head loss for a sudden enlargement, sudden contraction and losses in bend.
- Flow Visualization -Ideal Flow
13. To make studies in Wind Tunnel (Aerofoil and circular cylinder).

JCE401- Building Materials, and Construction Practices

Course Outcomes: At the end of this course the student will be able to-

- 1. Explain various building materials based on their properties.**
- 2. Explain use of non-conventional civil engineering materials.**
- 3. Select suitable type of flooring and roofing in the construction process.**
- 4. Characterize the concept of plastering, pointing and various other building services.**
- 5. Exemplify the various building services and modern construction practices.**

Content	Contact Hours
Unit I Scope of Study of building Materials, economics of the building materials	8
Stones: Classification of Stones–Properties of stones in structural requirements Bricks: Composition of good brick earth, Various methods of manufacturing of bricks and Testing of Bricks. Blocks: Cement and Concrete hollow blocks, Light weight concrete blocks Cement: chemical composition, Manufacturing process, Types and Grades, Properties of cement and Cement mortar, Hydration, Compressive strength, Tensile strength, Soundness and consistency, Setting time Concrete: compositions and grades of concrete various steps in concrete construction – batching, mixing, transporting, compacting, curing, shuttering, jointing, tests and quality control of concrete. Aggregates –Natural stone aggregates, Industrial by-products (EAF Slag, Steel Slag), Crushing strength, Impact strength, Flakiness, Abrasion Resistance, Grading Wood- Structure–Properties–Seasoning of timber–Classification of various types of woods used in buildings – Defects in timber.	
UNIT II Paints varnishes and distempers	8
Common constituents, types and desirable properties, Cement paints. Glass: Ingredients, properties types and use in construction. Insulating Materials Thermal and sound insulating material, desirable properties and types. Paints: Purpose, types, technical terms, ingredients and defects, Preparation and applications of paints to new and old plastered surfaces, wooden and steel surfaces. Supplementary cementitious materials: Fly ash, GGBS, Silica fume, Rice husk ash, Calcinated ash (Basic properties and their contribution to concrete strength) Modern Materials: Glass and plastic composites, Plywood, laminates, wall and roof panels, Introduction to noise barrier materials for bridges.	
UNIT III Building Construction	8
Components of building area considerations, Principles of building Planning Foundation: Preliminary investigation of soil, safe bearing capacity of soil, Function and requirements of good foundation, types of foundation Masonry: Definition and terms used in masonry. Brick and stone masonry, Bonds in brick and stone masonry work. Types of walls; load bearing, partition walls, cavity walls. Floors: Requirement of good floor, Components of ground floor, Selection of flooring material Procedure for laying of Concrete (VDF), Mosaic, Kota, Slate, Marble, Granite, Tile flooring, Stairs: Definitions, technical terms and types of stairs, requirements of good stairs; Geometrical design of RCC dog legged and open-well stairs. Construction Principle and Methods for layout. Introduction to Smart Building construction	
Unit IV Building Components	8
Lintels, arches, stair cases – types. Different types of floors – Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs – King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre-fabricated roofs. Doors and Windows: Construction details, types of doors and windows Formwork: Introduction to form work, scaffolding, shoring, under pinning.	
Unit V Plumbing Services	8

Water Distribution, Sanitary – Lines and Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics – characteristic-absorption – Acoustic design; Fire protection – Fire Hazards – Classification of fire-resistant materials and constructions. Plastering and Pointing: Mortar and its types. Purpose, materials and methods of plastering and pointing: Sand faced plastering, Stucco plastering, lathe plastering, and defects in plastering. Water proofing with various thicknesses. Damp proofing: causes, effects and methods. Principles and Methods of building maintenance Introduction to current construction practices such as: Expanded Polystyrene (EPS), 3D Printing, Pre-Fabricated Panel System	
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Books and References

1. SK Duggal, “Building Materials” New Age International
2. Purushothama Raj, “Building Construction Materials and Techniques” Pearson Edu.
3. PC Varghese, “Building Materials” PHI
4. Rangwala, “Building Materials” Charotar Publishing House.
5. Sushil Kumar, “Building Construction” Standard Publisher.
6. Domone, “Construction Materials” 4/e, CRC Press Taylor and Francis Group.
7. Adams, “Adams’ Building Construction Adams” CRC Press Taylor and Francis Group.
8. BC Punmia, “Building Construction” Laxmi Publication.
9. Jha and Sinha, “Building Construction” Khanna Publishers
10. Sahu, “Building Materials and Construction” Mc Graw Hill Education
11. Deodhar, “Civil Engineering Materials” Khanna Publishers
12. Mehta, “Building Construction Principles, Materials and Systems” 2/e, Pearson Education Noida.
13. Sandeep Mantri, “Practical building Construction and its Management” Satya Publisher, New Delhi.
14. Khanna S. K., Justo C.E.G, and Veeraragavan A., “Highway Materials and Pavement Testing”, Nem Chand and Bros.
15. Various related updated and recent standards of BIS, IRC, ASTM, RILEM, AASHTO etc.
16. Chudley, R. Greeno, Building Construction Handbook, Butterworth
17. Building Construction: Dr Rinku Kumar (Available on aicte ekumbh portal)
18. Link for aicte book portal: <https://ekumbh.aicte-india.org/allbook.php>

JCE402- Introduction to Solid Mechanics

Course Outcomes: At the end of this course the student will be able to-

1. Describe the concepts and principles of stresses and strains.
2. Calculate the deflections at any point on a beam subjected to a combination of loads
3. Analyse the given beam section for stresses.
4. Analyse structural members subjected to axial loading and combined stresses
5. Analyse the behavior of shafts, and cylinders against loads.

Content	Contact Hours
UNIT I Simple stress and strains:	8
Concept of elasticity, Types of stresses and strains–Hooke’s law– stress– strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson’s ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.	
UNIT II Shear Force and Bending Moment	8
Relation between S.F., B.M and rate of loading at a section of a beam, S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads, points of contra flexure. Deflection of Beams: Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay’s method. Use of these methods to calculate slope and deflection for determinate beams.	
Unit III Flexural Stresses	8
Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ Neutral axis – Determination of bending stresses and section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections, Simple numerical problems on beam sections. Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T angle sections. Simple numerical problems on beam sections.	
Unit IV Principal Stresses and Strains	8
Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses, two perpendicular normal stresses accompanied by a state of simple shear – Mohr’s circle of stresses, Principal stresses and strains – Analytical and graphical solutions. Theories of Failure: Introduction – Various theories of failure – Maximum Principal Stress Theory, Maximum Principal Strain Theory, Strain Energy and Shear Strain Energy Theory (Von Mises Theory). Short Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules.	
UNIT V Torsion of Circular Shafts	8
Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\theta/L$ and simple numerical problems. Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust – Design of shafts according to theories of failure. Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells.	

Books and References:

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of material by Gere, Cengage Learning

3. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA
4. Strength of Materials by Pytel and Singer, Harper Collins
5. Strength of Materials by Ryder, Macmillan.
6. Strength of Materials by Timoshenko and Youngs, East West Press.
7. Introduction to Solid Mechanics by Shames, Pearson
8. Mechanics of material by Pytel, Cengage Learning
9. An Introduction to Mechanics of Solids by Crandall, MCGRAW HILL INDIA
10. Strength of Materials by Jindal, Pearson Education
11. Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.
12. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.

JCE403- Open Channel Flow

Course Outcomes: After completion of the course student will be able to:

1. Apply knowledge of fluid flow for designing of channel sections.
2. Analyse the gradually varied flow in channel section.
3. Analyse the rapidly varied flow in channel sections.
4. Apply numerical methods for profile computation in channels.
5. Design channels for sub critical and super critical flows.

Content	Contact Hours
UNIT - 1	8
Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections	
UNIT- 2	8
Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections, Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels.	
UNIT - 3	8
Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater, Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free over fall. Rapidly varied unsteady flow: Equation of motion for unsteady flow, “Celerity” of the gravity wave, deep and shallow water waves, open channel positive and negative surge,	
UNIT - 4	8
Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, flow over side-weir and Bottom-rack.	
UNIT - 5	8
Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert.	

Reference Book:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI
6. French, R.H., Open channel Hydraulics, McGraw Hill International
7. 7. Srivastava, Flow through Open Channels, Oxford University Press.
8. Open Channel Flow by Madan Mohan Das

JCE451- Material Testing Lab

Testing of various properties of following materials as per BIS specifications

I. Cement

- a. Normal Consistency of cement.
- b. Initial and final setting time of cement
- c. Compressive strength of cement
- d. Fineness of cement by air permeability and Le-chatalier's apparatus.
- e. Soundness of cement.
- f. Tensile strength

II Coarse Aggregates

- a. Water absorption of aggregate
- b. Sieve Analysis of Aggregate
- c. Specific gravity and bulk density
- d. Grading of aggregates.

III Fine Aggregates

- a. Sieve analysis of sand
- b. Silt content of sand
- c. Bulking of sand

IV Bricks

- a. Water absorption.
- b. Dimension Tolerances
- c. Compressive strength
- d. Efflorescence

JCE452- Solid Mechanics Lab

Note: Students will perform minimum 10 experiments from the following:

1. Tension test on Mild Steel
2. Bending tests on simply supported beam and Cantilever beam.
3. Determination of torsion and deflection,
4. Measurement of forces on supports in statically determinate beam,
5. Determination of shear forces in beams,
6. Determination of bending moments in beams,
7. Measurement of deflections in statically determinate beam.
8. To determine Flexural Rigidity (EI) of a given beam
9. To find deflection of curved members.
10. To find Critical load in Struts with different end conditions.
11. Hardness Test (Brinell's and Rockwell)
12. Impact test (Charpy and IZOD)

JCE453- Open Channel Flow Lab

Note: Students will perform minimum 10 experiments from the following:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors.
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.

6. To study the characteristics of free hydraulic jump.
7. To study the free over-fall phenomenon in an open channel and to determine the end depth

BUNDELKHAND INSTITUTE OF ENGINEERING AND TECHNOLOGY JHANSI



Evaluation Scheme & Syllabus For

**B.TECH. 2nd YEAR
(CHEMICAL ENGINEERING)**

(Effective from the Session: 2026-27)

BUNDELKHAND INSTITUTE OF ENGINEERING AND TECHNOLOGY JHANSI

SEMESTER –III

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA				
1	JOE3** / JAS302	Science Based Open Elective/BSC (Math's-III/Math IV/ Math V)	T	ES/BS	3	1	0	20	10	30	70	100	4
2	JVE301 / JAS301	Universal Human Value and Professional Ethics/ Technical Communication	T	VA/HS	2	1	0	20	10	30	70	100	3
3	JCH301	Process Calculations	T	PC	3	1	0	20	10	30	70	100	4
4	JCH302	Chemical Engineering Fluid Mechanics	T	PC	3	1	0	20	10	30	70	100	4
5	JCH303	Heat Transfer Operations	T	PC	3	1	0	20	10	30	70	100	4
6	JCH351	Chemical Engineering Fluid Mechanics Lab	P	PC	0	0	2		50	50	50	100	1
7	JCH352	Heat Transfer Operations Lab	P	PC	0	0	2		50	50	50	100	1
8	JCH353	Soft Computing Lab	P	PC	0	0	2		50	50	50	100	1
9	JCC301 / JCC302	Cyber Security/Python programming	T	VA	2	0	0	20	10	30	70	100	2
10	JCC351	Internship Assessment /Mini Project	P							100		100	2
		Total			16	5	6					1000	26

- **Mathematics –III** for CE / ENV and allied branches
- **Mathematics-IV** for Computer/Electronics/Electrical & allied Branches, Mechanical & Allied Branches Textile/Chemical & Allied Branches
- **Mathematics-V** for Biotechnology/Agriculture Engineering

SEMESTER –IV

SN	Subject Code	Subject	Type	Category	Periods			Sessional Component		Sessional (SW) (TS/PS)	End Semester Examination (ESE)	Total SW+ESE	Credit Cr
					L	T	P	CT	TA				
1	JAS402 / JOE4**	BSC(Maths-III/Math IV/ Math V)/Science Based Open Elective	T	BS/ ES	3	1	0	20	10	30	70	100	4
2	JAS401 / JVE401	Technical Communication / Universal Human Value and Professional Ethics	T	HS/ VA	2	1	0	20	10	30	70	100	3
3	JCH401	Chemical Reaction Engineering-I	T	PC	3	1	0	20	10	30	70	100	4
4	JCH402	Chemical Engineering Thermodynamics	T	PC	3	1	0	20	10	30	70	100	4
5	JCH403	Mechanical Operations	T	PC	3	1	0	20	10	30	70	100	4
6	JCH451	Chemical Reaction Engineering Lab	P	PC	0	0	2		50	50	50	100	1
7	JCH452	Mechanical Operations Lab	P	PC	0	0	2		50	50	50	100	1
8	JCH453	Process Modelling and Simulation Lab	P	PC	0	0	2		50	50	50	100	1
9	JCC402 / JCC401	Python Programming/Cyber Security	P	VA	2	0	0	20	10	30	70	100	2
10	JVE451 / JVE452	Sports and Yoga - II / NSS-II	P	VA	0	0	3			50*		50*	0
11	JCHM 401/JCHH 401	Minor Degree MT-1/ Honors Degree HT-1	T	PC	3	1	0	20	10	30	70	100	4**
		Total			16+3	5+1	9					900+50*+100	24

*The Mini Project or internship (4 weeks) will be done during summer break after 4th Semester and will be assessed during V semester.

SUBJECT CODE: JCH301	COURSE TITLE: PROCESS CALCULATION
EXAM DURATION: 3 HOURS	SEMESTER : III (ODD)
L: T: P :: 3 : 1 : 0 CREDITS: 4	PRE REQUISITES: NIL
OBJECTIVE: To provide basic knowledge of principles of material and energy balances applied to chemical engineering systems and to make them able to calculate the quantity of material input and output of a process plant.	
COURSE OUTCOME: After successful completion of the course, the students will be able to: - Understand conversions of units, equations, and various concentration measures - Carry out combustion calculations, proximate and ultimate analysis. - Apply steady-state and unsteady-state material and energy balance on a system. - Analyze all the stoichiometric relations being applied to a system undergoing a chemical process and perform the enthalpy calculation. - Design equipment with inlet and outlet; including recycle-bypass streams for a chemical process and calculate the quantities of utilities required.	

CO-PO MAPPING(1 TO 3 SCALE)

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
CO-1	3	2	2	1	1	1	2	1	–	–	–	–
CO-2	3	3	2	1	2	2	2	1	–	–	–	–
CO-3	3	3	2	2	2	1	2	1	–	–	–	–
CO-4	3	3	2	2	1	1	1	1	–	–	–	–
CO-5	3	3	2	2	2	1	2	1	–	–	–	–
CO-6	3	2	2	3	2	2	2	1	–	–	–	–
Avg.	3.0	2.7	2.0	1.8	1.7	1.3	1.8	1.0	–	–	–	–

REFERENCE BOOKS

S.NO	NAME OF AUTHORS/BOOKS /PUBLISHERS	YEAR OF PUBLICATION / REPRINT
1.	Hougen D.A., Watson K.M. and Ragatz R.A., “Chemical Process Principles”, Part-I, 2Ed., CBS Publishers.	1995
2.	Felder R.M. and Rousseradu R.W., “Elementary Principles of Chemical Processes”, 3 Ed., John Wiley.	2005
3.	Narayanan K.V. and Lakshmikutty B., “Stoichiometry and Process Calculations”, Prentice Hall of India.	2006
4.	Bhatt B.I. and Vora S.M., “Stoichiometry”, 5th Ed., Tata McGraw-Hill	2010
5.	Himmelblau D.M. and Riggs J. B., “Principles and Calculations in Chemical Engineering”, 8 Ed., Prentice Hall of India.	2012

Units	Contents	Lecture Hours
1.	Introduction: Units and dimensions in chemical engineering, unit conversion factors, unit conversion of dimensional equations, Compositions of Mixture and Solutions, stoichiometric and composition relations, Concept of limiting and excess reactant, conversion, extent of reaction, selectivity and yield Average molecular weight, density and composition (by weight and by mole) of gas mixture, Ideal and Real Gas Laws - Gas constant - Calculations of Pressure, Volume and Temperature using Ideal Gas Law, Use of Partial Pressure and Pure Component Volume in Gas Calculations, Applications of Real Gas Relationships	8

2.	Material Balance & Applications: Stoichiometric Principles, Concept of material balance, open and closed systems, steady state and unsteady state, multiple component system, selection of a basis, problem solving strategy, Conservation of mass/atom, material balance for Systems without chemical reactions involving single unit and multiple units, Material balance for systems with chemical reactions involving single unit and multiple units, analysis of systems with bypass, recycle and purge streams	12
3.	Humidity & Saturation: Vaporization & condensation, partial pressure & vapor pressure, vapor-liquid equilibrium and concepts of humidity & saturation, Dry bulb and wet bulb temperature, Calculation of Absolute Humidity, Molal Humidity, Relative Humidity and Percentage Humidity, Use of Humidity in Condensation and Drying, Humidity Chart, Dew Point. Analysis of processes involving condensation, crystallization and vaporization.	6
4.	Energy Balance & Applications: Conservation of energy, energy balance for systems with and without chemical reactions, Analysis of Products of Combustion of Solid, Liquid and Gas Fuels, Calculation of Excess Air, Heat Capacity of Solids, Liquids, Gases and Solutions, Mean Heat Capacity, Sensible and Latent Heats, Enthalpy, Hess's Law, Standard Heats of Reaction, Formation, combustion, solutions and mixing, adiabatic and non-adiabatic reactions, theoretical & actual flame temperatures, chemical engineering problems involving energy balance.	10
5.	Degrees of freedom analysis & Unsteady State Material and Energy Balances: Degrees of freedom analysis for multicomponent systems, combined steady state material and energy balance, Unsteady State Material and Energy balances involving with and without chemical reactions.	6

SUBJECT CODE: JCH302	COURSE TITLE: CHEMICAL ENGINEERING FLUID MECHANICS
EXAM DURATION: 3 HOURS	SEMESTER: III (ODD)
L: 3 T: 1 P: 0 CREDITS: 4	PRE-REQUISITE: NIL

OBJECTIVE:

To present the fundamental insights of fluids, their static, dynamic behaviors, flow measurement and fluid machineries.

OUTCOME: After successful completion of the course the students will be able to:

- Understand the properties fluid and analyzing different properties when fluid in static condition.
- To understand the geometry and direction along with energy form of fluid flow in dynamic condition
- Analyze the model and prototype.
- Understand and solve incompressible viscous flow problems.
- To measure flow rate and design the pumps and compressors for optimum operation.

CO-PO MAPPING (1 TO 3 SCALE)

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
CO-1	3	2	2	2	1	–	–	–	–	–	–	3
CO-2	3	3	2	2	1	–	1	–	–	–	–	2
CO-3	3	2	2	2	–	–	1	–	–	–	–	1
CO-4	3	2	2	3	1	1	–	–	–	–	–	1
CO-5	3	3	3	3	1	1	–	–	–	–	–	2
CO-6	3	3	3	3	–	1	–	–	–	–	–	1
Avg.	3.0	2.5	2.3	2.5	1.0	1.0	1.0	–	–	–	–	1.7

REFERENCE BOOKS:

S.No.	Name of Authors / Books / Publishers	Year of Publication / Reprint
1	Nevers N.D., “Fluid Mechanics For Chemical Engineers”, 4 th Ed., McGraw Hill Higher Education.	2021
2	Cengel Y.A. and Cimbala J.M. “Fluid Mechanics: Fundamentals and Applications, 4 th Ed., McGraw-Hill.	2019
3	Balachandran P. “Engineering Fluid Mechanics”, PHI Learning Pvt. Ltd., New Delhi.	2014
4	Munson B.R., Young D.F., Okiishi T.H. and Huebsch W.W., “Fundamentals of Fluid Mechanics”, 8 th Ed., Wiley.	2018
5	White F.M. “Fluid Mechanics”, 9 th Ed. Tata McGraw-Hill.	2022
6	Rajput, R.K., “Textbook of Fluid Mechanics”, S.Chand and Co., New Delhi.	2016

Units	Contents	Lecture Hours
1.	Introduction: Fundamental concepts of fluids; Fluid statics, kinematics and dynamics; Properties of fluids. Fluid Statics: Pressure - depth relationship; Pressure forces on plane and curved surfaces; Buoyancy and stability; Forces on immersed and submerged bodies; Pressure measurements; Pressure in accelerated rigid body motions.	8
2.	Elementary Fluid Kinematics: Description of fluid flow, Classification of fluid flow, Flow visualization—streamline, pathline and streakline, Acceleration of fluid particle, Flow rate and continuity equation, Motion of fluid particle along curved path, stream function Dynamic Analysis of Flow: Control mass, Control volume, Energy and its form, Eulers equation of motion, Bernoulli theorem, Navier-Stokes equations	10
3.	Dimensional Analysis, Similitude and Modeling: Dimensional homogeneity and analysis, Methods of finding dimensionless numbers, Selection of variables, Rayleigh and Buckingham's π method, Common dimensionless numbers and their physical significance, Model and Prototypes, Complete and incomplete similarity.	8
4.	Internal Incompressible Viscous Flow: General characteristics of pipe flow – laminar, turbulent, entrance region, fully developed; Fully developed laminar/turbulent flow in pipe, duct and orifice – shear stress distribution and velocity profiles; Major and minor losses in pipes, fittings, non-circular ducts; vena contracta; Friction factor, pipe roughness	8
5.	Flow Measurements: Flow rate and velocity measurements – Pitot tube, orifice meter, venturi meter, rotameter, notches and weirs, etc. Fluid Handling Machinery: Classification; Positive-displacement pumps, centrifugal pumps, , Characteristics of pumps; performance characteristics of pump, Selection of pumps. compressors, fans and blowers etc.	8

SUBJECT CODE: JCH303	COURSE TITLE- HEAT TRANSFER OPERATIONS
EXAM DURATION: 3 HOURS	SEMESTER: III (ODD)
L: T: P:: 3: 1 : 0 CREDITS: 4	PREREQUISITES: NIL

OBJECTIVE:

The objective of this course is to impart a fundamental understanding of heat transfer operations and the associated processes employed within the Chemical Process Industries.

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

- Acquire fundamental knowledge of the numerous modes of heat transfer and a thorough understanding of heat conduction.
- Understand the convection phenomenon and use them to solve problems.
- Determine radiation heat transfer involving various geometries by applying the applicable laws.
- Formulating the equations pertaining to boiling and condensation phenomena, subsequently employing them to solve relevant problems.
- Design heat exchangers and evaporators and evaluate their performance.

CO-PO MAPPING(1 TO 3 SCALE)

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
CO-1	3	2	2	2	1	–	–	–	–	–	–	3
CO-2	3	3	2	2	1	–	1	–	–	–	–	2
CO-3	3	2	2	2	–	–	1	–	–	–	–	1
CO-4	3	2	2	3	1	1	–	–	–	–	–	1
CO-5	3	3	3	3	1	1	–	–	–	–	–	2
CO-6	3	3	3	3	–	1	–	–	–	–	–	1
Avg.	3.0	2.5	2.3	2.5	1.0	1.0	1.0	–	–	–	–	1.7

REFERENCE BOOKS

S.NO	NAME OF AUTHORS/BOOKS /PUBLISHERS	YEAR OF PUBLICATION/ REPRINT
1.	Cengel Y.A. and Ghajar A.J., “Heat and Mass Transfer: Fundamentals and Applications”, 5 th Ed., McGraw Hill	2017
2.	McCabe, W.L, Smith J.C, and Harriot, P, Unit Operations in Chemical Engineering, 7 th Edition, McGraw-Hill, Inc.	2017
3.	Coulson, J.M. and Richardson, J.F, Chemical Engineering, Vol. I, 6th Edition, Elsevier India.	2014
4.	Donald Q Kern, Process Heat Transfer, McGRAW-HILL BOOK COMPANY	2017
5.	JP HOLMAN, HEAT TRANSFER, McGRAW-HILL BOOK COMPANY, 10 TH ED	2020

Units	Contents	Lecture Hours
1.	Introduction: Importance of heat transfer in Chemical Engineering operations – and a brief description of various modes of heat transfer. Conduction: Fourier's law of heat conduction; One-dimensional steady state heat conduction equation for flat plate; Hollow cylinder and sphere, Heat conduction through a series of resistances; Critical radius of insulation; optimum insulation thickness, Thermal conductivity measurement; Effect of temperature on thermal conductivity; Heat transfer in extended surfaces (Fins); unsteady state heat conduction; Lumped system analysis.	8
2.	Convection : Concepts of heat transfer by convection; Natural and forced convection; hydrodynamic and thermal boundary layer; Analogies between the transfer of momentum and heat; Reynold's analogy; Prandtl and Coulburn analogy. Dimensional analysis; Correlations for the calculation of heat transfer coefficients; Heat transfer coefficient for laminar and turbulent flow through a pipe.	8
3.	Radiation: Absorptivity, Reflectivity, transmissivity, Concept of a black body and Gray body, Basic concepts of radiation from a surface: Planck's Law, Wien's Displacement Law, Stefan-Boltzmann Law, Kirchhoff's Law, Radiation heat exchange between surfaces – the view factor.	8
4.	Boiling: Pool boiling of saturated liquid, Characteristics, nucleate pool and forced convection boiling, boiling mechanism and curve, heat transfer correlations, heat pipes; types of reboiler. Condensation: Mechanism and types of condensation of vapour; Drop - wise and film -wise condensation; Nusselt equation for vertical and horizontal tubes; Condensation of superheated vapours.	8
5.	Heat Exchangers: Parallel and counter flow heat exchangers; Log mean temperature difference; Single-pass and multi-pass heat exchangers; Double pipe; Shell and tube; Plate and frame heat exchangers; Heat exchangers effectiveness; Number of transfer unit; Fouling factors; Design of heat exchangers. Evaporator: Classification and use of evaporators in process industries, the effect of boiling point rise on evaporator performance, concept of capacity, steam economy, Single effect and multiple effect evaporation - Design calculation for single and multiple effect evaporation.	10

SUBJECT CODE: JCH351	COURSE TITLE: CHEMICAL ENGINEERING FLUID MECHANICS LAB
EXAM DURATION: 3 HOURS	SEMESTER: III (ODD)
L: 0 T: 0 P: 2 CREDITS: 1	PRE-REQUISITE: NIL

OBJECTIVE:

To determine the various parameters related to fluid flow in pipes and in open channels.

COURSE OUTCOME: After successful completion of the course the students will be able to:

- Calculate coefficient of discharge through v-notch, venture meter, and orifice meter.
- Determine friction losses through different pipes and fittings.
- Calculate the efficiency of centrifugal pump.
- Study different types of flow and analyze Bernoulli's law.

CO-PO MAPPING (1 TO 3 SCALE)

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
CO-1	3	3	3	1	1	1	2	1	-	-	-	2
CO-2	2	3	2	1	2	2	2	1	-	-	-	2
CO-3	3	3	3	2	2	1	2	1	-	-	-	2
CO-4	2	3	2	1	1	1	1	1	-	-	-	2
CO-5	3	3	3	1	2	1	2	1	-	-	-	2
CO-6	3	2	3	1	2	2	2	1	-	-	-	2
Avg.	2.7	2.8	2.7	1.2	1.7	1.3	1.8	1.0	-	-	-	2.0

REFERENCE BOOKS:

S.No.	Name of Authors / Books / Publishers	Year of Publication / Reprint
1	Nevers N.D., "Fluid Mechanics For Chemical Engineers", 4 th Ed., McGraw Hill Higher Education.	2021
2	Cengel Y.A. and Cimbala J.M. "Fluid Mechanics: Fundamentals and Applications, 4 th Ed., McGraw-Hill.	2019
3	Balachandran P. "Engineering Fluid Mechanics", PHI Learning Pvt. Ltd., New Delhi.	2014
4	Munson B.R., Young D.F., Okiishi T.H. and Huebsch W.W., "Fundamentals of Fluid Mechanics", 8 th Ed., Willey.	2018
5	White F.M. "Fluid Mechanics", 9 th Ed. Tata McGraw-Hill.	2022
6	Rajput, R.K., "Textbook of Fluid Mechanics", S. Chand and Co., New Delhi.	2016

LIST OF EXPERIMENTS:

S. No.	Name of Experiments
1	To find the flow rate using a V notch.

2	To find the friction losses in a Straight pipe.
3	Study of Pipe fittings and Valves.

4	Determination of discharge coefficient with Reynolds Number in case of an orifice meter and a venturi meter.
5	Study and verification of the flow pattern in a Bernoulli's apparatus.
6	Determine the Reynolds number and study different types of flow.
7	To study the working principle of a centrifugal pump and determine its efficiency experimentally.
8	To study the minimum fluidization velocity in a fluidized bed.
9	To study the fluidization index, segregation index in a fluidized bed.

SUBJECT CODE: JCH352	COURSE TITLE: HEAT TRANSFER OPERATIONS LAB
EXAM DURATION: 3 HOURS	SEMESTER: III (ODD)
L: T: P :: 0 : 0 : 2 CREDITS: 1	PREREQUISITES: NIL
OBJECTIVE: The objective is to determine the thermal conductivity, heat transfer coefficient, and calculation of radiation heat transfer processes and heat exchangers.	
COURSE OUTCOME: On completion of this course, the students will be able to - Determine the thermal conductivity of different materials. - Determine the heat transfer coefficient for natural and forced convection and the rate of heat transfer. - Acquire an understanding of the radiation heat transfer process	

CO-PO MAPPING (1 TO 3 SCALE)

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
CO-1	3	3	3	1	1	1	2	1	-	-	-	2
CO-2	2	3	2	1	2	2	2	1	-	-	-	2
CO-3	3	3	3	2	2	1	2	1	-	-	-	2
CO-4	2	3	2	1	1	1	1	1	-	-	-	2
CO-5	3	3	3	1	2	1	2	1	-	-	-	2
CO-6	3	2	3	1	2	2	2	1	-	-	-	2
Avg.	2.7	2.8	2.7	1.2	1.7	1.3	1.8	1.0	-	-	-	2.0

LIST OF EXPERIMENTS:

S. No.	Name of Experiments
1.	To determine the thermal conductivity of a given insulating powder.
2.	To find out the thermal conductivity of a liquid.
3.	To measure the temperature gradient along the length of the metal rod and to determine the coefficient of thermal conductivity of the metal rod.
4.	To find out the overall thermal conductance and plot the temperature distribution in the case of a composite wall.
5.	To determine the heat transfer coefficient of a pin fin under natural convection.
6.	To determine the heat transfer coefficient of a pin fin under forced convection.
7.	To find the Emissivity of a given Test Plate concerning the Black Plate.
8.	To find out the Stefan Boltzmann constant and compare it with the theoretical value.
9.	To estimate individual and overall heat transfer coefficient in a shell and tube exchanger.
10.	To estimate the individual and overall heat transfer coefficient in a double pipe heat exchanger.
11.	To determine of heat transfer coefficient for drop wise condensation and film wise condensation.
12.	To study the pool boiling of saturated liquid.
13.	To study the performance of multi-effect evaporator.

SUBJECT CODE: JCH353	COURSE TITLE: SOFT COMPUTING LAB
EXAM DURATION: 3 HOURS	SEMESTER : III (ODD)
L: T: P :: 0 : 0 : 2 CREDITS: 1	PRE REQUISITES: NIL
COURSE OUTCOME: On completion of this course, the students will be able to - Understand the importance and application of software. - Solve basic chemical engineering problems using suitable software (MS-EXCEL, MATLAB, Aspen Plus, etc.).	

CO-PO MAPPING (1 TO 3 SCALE)

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
CO-1	3	2	2	2	3	2	2	1	1	1	2	3
CO-2	3	3	2	2	3	2	1	1	1	1	2	3
CO-3	3	3	3	3	3	2	2	1	1	2	2	3
CO-4	3	3	3	3	3	2	2	1	1	2	2	3
CO-5	3	3	3	3	3	2	2	1	1	2	2	3
CO-6	3	3	3	3	3	2	2	1	1	2	2	3
Avg.	3.0	2.8	2.7	2.7	3.0	2.0	1.8	1.0	1.0	1.7	2.0	3.0

S. No.	Name of Experiments
1.	To apply material balance on any chemical engineering unit operation.
2.	To apply energy balance on any chemical engineering unit operation
3.	To study the head loss in different types of Pipe fittings.
4.	To work on heat transfer problems
5.	To work on an exchanger or evaporator design using Kern's method.
6.	To find out the effect on conversion and time of operation in a batch reactor
7.	To find out the effect on conversion and time of operation in a plug flow reactor
8.	To find out the effect on conversion and time of operation in a continuous stirred tank reactor
9.	To design a distillation column, feed height, and the number of trays in a column using the McCabe Thiele method.
10.	To compare the change in molar volume in Vanderwal and Ideal gas equations of state

SUBJECT CODE: JCH401	COURSE TITLE: CHEMICAL REACTION ENGINEERING-I
EXAMINATION DURATION: 3 HOURS	SEMESTER: IV (EVEN)
L: 3 T: 1 P: 0 CREDITS:4	PRE-REQUISITE : NIL

OBJECTIVE:

To provide the comprehensive knowledge of reaction engineering and chemical reactors.

COURSE OUTCOME: After successful completion of the course the students will be able to:

- Identify the reaction type and their kinetics.
- Design the reactor for the batch and continuous chemical process.
- Design of Multiple Reactors.
- Understand Non – isothermal Reactors.
- Understand the Biochemical reactions.

CO-PO MAPPING(1 TO 3 SCALE)

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
CO-1	3	2	2	1	1	1	2	1	–	–	–	–
CO-2	3	3	2	1	2	2	2	1	–	–	–	–
CO-3	3	3	2	2	2	1	2	1	–	–	–	–
CO-4	3	3	2	2	1	1	1	1	–	–	–	–
CO-5	3	3	2	2	2	1	2	1	–	–	–	–
CO-6	3	2	2	3	2	2	2	1	–	–	–	–
Avg.	3.0	2.7	2.0	1.8	1.7	1.3	1.8	1.0	–	–	–	–

REFERENCE BOOKS:

S.No.	Name of Authors / Books / Publishers	Year of Publication / Reprint
1	Fogler H.S., Elements of Chemical Reaction Engineering, 6 th Edition, PHI Learning Pvt. Ltd.	2020
2	Levenspiel O., Chemical Reaction Engineering, 3 rd Edition, Wiley India Pvt. Ltd.	2021
3	Smith, J.M, Chemical Engineering Kinetics, 7 th Edition, McGraw -Hill Education.	2017
4	Froment G.F. & K.B. Bischoff, Chemical Reactor Analysis and Design, 3 rd Edition, Wiley.	2010
5	Butt, J.B., “Reaction Kinetics and Reactor Design” 2 nd Ed., CRC Press.	2000

Units	Contents	Lecture Hours
1.	Rate Equations: Rate equation, elementary and non-elementary reactions, theories of reaction rate and temperature dependency. Design equation for constant and variable volume batch reactors, analysis of experimental kinetics data-Integral and differential analysis. Half-life method for order of reaction.	8

2.	Design of Reactors: Design of continuous reactors – stirred tank and tubular flow reactor, comparison of reactors. Multiple reactor system for plug flow and mixed flow reactors. Determining best system for given conversion, recycle reactors, autocatalytic Reactors. Kinetics of enzymes reaction (Michaelis Menten and Monod models)	8
3.	Design of Multiple Reactors: Design of reactors for multiple reactions, quantitative treatment of product distribution, consecutive - parallel and mixed reactions, factors affecting choice, optimum yield, conversion, selectivity, reactivity and yield. Two step irreversible series-parallel reactions.	9
4.	Non – isothermal Reactors: Heat of reactions at various temperatures, temperature conversion reaction for different reaction types, Non-isothermal homogeneous reactor systems-adiabatic reactors. Heat effect in adiabatic operations, operations of batch and Continuous reactors –optimum temperature progression. Kinetics of Heterogeneous catalytic reaction	9
5.	Introduction to Biochemical reactions: Kinetics of Enzyme Fermentation and Microbial Fermentation . Hydrogen Fuel: Production and Storage, First, Second and Third generation of Biofuels.	8

SUBJECT CODE: JCH402	COURSE TITLE- CHEMICAL ENGINEERING THERMODYNAMICS
EXAM DURATION: 3 HOURS	SEMESTER: IV (EVEN)
L: T: P:: 3: 1 : 0 CREDITS: 4	PRE REQUISITES: NIL
OBJECTIVE: - Understanding equilibrium, nature of equilibrium, reversible and irreversible processes - To apply the laws of thermodynamics in solving problems related to flow processes and phase equilibrium of heterogeneous and reacting systems	
COURSE OUTCOME: On completion of this course, the students will be able to - Identify the thermodynamic property of the pure substance and mixture. - Know the basic principles of refrigeration and the liquefaction process. - Understand the relation between thermodynamic and chemical reactions	

CO-PO MAPPING (1 TO 3 SCALE)

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
CO-1	3	2	2	2	1	–	–	–	–	–	–	3
CO-2	3	3	2	2	1	–	1	–	–	–	–	2
CO-3	3	2	2	2	–	–	1	–	–	–	–	1
CO-4	3	2	2	3	1	1	–	–	–	–	–	1
CO-5	3	3	3	3	1	1	–	–	–	–	–	2
CO-6	3	3	3	3	–	1	–	–	–	–	–	1
Avg.	3.0	2.5	2.3	2.5	1.0	1.0	1.0	–	–	–	–	1.7

REFERENCE BOOKS

S.NO	NAME OF AUTHORS/BOOKS /PUBLISHERS	YEAR OF PUBLICATION/ REPRINT
1.	Smith, J.M., Van Ness, H.C., & Abbot, M.C., Introduction to Chemical Engineering Thermodynamics, 7th Edition, Tata McGraw-Hill Education Private Limited.	2009
2.	Narayanan K.V., Textbook of Chemical Engineering Thermodynamics, Phi Learning Pvt. Ltd-New Delhi.	2013
3.	Hougen, O.A., Watson, K.M., and Ragatz, R.A., Chemical Process Principles Part II, Thermodynamics, John Wiley.	1970
4.	Dodge, B.F., Chemical Engineering Thermodynamics, 1st Edition, 6th edition, McGraw-Hill.	1944
5.	Sandler, S.I., Chemical, Biochemical and Engineering Thermodynamics, 4 th Edition, Wiley	2006

Units	Contents	Lecture Hours
1.	Thermodynamic Laws: System and its types; Heat; Work; Joule's experiment; Thermodynamic process and its types; thermodynamic equilibrium; Laws of thermodynamics and their application for open and closed system and their limitation; Internal energy and enthalpy; Heat engine; Heat pump; Carnot cycle and Carnot theorems; Entropy; Change in entropy for an ideal system; PVT behaviour of mixtures; Generalized equations of state; Joule-Thompson effect. Thermodynamic properties of solutions: Fundamental property relation for a homogeneous system; Maxwell relations; Partial derivatives and Residual properties. BIS definitions of refrigeration terminology – IS 3615:2020 , Safety and environmental requirements as per IS 16678 Part 1, BIS approach to thermodynamic basics used in refrigeration cycles	12
2.	Properties of Solutions and Phase Equilibria: Fundamental property relation; Partial molar property; Chemical potential; Fugacity; Criteria for equilibrium between phases in multi-component non-reacting systems in terms of chemical potential and fugacity; Summability and Gibbs-Duhem equation; Calculation of partial properties in binary solution. Vapour-liquid equilibrium: Phase rule and its application; Raoult's and Henry's law; Phase diagrams, Effect of temperature and pressure on azeotrope composition	10
3.	Correlation and Prediction of Phase Equilibria: Activity coefficient; Composition models; thermodynamic consistency of phase equilibria; Application of the correlation and prediction of phase equilibria in systems of engineering interest, particularly to distillation and liquid extraction processes	8
4.	Chemical Reaction Equilibria: Definition of standard state; standard free energy change and reaction equilibrium constant; evaluation of reaction equilibrium constant; prediction of free energy data; equilibria in chemical reactors; calculation of equilibrium compositions for homogeneous chemical reactors; thermodynamic analysis of simultaneous reactions.	8
5.	Refrigeration: Principles of refrigeration; methods of producing refrigeration; liquefaction process; coefficient of performance; evaluation of the performance of vapour compression and gas refrigeration cycles. Refrigeration Fundamentals through BIS Standards , BIS Safety Standards – IS 16678 (Parts 1–4) , Refrigerants – BIS Standard IS 16656 (Designation & Safety Classification), BIS Components Standards to Add , BIS Appliances Standards (Chapter 10, 11)	4

SUBJECT CODE: JCH403	COURSE TITLE: MECHANICAL OPERATIONS
EXAM DURATION: 3 HOURS	SEMESTER: IV (EVEN)
L: T: P:: 3: 1 : 0 CREDITS: 4	PREREQUISITES: NIL
OBJECTIVE: The objective of this course is to bestow upon the students a comprehensive understanding of particle size analysis, size reduction techniques, as well as the separation of solid particles from fluids and the intricate dynamics of flow through porous media.	
COURSE OUTCOME: On completion of this course, the students will be able to • Demonstrate knowledge of size reduction and size enlargement and examine their performance using applicable legal principles. • Analyze and implement the principles of particle size analysis, screening apparatus types, and sedimentation and elutriation techniques. • Explain the concept of Particle Separation and various Particle Separation Approaches • Analysis, fluidization, and filtration, and demonstrate the concept of their respective applications. • Demonstrate knowledge of agitation, and mixing, in addition to the storage and conveying of solids.	

CO-PO MAPPING (1 TO 3 SCALE)

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
CO-1	3	2	2	2	1	–	–	–	–	–	–	3
CO-2	3	3	2	2	1	–	1	–	–	–	–	2
CO-3	3	2	2	2	–	–	1	–	–	–	–	1
CO-4	3	2	2	3	1	1	–	–	–	–	–	1
CO-5	3	3	3	3	1	1	–	–	–	–	–	2
CO-6	3	3	3	3	–	1	–	–	–	–	–	1
Avg	3.0	2.5	2.3	2.5	1.0	1.0	1.0	–	–	–	–	1.7

REFERENCE BOOKS

S.NO	NAME OF AUTHORS/BOOKS /PUBLISHERS	YEAR OF PUBLICATIN/ REPRINT
1.	McCabe W.L., Julian C Smith, Peter Harriott., “Unit Operations of Chemical Engineering”, McGraw Hill International. Singapore, 7e, 2017, ISBN: 978-9339213237.	2017
2.	Badger W.L. and Banchero J.T., “Introduction to Chemical Engineering”, McGraw Hill International Edition, Singapore, 1e, ISBN: 978- 0074630501.	2017
3.	Coulson J.M. and Richardson J.F., “Chemical Engineering, , Vol. 2. Particle Technology and Separation Processes”, New Delhi, 6e Asian Books, ISBN: 978-8181473868.	2017
4.	Brown G.G., Unit Operations, CBS Publishers & Distributors	2005

5.	A.S. Foust, L.A. Wenzel., Principles of Unit Operations”, John Wiley and Sons. New York, 3e, ISBN: 978-8126518296.	2008
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Units	Contents	Lecture Hours
1.	Comprehensive overview of mechanical operations and their significance within the chemical process industry. Size Reduction: Methods of size reduction; Classification of equipment; Crushers; Grinders; Disintegrators for coarse, Intermediate and fine grinding; Laws of size reduction; Energy relationships in size reduction; power requirement; Work Index Size Enlargement: Principle of granulation; Briquetting; Palletization; Flocculation.	8
2.	Particle Size Analysis: General characteristics of solids; Different techniques of size analysis; Shape factor; Surface area determination; Estimation of particle size; Screening methods and equipment; Screen efficiency; Ideal and actual screens. Standard screens industrial screening equipment - Gyratory screen, Vibrating screen, Sieve analysis, Sedimentation and elutriation methods.	8
3.	Particle Separation: Gravity settling; Sedimentation; Thickening; Elutriation; Double cone classifier; Rake classifier; Bowl classifier; Centrifugal separation; Continuous centrifuges; Design of basket centrifuges; Industrial dust removing equipment; Cyclones; Hydro cyclones; Electrostatic- Magnetic separators; Heavy media separations; Floatation; Jigging.	8
4.	Flow through Porous media (Filtration): Theory of filtration, Batch and continuous filters, Filtration types of equipment; Rotary drum filter; Plate and frame filter; Leaf filter; Notch filter; Sand filter; Bag filter; Selection; Operation; Filter aids. Flow through filter cake and Filter media; Compressible and incompressible filter cakes; Design of filters and optimum cycle of operation. Fluidization: Fluidization characteristics, aggregative and particulate fluidization, voidage and minimum fluidization velocity, terminal velocity of particles; entrainment; pressure drop in fluidization.	10
5.	Mixing and agitation: Mixing of liquids (with or without solids); Mixing of powders; Ribbon blender; Screw blender; Double cone blender; High viscous mixer; Banbury mixer; Selection of suitable mixers; Power requirement for mixing Storage and conveying of solids: Bunkers; Silos; Bins; Hoppers; Transportation of solids in bulk; Conveyer selection; Types of conveyors; Belt Conveyor; Bucket conveyor; Screw conveyor; Pneumatic conveyor.	8

SUBJECT CODE: JCH451	COURSE TITLE: CHEMICAL REACTION ENGINEERING LAB
EXAM DURATION: 3 HOURS	SEMESTER: IV (EVEN)
L: 0 T: 0 P: 2 CREDITS: 1	PRE-REQUISITE : NIL
OBJECTIVE: To provide the comprehensive knowledge of reaction engineering and chemical reactors.	
OUTCOME: After successful completion of the course the students will be able to - Analyze the reaction type and their kinetics. - Design the reactor for the batch and continuous chemical processes. - Study and operation of adiabatic reactor.	

CO-PO MAPPING (1 TO 3 SCALE)

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
CO-1	3	2	2	2	1	–	–	–	–	–	–	3
CO-2	3	3	2	2	1	–	1	–	–	–	–	2
CO-3	3	2	2	2	–	–	1	–	–	–	–	1
CO-4	3	2	2	3	1	1	–	–	–	–	–	1
CO-5	3	3	3	3	1	1	–	–	–	–	–	2
CO-6	3	3	3	3	–	1	–	–	–	–	–	1
Avg.	3.0	2.5	2.3	2.5	1.0	1.0	1.0	–	–	–	–	1.7

S.No.	Name of Authors / Books / Publishers	Year of Publication / Reprint
1	Fogler H.S., Elements of Chemical Reaction Engineering, 6 th Edition, PHI Learning Pvt. Ltd.	2020
2	Levenspiel O., Chemical Reaction Engineering, 3 rd Edition, Wiley India Pvt. Ltd.	2021
3	Smith, J.M, Chemical Engineering Kinetics, 7 th Edition, McGraw -Hill Education.	2017
4	Froment G.F. & K.B. Bischoff, Chemical Reactor Analysis and Design, 3 rd Edition, Wiley.	2010
5	Butt, J.B., “Reaction Kinetics and Reactor Design” 2 nd Ed., CRC Press.	2000

LIST OF EXPERIMENTS:

S. No.	List of Experiments:
1	Find out kinetic constant and study conversion of a given reaction in a batch reactor.
2	Find out kinetic constant and study conversion of a given reaction in a plug flow reactor.
3	Find out kinetic constant and study conversion of a given reaction in a CSTR.
4	Study of a reversible reaction in a batch reactor.
5	To determine energy of activation of reaction of ethyl acetate with sodium hydroxide.
6	Find out specific rate constant and activation energy of a reaction in a plug flow reactor.

7	To determine reaction equilibrium constant of acetic acid with ethanol.
8	To determine changes in free energy, enthalpy and entropy for the reaction of potassium iodide with iodine.
9	Study of a Non-Catalytic Homogeneous reaction in an isothermal batch reactor.
10	To study a second order saponification reaction (between Ethyl acetate and NaOH) in a Semi Batch Reactor under isothermal condition (i.e. at a fixed temperature).
11	Catalytic hydrolysis of ethyl acetate in a packed bed reactor.
12	RTD studies in CSTR.
13	RTD studies in a PFR.
14	Hydrodynamic studies on a Trickle Bed Reactor.

SUBJECT CODE: JCH452	COURSE TITLE: MECHANICAL OPERATIONS LAB
EXAM DURATION: 3 HOURS	SEMESTER: IV (EVEN)
L: T: P :: 0 : 0 : 2 CREDITS: 1	PREREQUISITES: NIL
OBJECTIVE: The objective of this study is to provide knowledge on the concepts of particle size analysis, size reduction, separation of solid particles from fluids, and flow through porous media.	
COURSE OUTCOME: On completion of this course, the students will be able to - Estimate the crushing efficiency and measure the particle size. - Calculate the medium and filter resistance of filters. - Explain the particle separation process.	

CO-PO MAPPING (1 TO 3 SCALE)

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
CO-1	3	3	3	1	1	1	2	1	-	-	-	2
CO-2	2	3	2	1	2	2	2	1	-	-	-	2
CO-3	3	3	3	2	2	1	2	1	-	-	-	2
CO-4	2	3	2	1	1	1	1	1	-	-	-	2
CO-5	3	3	3	1	2	1	2	1	-	-	-	2
CO-6	3	2	3	1	2	2	2	1	-	-	-	2
Avg.	2.7	2.8	2.7	1.2	1.7	1.3	1.8	1.0	-	-	-	2.0

S. No.	Name of Experiments
1.	Determination of average particle size of a mixture of particles by sieve analysis.
2.	Study and operation of Jaw crusher and thereby verification of Rittinger's constant.
3.	Determination of reduction ratio, maximum feed size and theoretical capacity of crushing rolls.
4.	Study of Ball mill and comparison of its critical speed with the operating speed.
5.	Study of Batch Sedimentation Test of calcium carbonate slurry.
6.	Study and operation of a cyclone separator and thereby find its efficiency of separation.
7.	To determine the screening effectiveness and the ratio of overflow and underflow for a given sample.
8.	To find the cake and filter medium resistance of the Plate and Frame Filter press.
9.	To find the filter medium resistance of a rotary Vacuum Filter.

SUBJECT CODE: JCH 453	COURSE TITLE: PROCESS MODELING & SIMULATION LAB
EXAM DURATION: 2 HOURS	SEMESTER: IV (EVEN)
L: T: P :: 0 : 0 : 2 CREDITS: 1	PREREQUISITE: NIL
COURSE OBJECTIVES: - To impart conceptual knowledge about the modelling & simulation techniques of chemical processes. - To teach various simulation approaches and basic knowledge of simulators. - To provide knowledge about skills in using process simulators for solving chemical engineering processes problem.	
COURSE OUTCOMES: On completion of this course, the students will be able to - Understand the fundamentals of process modeling and simulation, including key concepts and techniques. - Apply MATLAB to solve process modeling problems and simulate chemical processes. - Gain proficiency in using Aspen Plus/CHEMCAD for simulating individual equipment and analyzing VLE data. - Design and optimize distillation columns, evaporators, and heat exchangers using simulation tools. - Simulate absorption, reaction, and diffusion processes in various reactors using a two-film model. - Implement material and energy balances for reactor-separator systems and optimize process performance.	

CO-PO MAPPING (1 TO 3 SCALE)

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
CO-1	3	3	3	1	1	1	-	-	-	-	-	2
CO-2	3	3	3	2	1	1	1	1	1	-	-	2
CO-3	2	3	2	1	2	2	2	1	-	-	-	1
CO-4	3	2	3	1	1	1	1	1	-	-	-	3
CO-5	2	3	2	2	2	1	-	1	1	-	-	2
CO-6	2	3	2	1	1	2	1	-	-	-	-	1
Avg.	2.5	2.8	2.5	1.3	1.3	1.3	1.3	1.0	1.0	-	-	1.8

REFERENCE BOOKS:

S. No.	NAME OF AUTHORS/BOOKS/PUBLISHERS	YEAR OF PUBLICATION/ REPRINT
1.	Luyben W.L., Process Modeling, Simulation and Control for Chemical Engineering, McGraw-Hill.	1998
2.	Babu, B.V., Process Plant Simulation, Oxford University Press.	2004
5.	"Process Modelling and Simulation in Chemical, Biochemical and Environmental Engineering" by Ashok Kumar Verma, 1e, CRC Press	2020
6.	Jana, Amiya K. "Process modelling and control using ASPEN". PHI Learning Pvt. Ltd.	2011

7.	Kamal, I. M. AL-Malah, Aspen plus: chemical engineering applications, 2e, Wiley	2022
8.	Juma Haydary, Chemical Process Design and Simulation: Aspen Plus and Aspen HYSYS Applications, Wiley	2019
10.	Yeong Koo Yeo, Chemical Engineering Computation with MATLAB, CRC Press	2018
11.	NPTEL Lectures	

S.NO.	Name of Experiments
1.	Introduction to Process Modeling & Simulation.
2.	Practice examples of process Modeling & simulation and solution of problems using MATLAB
3.	Introduction to Aspen Plus and Simulation of individual equipment using ASPEN Plus.
4.	To calculate the VLE data for ideal mixture and various activity coefficient models by using ASPEN Plus.
5.	To determine the Composition of vapor and liquid streams in a flash distillation still using VLE data.
6.	To apply material balance/enthalpy balance in the plate columns.
7.	To study the absorption, reaction and diffusion processes in a contact reactor/bubble absorber/packed tower/plate column through a two-film model.
8.	To simulate liquid –liquid extraction column.
9.	To design and optimize a single effect and multiple effect evaporator.
10.	To design a shell and tube heat exchanger.
11.	To simulate the CSTR/PFR model and compute the component mole fractions in the product stream.
12.	To simulate the laminar flow of water through a constant diameter circular pipe.
13.	To apply complete material and energy balance for a given reactor-separator system.

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY
LUCKNOW**



**Teaching and Evaluation Scheme
For
Second Year
MBA (Common)**

AS PER AICTE MODEL CURRICULUM & NEP 2020

(Effective from the Academic Session: 2025-26)

PREAMBLE

The Evaluation Scheme and Syllabus for Second Year MBA (Common) programme is designed with a view to enhance the skills, knowledge & leadership of management graduates in order to maximize the employment opportunities in various functional areas. The guidelines of Model Curriculum of AICTE are duly considered by incorporating relevant emerging areas in all specializations offered during the program. It has also followed the guidelines of New Education Policy (NEP) to emphasis on skill building through project and practical work specifying the learning outcomes for each subject and used Bloom's hierarchical model as expected indicators of learning levels. The specified levels of learning outcomes are indicative and could be used suitably for assessment and evaluation.

The management education is dynamic and driven by socio-economic and technological changes as well as innovations. Hence, it is expected that, latest updates from research, industry practices and cases must be discussed extensively during teaching to achieve the desired levels of knowledge and skills with practical outlook among graduating students. The detailed syllabus has introduced case studies and latest updates also.

Visits to Manufacturing Units, malls, ware house & logistic hubs, Ports etc. and some short duration live Projects will be helpful to buddy managers in gaining the feel real corporate culture and working practices. It will help in orienting the students towards entrepreneurship and to start their own start-ups.

Today IT is enable of all areas of management be HR, Finance, Marketing and hence technological integrations with all functions have changed the face of planning and decision making in all manufacturing and service industries. The Supply Chain processes are driven by ERP System and High-End Technologies for real time tracking and identifications during transportation for better customer's support. Therefore in the real time scenario , while designing the syllabus, we have given equal emphasis on the quantitative and analytics approaches which will help the students to understand the practical know how of corporate and will understand the pattern & interpretation of large data. Therefore we have given equal emphasis on building student's IT skills .

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GUIDELINES FOR SUMMER TRAINING (III SEMESTER) AND RESEARCH PROJECT REPORT (RPR) (IV SEMESTER)

Summer Training Project Report (STPR)

Objective:

The internship module aims to provide the student with:

- A practice-oriented and ‘hands-on’ working experience in the real world or industry, and
- To enhance the student’s learning experience.
- An opportunity to develop a right work attitude, self-confidence, interpersonal skills and
- Ability to work as a team in a real organisational setting.
- An opportunity to further develop and enhance operational, customer service and other
- Life-long knowledge and skills in a real-world work environment.
- Pre-employment training opportunities and an opportunity for the company or
- Organisation to assess the performance of the student and to offer the student an employment
- Opportunity after his/her graduation, if it deems fit.

Outcomes:

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

CO – 1: Understand the application of knowledge and skill sets acquired from the course and workplace in the assigned job function/s.

CO – 2: Apply real life challenges in the workplace by analyzing work environment and conditions, and selecting appropriate skill sets acquired from the course.

CO – 3: Create critical thinking and problem-solving skills by analyzing underlying issue/s.

CO – 4: Develop the ability to harness resources by analyzing challenges and considering opportunities.

CO – 5: Understand appreciation and respect for diverse groups of professionals by engaging harmoniously with different company stakeholders.

Guidelines For Summer Internship Project Report

1. At the end of the second semester examination, it is mandatory for every student of MBA to undergo on-the-job practical training in any manufacturing, service or trading organization. The training will be of 6 to 8 weeks duration. The college/institute will facilitate this compulsory training for students.
2. During the training, the student is expected to learn about the organization and analyze and suggest solutions to a live problem. The objective is to equip the students with the knowledge of actual functioning of an organization and problems faced by them for

exploring feasible solutions.

3. During the course of training, the organization (where the student is undergoing training) will assign a problem/project to the student.
4. The student, after the completion of training will submit a report to the College/Institute which will form part of the third semester examination. However, the report must be submitted by the end of September 30.
5. The report (based on training and the problem/project studied) prepared by the student will be known as Summer Training Project Report. The report should reflect in depth study of a micro problem, ordinarily assigned by the organization where the student undergoes training. Relevant tables and bibliography should support it. One comprehensive chapter must be included about the organization where the student has undergone training. This should deal with brief history of the organization, its structure, performance products/services and problem faced. The average size of report ordinarily will be of minimum 100 pages in standard font size (12) and double spacing. Two neatly typed (one sided only) and soft bound copies of the report will be submitted to the College/Institute. The report will be typed on A-4 size paper.
6. The report will have two certificates, one from the Faculty guide and another from reporting officer of the organization where the student has undergone training. These certificates should be attached in the beginning of the report.
7. The Summer Training Project Report will carry Total 100 marks and out of which 70 marks will be evaluated by two examiners (one external and one internal). The external examiner will be appointed by University. The evaluation will consist of (1) Summer Training Project Report evaluation (2) Project Presentation and Viva Voce. The average of the marks awarded by the 2 examiners will be taken into account for the results.
8. The Project Report evaluation will comprise of 30 sessional marks and would be evaluated by internal project guide.
9. Only such person will be appointed as an external examiner for the evaluation of the project report who has minimum three years of experience of teaching MBA classes in a College/University. Experience of teaching MBA classes as guest faculty shall not be counted.
10. It is mandatory that the student will make presentation in the presence of teachers and students. The student is expected to answer to the queries and questions raised in such a meeting.
11. The suggestive parameters on which external evaluation would be carried out are as under:

Project Report Evaluation:

Evaluation Criteria	Marks
Understanding of Objectives with topic	20
Understanding of Relevance of topic	20
Interpretation & Analysis	10
Presentation	10
Query handling	10

Research Project Report (RPR)

In fourth semester, the candidates will have to submit a Research Project Report on a problem/topic (from the specialization areas) to be assigned by the MBA department under the supervision of a core faculty member of the department. The Research Project Report will carry 300 marks. The evaluation of the project report will be done by two examiners (external & internal). The evaluation will consist of (1) Evaluation of Project Report (2) Presentation and Viva Voce.

The evaluation of Project Report will comprise of 100 marks and would be evaluated by the internal guide. The evaluation of Viva Voce of Project would comprise of 200 marks and would be evaluated by an external examiner appointed by University and one internal examiner appointed by institute. The average of the marks awarded by the 2 examiners will be taken into account for the results. In case the difference in the marks given by the examiners is 30 or more, the project report will be referred to a third examiner. In such cases the average of two closer awards (given by three examiners) will be taken into account for the results. The report will contain the objectives and scope of the study. Research Methodology, use and importance of the study, analysis of data collected, conclusions and recommendations. It will contain relevant charts, diagrams and bibliography. A certificate of the supervisor and the Head of the MBA program certifying the authenticity of the report shall be attached therewith. The student will submit two copies of the report to the Head of MBA program. The number of pages in the report will be minimum 75 or more. The report should be typed in A-4 size paper. The suggestive parameter on which evaluation would be carried

1. Understanding & relevance of the topic
2. Relevance & Analysis of the data
3. Ability to present
4. Ability to handle query

MBA II Year Teaching and Evaluation Scheme
W.E.F. Academic Session 2025-26
(In Accordance with AICTE Model Curriculum & New Education Policy)
III SEMESTER

SN	CODE	SUBJECT	PERIODS			INTERNAL EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	PS	Total	TE	PE		
1	JMB 301	Strategic Management	3	0	0	20	10	0	30	70	0	100	3
2		Elective- 1 Specialization Group 1	3	0	0	20	10	0	30	70	0	100	3
3		Elective -2 Specialization Group 1	3	0	0	20	10	0	30	70	0	100	3
4		Elective -3 Specialization Group 1	3	0	0	20	10	0	30	70	0	100	3
5		Elective -1 Specialization Group 2	3	0	0	20	10	0	30	70	0	100	3
6		Elective -2 Specialization Group 2	3	0	0	20	10	0	30	70	0	100	3
7		Elective -3 Specialization Group 2	3	0	0	20	10	0	30	70	0	100	3
8	JMB 308	Summer Training Project Report & Viva Voce	0	4*	0	0	30	0	30	0	70	100	4
		TOTAL										800	25

- Students will be guided & assessed by Faculty Guide for internship report.

MBA II Year Teaching and Evaluation Scheme
W.E.F. Academic Session 2025-26
(In Accordance with AICTE Model Curriculum & New Education Policy)

Semester IV

SN	CODE	SUBJECT	PERIOD S			INTERNAL EVALUATION SCHEME				END SEMESTER		TOTAL	CREDIT
			L	T	P	CT	TA	PS	Total	TE	PE		
1	BVE 401	Universal Human Values and Professional Ethics	3	0	0	20	10	0	30	70	0	100	3
2		Elective-4 Specialization Group-1	3	0	0	20	10	0	30	70	0	100	3
3		Elective 5 Specialization Group-1	3	0	0	20	10	0	30	70	0	100	3
4		Elective -4 Specialization Group-2	3	0	0	20	10	0	30	70	0	100	3
5		Elective -5 Specialization Group-2	3	0	0	20	10	0	30	70	0	100	3
6	JMB 406	Research Project Report & Viva Voce	0	6*	0	0	100	0	100	0	200	300	10
		TOTAL										800	25

***Students will be guided and assessed by Faculty Guide for Research project**

ELECTIVES IN III SEM

Specialization Group: MARKETING (MK)

SN	CODE	SUBJECT
1	JMB MK 01	CONSUMER BEHAVIOUR AND NEURO MARKETING
2	JMB MK 02	MARKETING & WEB ANALYTICS
3	JMB MK 03	SALES AND DISTRIBUTION MANAGEMENT

Specialization Group: FINANCIAL MANAGEMENT (FM)

SN	CODE	SUBJECT
1	JMB FM 01	INVESTMENT AND PORTFOLIO MANAGEMENT
2	JMB FM 02	FINANCIAL PLANNING AND TAX MANAGEMENT
3	JMB FM 03	FINANCIAL AND CREDIT RISK ANALYSIS

Specialization Group: INFORMATION TECHNOLOGY (IT)

SN	CODE	SUBJECT
1	JMB IT 01	SOFTWARE ENGINEERING AND MANAGEMENT
2	JMB IT 02	EMERGING TECHNOLOGIES FOR BUSINESS
3	JMB IT 03	DATABASE MANAGEMENT SYSTEM

ELECTIVES IN IV SEM

Specialization Group: MARKETING (MK)

SN	CODE	SUBJECT
4	JMB MK 04	SERVICES & RETAIL MARKETING
5	JMB MK 05	B 2 B MARKETING

Specialization Group: FINANACIAL MANAGEMENT (FM)

SN	CODE	SUBJECT
4	JMB FM 04	BEHAVIOURAL FINANCE
5	JMB FM 05	STRATEGIC FINANCIAL MANAGEMENT

Specialized Group : INFORMATION TECHNOLOGY (IT)

SN	CODE	SUBJECT
4	JMB IT 04	E-BUSINESS
5	JMB IT 05	BUSINESS DATA WAREHOUSING AND DATA MINING

III SEMESTER

STRATEGIC MANAGEMENT

JMB 301

Course Credit: 3

Total Hours: 40

Course Objectives: The objective of this course is to:

- Understand the fundamental concepts, models, and processes of strategic management.
- Analyze the external and internal environments of organizations using relevant frameworks and tools.
- Formulate effective business, corporate, and functional strategies based on situational analysis.
- Evaluate and choose appropriate strategies using strategic analysis techniques.
- Implement strategies effectively through structured programs and organizational alignment.
- Evaluate strategic performance and apply controls to ensure strategic success and sustainability.

Unit 1 (5 Hours)

Introduction: meaning nature, scope, and importance of strategy; Model of strategic management, Strategic Decision-Making Process.

Corporate Governance: Composition of the board, Role and Responsibilities of the board of directors, Trends in corporate governance, Corporate Social Responsibility. **Case Studies and Latest Updates.**

Unit 2 (8 hours)

Environmental Scanning: *Understanding the Macro Environment:* PESTEL Analysis, Industrial Organization (IO) & the Structure Conduct Performance (SCP) approach, Porter's Five Forces Model, *Understanding the Micro Environment:* Resource Based View (RBV) Analysis, VRIO Framework, Using resources to gain Competitive advantage & its sustainability, Value Chain Analysis. **Case Studies and Latest Updates.**

Unit 3 (9 hours)

Strategy Formulation: Situational Analysis using SWOT approach

Business Strategies: **Competitive Strategy:** - Cost Leadership, Differentiation & Focus, **Cooperative Strategy:** - Collusion & Strategic Alliances **Corporate Strategies:** Directional **Strategy:** Growth strategies, Stability Strategies & Retrenchment Strategies. Corporate Parenting, **Functional Strategies:** Marketing, Financial, R&D, Operations, Purchasing, Logistics, HRM & IT. *The sourcing decision:* Outsourcing & offshoring. **Case Studies and Latest Updates.**

Unit 4 (9 hours)

Strategy Choice and Analysis: Scenario Analysis Process, Tools & Techniques of strategic Analysis: BCG Matrix, Ansoff Grid, GE Nine Cell Planning Grid, McKinsey's 7'Sframework.

Strategy implementation: Developing Programs, Budget and Procedures, Stages of Corporate Development, Organizational Life cycle, *Organizational Structures:* Matrix, Network & Modular/Cellular; Reengineering and Strategy implementation, Leadership and corporate culture, **Case Studies and Latest Updates.**

Unit 5 (5 hours)

Strategy Evaluation & Control: Evaluation & Control process, *Measuring performance:* types of controls, activity based costing, enterprise risk management, primary measures of corporate performance, balance scorecard approach to measure key Performance, responsibility centers, Benchmarking, Problems in measuring Performance & Guidelines for proper control. Strategic Audit of a Corporation. **Case Studies and Latest Updates.**

Course Outcomes

	Course Outcome	Bloom's Level
CO1	Define and explain the fundamental concepts, models, and processes of strategic management	K2: Understanding
CO2	Analyze external and internal environments using various frameworks to assess organizational positioning.	K4: Analyzing
CO3	Apply situational analysis techniques to formulate competitive, corporate, and functional strategies in diverse business contexts.	K3: Applying;
CO4	Evaluate strategic options using analytical tools for informed strategy choice.	K5: Evaluating
CO5	Design and develop strategic implementation plans for effective strategy execution.	K6: Creating
CO6	Assess and control organizational performance to ensure strategic success and sustainability.	K4: Analyzing

Suggested Readings

1. Wheelen, L. Thomas and Hunger, David J.; Concepts in Strategic Management and Business Policy, Pearson Education,
2. Stewart Clegg, Chris Carter, Martin Kornberger & Jochen Schweitzer : Strategy - Theory and Practice.(SAGE Publishing India)
3. Kazmi, Azhar; Business Policy and Strategic Management; McGraw-Hill Education.
4. David, Fred; Strategic Management: Concepts and Cases; PHI Learning.
5. Thomson, Arthur A. and Strickland, A. J.; Strategic Management: Concept and Cases; McGraw Hill Education,
6. Jauch, L.F., and Glueck, W.F.; Business Policy and Strategic Management; McGraw-Hill Education.

III SEMESTER ELECTIVES

MARKETING ELECTIVES

CONSUMER BEHAVIOUR AND NEURO MARKETING

JMB MK 01

Course Credit: 3

Total Hours: 40

Course Objectives: The objective of this course is to:

- Understand the fundamental concepts, theories, and models of consumer behaviour and their relevance in marketing decision-making.
- Analyze the psychological, personal, social, and cultural factors influencing consumer decision-making.
- Examine consumer behaviour across digital platforms and modern consumption contexts.
- Understand the principles, techniques, and applications of neuromarketing in analyzing consumer behaviour.
- Evaluate the ethical and legal considerations related to neuromarketing and consumer influence.
- Apply consumer insights and neuromarketing tools to develop evidence-based marketing strategies.

Unit 1 (5 Hours)

Introduction: Consumer Behavior & the Marketing Mix, Consumer Goals, **Consumer Decision Making Process:** Need Recognition, Search for information, Pre purchase evaluation of alternatives, Purchase, Consumption, Post consumption Evaluation & Divestment, Interruption in buying process & their effects, Customer involvement, Consumer Journey through the World of Technology.

Unit 2 (8 hours)

Psychological factors: Perception, learning, motivation, attitude formation and change, personality, and lifestyle. **Personal factors:** Demographics, life cycle, occupation, and income. **Social factors:** Family, reference groups, roles and status. **Cultural factors:** Culture, sub-culture, cross-cultural consumer behaviour. Consumer involvement and buying decision process (complex, habitual, variety-seeking). Organizational buying vs individual buying behaviour. **Case Studies and Industry Applications.**

Unit 3 (8 hours)

Consumer Behaviour in Digital Age Online and mobile consumer behaviour, Influence of social media, peer reviews, and digital communities. Role of AI, machine learning, and big data in understanding consumers. Behavioural targeting and personalization strategies. Consumer privacy and data protection in digital marketing. Emerging trends in digital consumption patterns. **Case Discussions and Industry Practices.**

Unit 4 (8 hours)

Introduction to Neuromarketing: Meaning and scope of neuromarketing. **Principles of neuroscience relevant to marketing:** Brain functions, emotions, and decision-making. **Neuromarketing techniques:** Eye-tracking, fMRI, EEG, biometrics, facial coding. Applications of neuromarketing in advertising, branding, packaging, and pricing strategies. Benefits and limitations of neuromarketing. Ethical issues, criticisms, and regulatory frameworks related to neuromarketing. **Case Studies.**

Unit 5 (7 hours)

Consumer Behaviour and Neuromarketing Strategies: Translating consumer insights into marketing strategy. Designing customer experiences using neuromarketing findings. Sensory marketing and subconscious consumer triggers. Role of neuromarketing in retail, FMCG, luxury brands, and service sectors. Developing integrated consumer behaviour and neuromarketing strategies for real-world challenges. Case Study.

Course Outcomes

	Course Outcome	Bloom's Level
CO1	Define and explain key concepts, theories, and models of consumer behaviour and neuromarketing.	K1: Remembering, K2: Understanding
CO2	Analyze the impact of psychological, social, personal, and cultural factors on consumer buying behaviour.	K4: Analyzing
CO3	Apply frameworks of consumer behaviour to develop marketing strategies suitable for traditional and digital markets.	K3: Applying
CO4	Evaluate neuromarketing techniques and their application in strategic marketing decisions, considering ethical and regulatory concerns.	K5: Evaluating
CO5	Design and develop integrated marketing strategies using consumer behaviour insights and neuromarketing data for real-world business scenarios.	K6: Creating
CO6	Critically assess emerging trends in digital consumer behaviour and recommend appropriate marketing interventions.	K5: Evaluating

Suggested Readings

1. Schiffman, L. G., & Wisenblit, J. (2020). *Consumer Behavior*, Pearson.
2. Solomon, M. R. (2022). *Consumer Behaviour: Buying, Having, and Being*, Pearson.
3. Lindstrom, Martin (2009). *Buyology: Truth and Lies About Why We Buy*, Crown Business.
4. Majumdar, Ramanuj (2010). *Consumer Behaviour: Insights from Indian Market*, PHI Learning.
5. Morin, Christophe (2022). *The Science of Customer Connections: Manage Your Message to Gain and Retain Customers*, Wiley.
6. Lee, Darren Bridger (2015). *Neuromarketing: Understanding the Buy Buttons in Your Customer's Brain*, Kogan Page.
7. Kumar, S. R. (2015). *Consumer Behaviour: The Indian Context (Concepts and Cases)*, Pearson India.
8. Nair, Suja R. (2018). *Consumer Behaviour in Indian Perspective*, Himalaya Publishing House.

MARKETING AND WEB ANALYTICS

JMB MK 02

Course Credit: 3

Total Hours: 40

Course Objectives: The objective of this course is to:

- To introduce the concept, scope, and importance of Marketing Analytics in data-driven decision-making.
- To equip students with pricing, sales forecasting, and customer analysis techniques using quantitative models.
- To enable understanding and application of various retailing, advertising, and web analytics methods.
- To familiarize students with tools and frameworks used in social media and digital analytics platforms.
- To develop competence in interpreting qualitative insights from digital interactions through modern web tools and methods.

Unit 1: (4 Hours)

Introduction to Marketing Analytics: Meaning, Characteristics, Advantages & Disadvantages of Marketing Analytics, Market Data Sources: Primary & Secondary Market Sizing: Stakeholders, Applications, Top-down & Bottom-up Approaches, PESTLE Analysis & Porter's Five Forces Model for market evaluation

Unit 2: (8 Hours)

Pricing Analytics: Pricing Policy & Objectives, Demand Estimation: Price Elasticity, Linear & Power Demand Curves, Optimizing Pricing and Subjective Demand Curves, Pricing Multiple Products ,Price Bundling: Pure vs. Mixed Bundling Nonlinear Pricing & Profit Maximization Strategies, Revenue Management: Markdown Pricing & Uncertainty Handling, Price Skimming and Sales Promotions

Unit 3: (7 Hours)

Sales Forecasting & Customer Analytics: Linear & Multiple Regression for Forecasting, Seasonality & Special Events Modeling, Ratio to Moving Average Methods-Curve Forecasting for New Products, Customer Lifetime Value (CLV): Concept, Estimation & Business Implication, Market Segmentation: STP Framework, Clustering for Segment Derivation, Describing Market Segments

Unit 4: (8 Hours)

Retailing, Advertising & Web Analytics Retail Analytics: Market Basket Analysis (2-way & 3-way lift), RFM Analysis, Retail Space & Sales Resource Allocation. **Advertising Analytics:** Advertising Effectiveness, PPC, Online Ads.

Introduction to Web Analytics: Key Terms, Process, Offsite vs. Onsite Web Analytics, Web Analytics Tools & Metrics: Hits, Page Views, Bounce Rate, Traffic Source

Google Analytics Overview KPIs: Need, Characteristics, Perspective & Usage Custom Campaigns & Content Reports

Unit 5: (9 Hours)

Social Media, Web Analytics Tools & Qualitative Analysis: Facebook Analytics: Demographics, Engagement & Post Performance, Social Campaign Analysis: Goals & Outcomes, Analytics for

Instagram, Twitter, LinkedIn, YouTube Organic vs. Paid Traffic, Benchmarking

Web Analytics Tools: A/B Testing, Online Surveys, Web Crawling & Indexing, NLP Techniques for Micro-text Analysis **Google Website Optimizer: Working & Implementation.**

Qualitative Techniques: Heuristic Evaluation, Site Visits, Surveys (Post-visit & Online) Web Analytics 2.0 vs. 1.0, Competitive Intelligence, Website Traffic Trends & Overlap

Suggested Readings

1. Marketing Analytics: Data-Driven Techniques with Microsoft Excel by Wayne L Winston, Wiley India Pvt. Ltd.
2. Marketing Analytics: Strategic Models and Metrics by Stephan Sorger, Create Space Publishing
3. Marketing Engineering and Analytics by Gary Lilen, Arvind Rangaswamy, and Arnaud De Bruyn, Decision Pro, Inc.
4. Marketing Metrics by Dugar Anurag, SAGE Publishing India
5. Avinash Kaushik, Web Analytics 2.0: The Art of Online Accountability and Science of Customer Centricity,
6. Clifton B., Advanced Web Metrics with Google Analytics, Wiley Publishing, Inc. 2nd ed.
7. Kaushik A., Web Analytics 2.0, The Art of Online Accountability and Science of Customer Centricity, Wiley Publishing, Inc. 1st ed.
8. Sterne J., Web Metrics: Proven methods for measuring web site success, John Wiley and Sons
9. Annmarie Hanlon, Digital Marketing, SAGE Publishing India

Course Outcomes

	Course Outcome	Bloom's Level
CO1	Understand the meaning, characteristics, and applications of marketing analytics and market evaluation tools such as PESTLE and Porter's Five Forces.	K2 (Understand)
CO2	Apply pricing analytics techniques including bundling, nonlinear pricing, and revenue management to solve pricing problems.	K3 (Apply),
CO3	Use regression models and forecasting techniques to estimate sales and customer lifetime value.	K4 (Analyze),
CO4	Analyze & Evaluate customer behavior through segmentation, clustering, and retail metrics like RFM and basket analysis.	K5 (Evaluate)
CO5	Evaluate the effectiveness of online advertising and interpret web analytics metrics using tools such as Google Analytics.	K5 (Evaluate)
CO6	Develop insights using social media analytics, A/B testing, and qualitative tools like heuristic evaluations and surveys.	K6 (Create)

SALES & DISTRIBUTION MANAGEMENT

JMB MK 03

Course Credit: 3

Total Hours: 40

Course Objectives: The objective of this course is to:

- Provide students with a conceptual understanding of the role of selling in marketing, personal selling, types of sales personnel, and the process of effective selling.
- Develop managerial competencies in sales force recruitment, training, motivation, compensation, forecasting, territory management, productivity assessment, and performance appraisal.
- Enable students to plan and control sales operations using forecasting methods, budgeting, resource allocation, sales planning processes, CRM tools, and ethical practices.
- Equip students with knowledge and analytical skills for designing, managing, and evaluating distribution channels, channel partners, and retail-wholesale networks.
- Familiarize students with modern logistics, supply chain processes, IT-enabled distribution, and emerging trends such as e-commerce, green logistics, and reverse logistics.
- Cultivate skills to analyze real-world sales and distribution problems and formulate innovative, technology-driven strategies for effective sales and distribution management.

Unit1: (4 Hours)

Introduction to Sales: Role of selling in marketing, Personal selling, Types of sales personnel, Characteristics of a successful salesman, Process of effective selling.

UNIT 2: (8 Hours)

Sales Force Management: Types of sales organizations and their structure, Recruitment, Selection, Training and Development. Sales force motivation & compensation, designing incentives and contests, Sales forecasting, Sales budget, Sales quota, Sales territory, Building sales reporting mechanism and monitoring, Sales force productivity, Sales force appraisal.

Unit 3: (8 Hours)

Sales Planning and Control: Sales Forecasting Methods and Techniques, Sales Budgeting and Resource Allocation, Sales Strategy and Sales Planning Process, Sales Call Planning and Time Management, Role of Technology in Sales Planning (CRM, Sales force Automation), Ethics in Selling and Legal Aspects

Unit 4: (10 Hours)

Distribution Channel Management: Types of Marketing Channels, Channel Design and Selection, Channel Conflict and its Management, Channel Partner Selection, Motivation, and Performance Appraisal, Retailing and Wholesaling: Trends and Practices. Managing Vertical and Horizontal Marketing Systems

Unit 5: (10 Hours)

Logistics and Emerging Trends in Distribution: Introduction to Logistics and Supply Chain Management, Order Processing, Warehousing, Inventory Management, Transportation and Distribution Cost Control, E-commerce and Omnichannel Distribution, Role of IT in Distribution (ERP, SCM Tools), Emerging Trends: Green Logistics, Reverse Logistics, Direct-to-Consumer (D2C) Channels, Role of IT in retailing: ERP, CRM, analytics-retailing and Digital marketing channel

strategies, Mobile retailing, Social commerce, AI/ML in retail, Ethical and legal issues in retail, Sustainability in retailing, Future trends

Suggested Readings

1. Still, R.R., Cundiff, E.W. and Govani, N.A.P.; Sales Management; Pearson Education
2. Venugopal, Pingali, Sales and Distribution Management, SAGE Publishing
3. Berman, Evans, Retail Management Strategic approach, Pearson
4. Chaudhary Prashant , Selling and Negotiation, SAGE Publishing
5. Tapan Panda: Sales and Distribution Management, OUP.
6. Havaladar, K.K., and Cavale, V.M.; Sales and Distribution Management; McGraw- Hill Education.

Course Outcomes

	Course Outcome	Bloom's Level
CO1	Define and explain the fundamentals of selling, personal selling, and characteristics of sales personnel in the marketing function.	<i>K1: Remembering,</i>
CO2	Apply sales force management concepts in recruitment, training, motivation, forecasting, and productivity management within various sales organizations.	<i>K3: Applying</i>
CO3	Analyze sales planning and control processes including forecasting, budgeting, sales strategy formulation, ethical practices, and the role of technology in sales management.	<i>K4: Analyzing</i>
CO4	Evaluate distribution channel structures, partner selection processes, retail-wholesale strategies, and conflict management for effective channel operations.	<i>K5: Evaluating</i>
CO5	Develop strategies for managing logistics, modern distribution systems, and supply chain networks incorporating emerging trends and technology-driven innovations.	<i>K6: Creating</i>
CO6	Critically assess the use of omnichannel distribution, e-commerce models, and IT tools such as ERP and SCM systems for enhancing distribution efficiency and customer value.	<i>K5: Evaluating</i>

Financial Management (FM) Electives

Investment and Portfolio Management JMB FM 01

Credits 3

Total Hours 40

Course Objective: This course will emphasize an understanding of the economic forces that influence the pricing of financial assets with an objective

1. **To understand** the fundamental concepts of investment theory and their application in portfolio selection and management.
2. **To apply** appropriate financial models and formulae to solve business problems related to active portfolio management.
3. **To analyze** securities using various tools and techniques to assess risk-return trade-offs and investment performance.
4. **To evaluate** different investment avenues and portfolio strategies to enhance returns and manage risks effectively.
5. **To develop** the ability to construct and manage efficient portfolios by integrating theoretical knowledge with practical insights.

Unit I Investments

(10 hrs)

Overview of Capital Market: Market of securities, Stock Exchange and New Issue Markets - their nature, structure, functioning and limitations; Trading of securities: equity and debentures/ bonds. Securities trading - Types of orders, margin trading, clearing and settlement procedures. Regularity systems for equity markets, Type of investors, Aim & Approaches of Security analysis.

Unit II Portfolio Theory

(8 Hrs)

Risk & Return: Concept of Risk, Component & Measurement of risk, covariance, correlation risk. Fundamental coefficient, Measurement of systematic Analysis: Economic, Industry, Company Analysis, Portfolio risk and return, Beta as a measure of risk, calculation of beta, Selection of Portfolio: Markowitz's Theory, Single Index Model, Case Studies.

Unit III Capital Market & Asset Pricing

(6 Hrs)

Technical Analysis: DOW Theory, Support and Resistance level, Type of charts & its interpretations, Trend line, Gap Wave Theory, Relative strength analysis, Technical Versus Fundamental analysis. Nature of Stock Markets: EMH (Efficient Market Hypothesis) and its implications for investment decision. Capital market theorem, CAPM (Capital Asset Pricing Model) and Arbitrage Pricing Theory. Case Studies.

Unit IV Bond, Equity and Derivative Analysis

(8 Hrs)

Valuation of Equity Discounted Cash-flow techniques: Balance sheet valuation, Dividend discount models, Intrinsic value and market price, earnings multiplier approach, P/E ratio, Price/Book value, Price/sales ratio, Economic value added (EVA). Valuation of Debentures/Bonds : nature of bonds, valuation, Bond theorem, Term structure of interest rates. Meaning, features, and types of derivatives, Role and significance of derivatives in financial markets, Participants in derivative markets: hedgers, speculators, and arbitrageurs, Regulatory framework of derivative markets

Unit V Active Portfolio Management**(8Hrs)**

Portfolio Management and Performance Evaluation: Performance Evaluation of existing portfolio, Sharpe, Treynor and Jensen measures; Finding alternatives and revision of portfolio; Portfolio Management and Mutual Fund Industry

Course Outcomes

S. No.	Course Outcome	Bloom's Taxonomy
1.	CO 1: Understand about various investment avenues.	• K2(Understand)
2.	CO 2: Use the value of assets and manage investment portfolio.	• K3(Apply)
3.	CO 3 : Use & Evaluate of various Models of Investment and its application	• K5(Evaluate)
4.	CO 4: Understand and create various investment strategies on the basis of various market conditions.	• K6(Create)
5.	CO 5: Measure riskiness of a stock or a portfolio position.	• K3 (Apply)

Suggested Readings:**Text Books :**

- 1) Ranganatham - Security Analysis and Portfolio Management (Pearson Education, 2nd Ed.)
- 2) Chandra P - Investment Analysis and Portfolio Management (Tata McGraw Hill, 3rd Ed)
- 3) Bhatt- Security Analysis and Portfolio Management (Wiley ,1st Ed)
- 4) Pandian P - Security Analysis and Portfolio Management (Vikas, 1st Ed.)
- 5) Bodie, Kane, Marcus & Mohanti - Investment and Indian Perspective (TMH, 10th Ed)

Reference Books

1. William F. Sharpe, Gordon J. Alexander and Jeffery V. Bailey: Investments, (Prentice Hall, 6th Ed).
2. Donald E. Fischer and Ronald J. Jordan: Security Analysis and Portfolio Management, (Pearson Education, 6th Ed)
3. Charles P. Jones, Investments Analysis and Management, (John Wiley & Sons, 13 Ed)..
4. Edwin J. Elton, Martin J. Gruber: Modern Portfolio Theory and Investment Analysis, 9/e, John Wiley & Sons, 2001.
5. Sidney Cottle, Roger F. Murray, Frank E. Block, Graham and Dodd: Security Analysis, 5/e, Tata McGraw-Hill, New Delhi, 2002.

Tax Planning & Management

JMB FM 02

Credit 3

Total Hours 40

COURSE OBJECTIVES:

1. **To understand** the principles, structure, and key issues related to different types of taxes in the Indian economy.
2. **To apply** tax policies and provisions in evaluating personal and corporate tax obligations.
3. **To analyze** the role of taxation in promoting economic growth and industrial development.
4. **To evaluate** the impact of direct and indirect taxes, including GST, on corporate decision-making and financial planning.
5. **To develop** the ability to design tax-efficient strategies that align with legal provisions and contribute to sound fiscal management.

Unit 1 : Fundamental Concepts

(6Hours)

Introduction: Definition, Cannons of Taxation Person, Assesse, Income, Previous Year, Assessment Year, Income Tax Important Dates and Forms. Residential Status & Tax Incidence: Individual Income Exempted from Tax.

Unit 2 :Heads of Income and provisions

(10Hours)

Heads of Income – Salaries, Income from House Property, Profits & Gains from Business or Profession, Capital Gains, Income from Other sources., Clubbing of incomes, Calculation of Taxable Income, Tax Calculation including Surcharge and Marginal relief, Deduction, Rebate, Relief, Set Off & Carry Forward of Losses – Principles, Meaning, inter-sources & inter-head Set Off.

Unit 3 : Tax Planning & Management

(8 Hours)

Tax Avoidance, Planning, & Evasion, Income Tax Authorities- Their appointment- Jurisdiction- Powers and functions- Provisions relating to collection and recovery of tax- Refund of tax, Offences, penalties and Prosecutions, Appeals and Revisions, Advance Tax, TDS, Advance Rulings, Avoidance of DoubleTaxation Agreements.

Unit 4 : Corporate Tax

(6Hours)

Computation of taxable income, Carry-forward and set-off of losses for companies, Minimum Alternative Tax (MAT), Set-off and Carry-forward of Amalgamation Losses, Tax Planning for Amalgamation, Merger and Demerger of Companies, Tax Provisions for Venture Capital Funds.

Unit 5 GST

(10 Hours)

Introduction to GST: GST Concepts –Advantages and Limitations of VAT – GST as the preferred Tax Structure. Model of GST. Need for Tax Reforms, GST Principles – Single GST, Dual GST; Transactions covered under GST; Impact of GST. Registration and Filing: – Rates of Tax – Rates in Foreign Countries – In India; Assessment and Administration of GST.

Course Outcomes

S. No.	Course Outcome	Bloom's Taxonomy
1.	CO 1: Understand about various Tax provisions and Tax planning	K2(Understand)
2.	CO 2: Use of tax planning concerning various business and managerial and strategic activities	K3(Apply)
3.	CO 3: Evaluate the various Tax saving options & Rates	K5(Evaluate)
4.	CO 4: Measure Corporate Tax and Taxation in case of business restructuring	K3(Apply)
5.	CO 5: Understand how GST can be calculated & managed.	K3 (Apply)

SUGGESTED READINGS

Text Books :

1. Dr. Vinod K. Singhania & Dr. Monica Singhania Students Guide to Income Tax (Taxmann Publication ,Latest Edition according to assessment year)
2. Dr.B.K. Agarwal &Dr. Rajeev Agarwal Tax Planning and Management (Nirupam Publication, Latest Edition according to assessment year)
3. Paolo M. Panteghini Corporate Taxation in a Dynamic World (Springer, Latest Edition)
4. Girish Ahuja & Ravi Gupta Direct Tax Laws & Practice (Bharat Law House, Latest Edition)
5. Datey V.S. – Indirect Taxes – Law & Practice (Taxman ,Latest Edition) 6.E. A.Srinivas Corporate Tax Planning(Tata McGraw Hill, Latest Edition)

Reference Books & Journals :

1. Dr.Vinod K. Singhania & Dr. Kapil Singhania Students Guide to Income Tax(Taxmann Publication ,Latest Edition)
2. Parthasarathy Corporate Governance: Principles, Mechanisms & Practice (Wiley,Latest Edition)
3. H. P. Ranina Corporate Taxation (Orient Law House, Latest Edition)
- 4.Balachandran- Indirect Taxes (PHI, Latest Edition)
4. .Income Tax Reports, Company Law institute of India PvtLtd(Chennai Latest Edition)

Financial Credit and Risk Analysis

JMB FM 03

Course Credit: 3

Total Hours 40

Course Objectives:

1. **To understand** the fundamentals of risk management, its context, and the prevailing perceptions and stereotypes associated with it.
2. **To apply** risk management principles as an enabler for effective decision-making and business performance.
3. **To analyze** the role of risk culture in integrating risk management into organizational processes.
4. **To evaluate** how effective risk management contributes to sustainable competitive advantage.
5. **To develop** a proactive risk culture that positions risk management as a strategic enabler of business success.

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

1. Understand the fundamental principles of credit assessment, creditworthiness evaluation, and risk analysis in financial decision-making.
2. Apply quantitative and qualitative techniques to conduct credit appraisal, financial statement analysis, and borrower risk profiling.
3. Analyze credit risk models and interpret key indicators for assessing default probabilities and portfolio risk.
4. Evaluate credit policies, risk mitigation strategies, and portfolio management practices to enhance financial stability.
5. Develop effective credit strategies and sound risk management frameworks to minimize exposure and ensure sustainable financial performance.

UNIT I : Introduction

(6 hours)

Financial Credit: Meaning & Objectives, Credit Risk, Credit Analysis, Seven C's, Credit Analysis Process, Credit Process, Documentation, Loan Pricing and Profitability Analysis. Regulations, Types of Credit Facilities: Various types of Credit Facilities- Cash Credit, Overdrafts, Demand Loan, Bill Finance – Drawee Bill Scheme, Bill Discounting. Cash Delivery: Types of Facilities, Modes of Delivery.

UNIT II : Trade Credit Risk

(8 hours)

Sole -Banking Arrangement, Multiple Banking Arrangement, Consortium Lending, Syndication. Credit Thrust, Credit Priorities, Credit Acquisitions, Statutory & Regulatory restrictions on Advances. Credit Appraisal: Validation of proposal, Dimensions of Credit Appraisals, Structuring of Loan documents, Credit Risk, Credit Risk Rating, Credit Worthiness of Borrower, Purpose of Loan, Source of Repayment, Cash Flow, Collateral.

UNIT III : Letter of Credit and Loan Commitments

(10 hours)

Quasi Credit Facilities: Advantages of Non-Fund Facilities, Various types of NFB Facilities, Various types Letter of Credits, Assessment of LC limits, Bills Purchase/ Discounting under LC, Loan commitments, Un-funded lines of credit and their characteristics

Various types of Bank Guarantees: Performance Guarantee, Financial Guarantees, Deferred Payment Guarantees, Types of Performance and Financial Guarantees, Assessment of Bank Guarantees Limit, Period of Claim under Guarantee.

UNIT IV : Operational Risk Overview

(08 hours)

Risk & Uncertainty, Financial Sector, Risk Types, Operational Risk Management- Recruitment & Training, Work flow Design, Work Flow Documentation, Delegation of Authority, Independent Internal Audit, Independent Compliance Function, Independent Risk Management Function, System Audit, Corporate Governance, Whistle Blower Policy, Risk Management Culture.

UNIT V : Credit Analysis & Rating

(08 hours)

Importance of credit analysis, Stages of credit analysis profitability analysis and pricing of loans, Credit risk analysis (Debt ratios and risk of leverage), Analysis of working capital, liquidity , operating and cash cycle risk .

Credit Rating: Measurement of Risk, Objective of Rating, Internal & External Rating, Model Credit Rating, Methodology of Rating, Internal & External Comparison, Model Rating Formats.

Course Outcomes: After successful completion of this course students will be able to

CO 1: Understand about various types of financial credit.	K2(Understand)
CO 2: Understand the credit risk and its rating.	K1(Remember)
CO 3 : Use of credit commitments and its application	K3(Apply)
CO 4: Evaluate the risk management and corporate governance.	K5 (Evaluate)
CO 5: Develop the metrics of Measuring riskiness of a stock or a portfolio position.	K5 (create)

SUGGESTED READINGS:

Text Books & Reference Books

1. Kotreshwar G -Risk Management: Insurance & Derivatives- 2/e, Himalaya Publishing, Mumbai.
2. Chance -Introduction to Derivatives & Risk Management-, Cengage Learning, New Delhi. 4.Saita.F- Value at Risk and Bank Capital Management,1/e- Elsevier Inc., U.K.
3. Rejda, George E.-Principles of Risk Management and Insurance- Addison Wesley Longman. 6. McNamara- Principles of Risk Management and Insurance-Addison-Wesley
4. Dorfman- Introduction to Risk Management and Insurance- Prentice Hall.
5. Williams &Heins - Risk Management and Insurance-McGraw Hill.
6. James S. Treischmann, Sandra G. Gustavson - Risk Management and Insurance-South Western Thomson Learning.

INFORMATION TECHNOLOGY (IT) ELECTIVES

SOFTWARE ENGINEERING AND MANAGEMENT

JMB IT 01

Credits: 3

Contact Hours 40 L

Course Objectives

- To understand the fundamentals of information system development and system design processes.
- To apply structured analysis and documentation techniques such as DFDs, ERDs, and data dictionaries.
- To develop practical skills in application prototyping, project planning, cost estimation, and resource analysis.
- To evaluate design methodologies in data management and e-commerce system architectures.
- To identify security and auditing requirements in software systems and suggest appropriate control mechanisms.
- To implement best practices for software quality assurance, system maintenance, and business continuity.

Unit - I: 6hrs

Introduction to Information System Development: Overview of System Analysis and Design; Business System Concepts; Categories of Information Systems; Strategies for System Development; Implementation and Evaluation of Systems; Managing the Application Development Portfolio

Unit - II: 8 hrs

Analysis Techniques & Tools: Study of Existing Systems - Information Requirement Analysis, System Documentation; Structured Analysis - Data Flow Tools: Data Flow Diagrams (DFD), Data Dictionary Concepts; Application Prototype Development - Steps, Uses, Tools, and Strategies; Computer-Aided System Tools (CASE); Project Planning Fundamentals- Cost Estimation, Work and Resource Estimation, Risk Analysis in Software Projects

Unit - III: 8 hrs

System Design and Data Management: Principles of System Design; Input-Output Design for

Business Applications; Design of Online Catalogues; File Organization and Design Techniques; Database Concepts and Design

Unit - IV: 8 hrs

Systems Analysis and Design in E-Commerce: E-Commerce Models: B2B, B2C, and C2C; Advantages and Disadvantages of E-Commerce Systems; E-Commerce System Architectures; Security Considerations in E-Commerce

Unit - V: 10 hrs

Business System Development and Implementation: System Testing and Quality Assurance; Documentation for Systems; Implementation and Development Processes; Hardware and Software Selection Criteria; System Maintenance and Support

Security Control and Auditing: Security and Auditing of Information Systems; Objectives and Techniques of Information System Controls; Auditing Information Systems; Disaster Recovery and Business Process Continuity Planning

Course Outcomes (COs)

S. No	Course Outcome	Bloom's Taxonomy
CO1	Understand the lifecycle stages of system development and distinguish between types of information systems.	K2 (Understanding)
CO2	Apply structured analysis techniques to design business applications and document systems using appropriate tools.	K3 (Applying)
CO3	Analyze cost estimation models, risk management strategies, and project planning techniques in software development.	K5 (Evaluating)
CO4	Evaluate database design principles and e-commerce architectures in the context of online business systems.	K5 (Evaluating)
CO5	Develop and justify software control, auditing, and continuity plans to ensure quality and system integrity.	K6 (Creating)

Suggested Readings:

- Senn, J. A., Analysis & Design of Information System; McGrawHill
- Jalote, P., An Integrated Approach to Software Engineering, Narosa Publications
- Awad, E. M., System Analysis and Design, Galgotia
- Hoffer, J. A., George, J. F. and Valacich, J. S., Modern Systems Analysis and Design, Pearson

EMERGING TECHNOLOGIES FOR BUSINESS

JMB IT 02

Credits: 3

Contact Hours 40 L

Course Objectives

- To understand the evolution of emerging technologies and their relevance to business strategy in the era of Industry 4.0.
- To examine the architecture and application of data science, big data, and cloud technologies in business contexts.
- To analyze the integration of AI, IoT, and computer vision in domains such as manufacturing, retail, and healthcare.
- To explore the disruptive impact of blockchain, 3D printing, and advanced computing technologies.
- To assess immersive technologies like AR, VR, MR, and their roles in customer experience and business transformation.
- To evaluate ethical, cybersecurity, and sustainability challenges in deploying emerging technologies.

Unit - I: 8 Hours

Foundations of Digital & Emerging Technologies: Evolution of technology and the Fourth Industrial Revolution (Industry 4.0); Introduction to digital transformation in business; Overview of enabling technologies and business drivers; Human-machine interaction; future trends in business technology adoption; Introduction to programmable networks, devices, and automation

Unit - II: 8 Hours

Data Science, Big Data & Cloud Computing: Understanding data, information, data value chain, and types; The data pipeline: collection, cleaning, storage, analysis, curation, and visualization; Big Data: key concepts and business use cases; Role of data science in business analytics and decision-making; Cloud Computing: fundamentals, service models (IaaS, PaaS, SaaS), deployment models; Cloud platforms for data storage, management, and scalable analytics

Unit - III: 6 Hours

Artificial Intelligence, IoT & Computer Vision: Artificial Intelligence (AI): machine learning, deep learning, business applications; IoT: architecture, devices, enabling networks, and business implementations; Use of IoT in supply chain, healthcare, smart cities, manufacturing; Computer Vision: fundamentals, business applications in quality control, retail, and automation; Integration of AI & IoT for intelligent products and smart services

Unit - IV: 12 Hours

Blockchain, 3D Printing & Other Disruptive Technologies: Blockchain fundamentals: distributed ledgers, smart contracts, business applications (finance, supply chain, traceability); Real-world challenges and regulatory considerations for blockchain adoption; 3D Printing (Additive Manufacturing): technology, business use cases, supply chain impact, mass customization; Survey of additional emerging technologies (e.g., neuromorphic computing, quantum computing, edge computing)

AR, VR, MR & Virtual Try-On in Business: Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR): differences, technologies, and development; Immersive experiences in business: marketing, training, product design, simulation; Virtual Try-On: concepts, enabling technologies (AR/AI), applications in retail, fashion, beauty, home décor; Data-driven personalization and customer engagement via immersive technologies; Challenges and opportunities of implementing immersive solutions

Unit - V: 6 Hours

Ethics, Security, Sustainability & Leadership in Emerging Tech: Data privacy, security, and compliance (GDPR, other regulations); Cybersecurity issues in cloud, AI, IoT, and blockchain adoption; Ethics and bias in AI, big data, and immersive technologies; Sustainable technology adoption and digital responsibility; Leadership and future workplace skills: managing innovation, change management, digital strategy

Course Outcomes (COs)

S. No	Course Outcome	Bloom's Taxonomy
CO1	Understand the strategic importance of emerging technologies in modern business transformation.	K2 (Understanding)
CO2	Apply data science, cloud, and big data concepts in real-world analytics scenarios.	K3 (Applying)
CO3	Analyze how AI, IoT, and computer vision can be leveraged for intelligent automation and services.	K4 (Analyzing)
CO4	Evaluate the application and implications of blockchain, 3D printing, and other disruptive technologies.	K5 (Evaluating)
CO5	Develop strategic insights for integrating AR/VR and address ethical, security, and sustainability concerns.	K6 (Creating)

Suggested Readings:

- Brynjolfsson, E., & McAfee, A. The Second Machine Age, W. W. Norton & Company.
- Marr, B. Big Data in Practice, Wiley.
- Tapscott, D., & Tapscott, A. Blockchain Revolution, Penguin.
- Greengard, S. The Internet of Things, MIT Press.
- Lewrick, M., Link, P., & Leifer, L. The Design Thinking Toolbox, Wiley

DATABASE MANAGEMENT SYSTEM

JMB IT 03

Credits: 3

Contact Hours 40 L

Course Objectives

- To understand the core principles and architecture of database systems.
- To develop ER models and relational schema for real-world applications.
- To formulate complex SQL queries and apply normalization techniques.
- To analyze query optimization and transaction management strategies.
- To examine database security, recovery, and concurrency mechanisms.
- To explore emerging concepts in distributed databases and data warehousing.

Unit - I: 6 hrs

Introduction to Database Systems: Basic concepts: Data, information, fields, records, files, databases; Evolution and need for database systems in business; Data models: Hierarchical, network, relational, object-oriented; File-oriented systems vs. Database systems; Three-layered architecture of DBMS; Applications and advantages/disadvantages of DBMS

Unit - II: 8 hrs

Data Modelling & Database Design: Entity-Relationship (ER) Model - Entities, attributes, relationships, constraints, ER diagrams, extended features (generalization, specialization, aggregation); Relational database model - Structure, keys (primary, foreign), integrity constraints, Normalization (1NF, 2NF, 3NF, BCNF); Relational schema and table design; Role and responsibilities of the Database Administrator (DBA)

Unit - III: 8 hrs

Relational Query Languages: Structured Query Language (SQL) -Data Definition Language (DDL), Data Manipulation Language (DML), Creating, altering, and deleting tables, Data types, constraints, aggregate functions, Joins, sub-queries, views, transaction control commands (commit, rollback); Relational algebra and calculus - Operators: Selection, projection, join, set operations

Unit - IV: 8 hrs

Database Implementation & Management: Database storage and physical structures - Indexing, B-trees, hashing; Query processing and optimization - Evaluation strategies, query cost analysis; Backup, recovery, and disaster management; Concurrency control: Locking, timestamping, deadlocks; Transaction management and ACID properties

Unit - V: 10 hrs

Security, Authorization, and Advanced Topics: Database security: Authentication, authorization, privileges, threats; Auditing, access controls, violation handling; Data integrity and constraints; Distributed databases and client-server architecture basics; Introduction to data warehousing, OLAP, OLTP, and data mining concepts

Practical Applications & Case Studies: Use of commercial and open-source DBMS (e.g., MySQL, Oracle, SQL Server); Case studies from finance, marketing, HR, retail, and e-commerce sectors; Designing and demonstrating a relational database for a business use case

Course Outcomes (COs)

S. No	Course Outcome	Bloom's Taxonomy
CO1	Understand fundamental database concepts and the need for DBMS in modern organizations.	K2 (Understanding)
CO2	Apply data modeling techniques to design relational databases and use SQL for data manipulation.	K3 (Applying)
CO3	Analyze database normalization and indexing methods for data integrity and performance.	K4 (Analyzing)
CO4	Evaluate transaction management, backup, and recovery mechanisms.	K5 (Evaluating)
CO5	Design and implement secure, scalable databases and understand trends in warehousing and data mining.	K6 (Creating)

Suggested Readings:

- Chakrabarti- Advance Database Management System (Wiley Dreamtech)
- Beynon- Davies P- Database Systems (Palgrave, 2003)
- Karthikeyan- Understanding Database Management System (Acme Learning)
- Hoffer- Modern Database Management (Pearson Education, 6th edition)
- Alexis and Leo- Database Management System (Vikas, 2003.)
- Majumdar and Bhattacharya- Database Management System (Tata Mc Graw Hill, 1996).
- Navathe- e-Fundamentals of Database Systems (Pearson Education, 3rd Ed.)

IV SEMESTER

UNIVERSAL HUMAN VALUES AND PROFESSIONAL ETHICS

BVE 401

Credit: 3

Total Hours: 40

Course Objectives

1. To help students distinguish between values and skills, and understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog within themselves to know what they 'really want to be' in their life and profession
3. To help students understand the meaning of happiness and prosperity for a human being.
4. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcomes

1. Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
2. Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.
3. Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society
4. Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
5. Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work.

Course Description

Every human being has two sets of questions to answer for his life: a) what to do? and, b) how to do?. The first set pertains to the value domain, and the other to the skill domain. Both are complimentary, but value domain has a higher priority. Today, education has become more and more skill biased, and hence, the basic aspiration of a human being, that is to live with happiness and prosperity, gets defeated, in spite of abundant technological progress. This course is aimed at giving inputs that will help to ensure the right understanding and right feelings in the students in their life and profession, enabling them to lead an ethical life. In this course, the students learn the process of self- exploration, the difference between the Self and the Body, the naturally acceptable feelings in relationships in a family, the comprehensive human goal in the society, the mutual fulfillment in the nature and the co- existence in existence. As a natural outcome of such inputs, they are able to evaluate an ethical life and profession ahead.

UNIT-1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education (8 Hours)

Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration—what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation— as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-2: Understanding Harmony in the Human Being - Harmony in Myself (8Hours)

Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’, Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha, Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer), Understanding the characteristics and activities of ‘I’ and harmony in ‘I’, Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT-3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship (8 Hours)

Understanding harmony in the Family- the basic unit of human interaction , Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding the meaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society (AkhandSamaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!.

UNIT-4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence (8 Hours)

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-5: Implications of the above Holistic Understanding of Harmony on Professional Ethics (8 Hours)

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in Professional Ethics: a) Ability to utilize the professional competence for augmenting universal human order, b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, technologies and management models, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) At the level of society: as mutually enriching institutions and organizations

Suggested Readings

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
3. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.
4. Susan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome’s report, Universe Books.
6. A Nagraj, 1998, Jeevan Vidya Ek Parichay, Divya Path Sansthan, Amarkantak.
7. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.
8. A N Tripathy, 2003, Human Values, New Age International Publishers.
9. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantraShodh, Amravati.
10. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press
11. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
12. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books
13. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008

IV SEMESTER ELECTIVES
MARKETING GROUP (MK)
SERVICE & RETAIL MARKETING
JMB MK 04

Credit: 3

Total Hours: 40

Course Objectives: The objective of this course is to:

- Understand the fundamental concepts, characteristics, and strategic frameworks of services marketing.
- Analyze consumer behavior in services and apply principles for service design and delivery.
- Evaluate pricing, promotion, and service quality aspects to ensure customer satisfaction and loyalty.
- Gain insights into the nature of industrial marketing and different types of industrial products.
- Apply knowledge of organizational buying behavior, models, and influencing factors in industrial markets.

Unit 1 (6 Hours)

Introduction to Services Marketing: Introduction: Definition, Characteristics and Classification of Services, Difference between Product and Services Marketing, Paradigms in Services Marketing, Present Marketing Environment, Services Marketing Mix: Understanding the 7 P's, Strategies for Services Marketing: Segmentation, Targeting & Positioning, Differentiation.

Unit 2 (6 Hours)

Understanding Consumer Behavior and Service Design Understanding Consumer Behavior: Services vis-à-vis goods, Consumer Behavior in Services, Customer Expectations and Perceptions of Services – Evaluation of services. Service Development Design & Standards: New Service Development Process – Basic service to potential service, Customer Defined Service Standards, Demand and Capacity Management.

Unit 3 (8 Hours)

Delivering Services: Role of Employees and Customers in service delivery;, Service process – Blue printing – Physical evidence. **Pricing of Services:** Pricing Considerations and Strategies,. Managing Service Promise: Role of Advertising, Personal Selling, Sales Promotion, Publicity and Public Relations. Service Performance. **Evaluating Success of Service Offering:** Service quality and measurement, Complaint handling, Recovery Management, Service Guarantees, the GAP model of service Quality.

Unit 4 (10hrs)

Introduction to retailing & Retail Consume behavior : Nature, scope and importance of retailing, Factors Influencing Retailing, Retail Models ,Retail formats: Store-based (department stores, supermarkets, discount stores) and non-store based (e-retail, vending, direct selling), Organized vs Unorganized retail in India, FDI in retail and current policy framework, Understanding retail consumer behavior, Factors influencing in-store and online consumer decisions, Retail marketing mix (6Ps: Product, Price, Place, Promotion, People, Presentation),Retail branding and private labels.

Unit 5 (10)

Merchandise Management, Pricing, and Supply Chain: Merchandise planning process, Assortment planning and category management, Retail buying process; vendor selection, Inventory management and stock turnover Pricing objectives and strategies in retail, Supply chain management in retail, Role of technology: barcoding, RFID, POS

Suggested Readings:

1. Services marketing, Zeithaml Valerie and Mary jo Bitner, Gremler & Pandit, Tata McGraw Hill. Services Marketing, Lovelock, Christopher, Prentice Hall
2. Services Marketing: Concepts, Planning and Implementation, *Adrian Payne*
3. Chetan Bajaj, Rajnish Tuli & Nidhi V. Srivastava; Retail Management; Oxford University Press
4. Swapna Pradhan; *Retail Management: Text and Cases*; McGraw Hill
5. S.C. Bhatia; Retailing Management; Atlantic Publishers & Distributors
6. U.C. Mathur; *Retail Marketing*; Excel Books

Course Outcomes

	Course Outcomes	Bloom's Level
CO1	Understand the fundamental concepts of services marketing in the evolving marketing environment.	K2: Understand
CO2	Analyze consumer behavior in services, identify customer expectations and perceptions, and apply service design and development strategies.	K4: Analyze
CO3	Evaluate service delivery systems, pricing, promotion mix, and service performance using quality frameworks.	K5: Evaluate
CO4	Create various Retail Formats & classifications.	K6 : Create
CO5	Examine organizational buying processes and analyze factors affecting Retailing Business and its evaluation .	K5: Evaluate

B2B MARKETING

JMB MK 05

Course Credit: 3

Total Hours: 40

Course Objectives:

1. Introduce the fundamental concepts and characteristics of business-to-business (B2B) marketing.
2. Explain the nature of organizational buying behavior and the decision-making processes involved in B2B markets.
3. Provide an understanding of B2B marketing strategies, including market segmentation, targeting, and positioning.
4. Familiarize students with various B2B communication tools and distribution channel strategies.
5. Equip learners with strategic tools and frameworks to analyze and manage marketing performance in business markets.

UNIT I: Introduction to B2B Marketing (8 Hours)

Concept of Business Marketing and Business Market Customers; Market Structure and Business Environment; Characteristics of Business Marketing; Strategic Role of Marketing in Business Context; Types of Commercial Enterprises; Commercial and Institutional Customers. Case studies.

UNIT II: Organizational Buying and Buyer Behaviour (8 Hours)

Organizational Buyers' Decision Process: Stepwise Model, Process Flow Model; Characteristics of Business Markets; Government as a Customer; Commercial Enterprises within Business Markets; Commercial and Institutional Customers' Roles and Buying Behavior. Case studies.

UNIT III: B2B Marketing Strategy (8 Hours)

Strategy Making and Strategy Management in B2B; Industrial Product Strategy; Managing Products and Services for Business Markets; Managing Business Market Channels; Strategic Tools: Growth-Share Matrix, Multifactor Portfolio Matrix, The Balanced Scorecard. Case studies.

UNIT IV: Segmentation, Targeting & Positioning (STP) in B2B Markets (8 Hours)

Market Segmentation in B2B Context; Basic Framework of Segmentation; Selecting Target Segments; Positioning Strategies in B2B; Pricing Strategies in Business Markets; B2B Advertising Techniques; Competitive Bidding Process; Relationship Marketing and CRM. Case studies.

UNIT V: Business Marketing Communication and Channels (8 Hours)

B2B Advertising Channels and Communication Strategies; Digital Marketing in B2B; Trade Shows, Exhibitions, and Business Meets; Sales Force Management and Deployment Analysis; Business Marketing Channels and Participants; Channel Design and Management Decisions; B2B Logistics Management. Case studies.

Course Outcomes (COs)

CO No.	Course Outcome	Knowledge Level (Bloom's Taxonomy)
CO1	Explain the foundational concepts of B2B marketing and the nature of business markets.	K2 – Understand
CO2	Analyze the behavior of organizational buyers and decision-making frameworks.	K4 – Analyze
CO3	Apply strategic marketing tools to develop B2B product and channel strategies.	K3 – Apply
CO4	Evaluate segmentation, targeting, and positioning strategies for business markets.	K5 – Evaluate
CO5	Design integrated B2B marketing communication plans and distribution channels.	K6 – Create

Suggested Readings

1. Michael D. Hutt, Dheeraj Sharma, Thomas W. Speh, *B2B Marketing: A South Asian Perspective*, Cengage, 2014.
2. Sharad Sarin, *Business Marketing: Concepts and Cases*, McGraw Hill, 2013.
3. James C. Anderson, Das Narayandas, James A. Narus, D.V.R. Seshadri, *Business Market Management (B2B)*, Pearson, 2010.
4. Robert Vitale, Waldemar Pfoertsch, Joseph Giglierano, *Business to Business Marketing*, Pearson, 2011.
5. Krishna K. Havaladar, *Business Marketing: Text and Cases*, McGraw Hill, 2014.
6. Armstrong, Gary and Philip Kotler, *Principles of Marketing*, Prentice Hall, 2006.

1. Little Brow

FINANCIAL MANAGEMENT (FM) GROUP

BEHAVIOURAL FINANCE

JMB FM 04

Credit: 3

Total Hours 40

Objectives:

1. **To understand** the foundations of rational finance and behavioural finance, and the challenges behavioural finance poses to traditional financial theories.
2. To apply knowledge of cognitive and emotional biases in making informed and rational investment decisions
3. **To analyze** the impact of overconfidence, herd behaviour, and other social factors on financial markets division and investor decisions.
4. **To evaluate** the principles of value investing through the lens of behavioural biases and investor psychology.
5. **To develop** informed investment strategies by integrating behavioural insights into financial decision-making and market outcomes.

Unit I

8 Hours

Introduction to Behavioral Finance: Foundations of behavioral Finance, behavioral Finance Vs Conventional Finance

Rational Markets Hypothesis and Challenge of Behaviouralist : Intellectual Underpinnings, The rise of Rational Market Hypothesis, Impact on wall street and the choices, The Challenge of Behaviouralist, Synthesis and Future Horizons. Impact on Capital Market

Foundations of Rational Finance: Introduction, Neoclassical, Economics, Rational Preferences, Utility maximization, Relevant information; Expected Utility Theory, Modern Portfolio Theory, Capital Asset Pricing Model, Efficient Markets Hypothesis, Agency Theory, From Rationality to Psychology.

Unit II

Hrs 8

Heuristics and Biases : How the Human mind Works: The Two Systems, Familiarity and related Heuristics, Anchoring, Irrationality and Adaption, Hyperbolic Discounting.

Self Deception: Introduction, Miscalibration, Forms of Over confidence, Causes of Over confidence, Other forms of self- Deception, Implications of Over confidence for financial decision making. Factors Impeding correction, How much do the experts know, the Success equation: Untangling skill and Luck in business.

Unit III

Hrs 8

Prospect Theory, Framing and Mental Accounting: Error in Bernoulli's Theory, Prospect Theory, SP/A Theory, Framing, Mental Accounting, From theory to practice.

Challenge to market efficiency: Theoretical foundations of EMH, Empirical for EMH, Theoretical Challenges for EMH, Noise trading and limits to Arbitrage, Keynes Beauty contest and guess- a number game, Assessment of EMH.

UNIT IV

Hrs 8

Investor Behaviour: Portrait of an individual investor, what the heuristics and biases mean for financial decision making, implications of: emotions and mental accounting. Behavioural portfolio

theory, psychographic models, basic ingredients of sound investment philosophy, guidelines for overcoming psychological biases.

UNIT V

Hrs 8

Market outcomes: Size effect and seasonality, Momentum and reversal, post- earnings announcement drift, value premium, premium puzzle, excessive volatility, Bubbles, Behavioral Asset Pricing Model.

Value Investing: Central tenets of value investing, Evidence and prospects of value investing, Strategies of well-known value investors, academic research on value investing.

S. No	Course Outcome	Bloom's Taxonomy
CO1	Understand the foundations of rational finance and behavioural finance.	K2 (Understanding)
CO2	Apply knowledge of cognitive and emotional biases in making informed and rational investment decisions.	K3 (Applying)
CO3	Analyze the impact of overconfidence, herd behaviour, and other social factors on financial markets division and investor decisions	K4 (Analyzing),
CO4	Evaluate the principles of value investing through the lens of behavioural biases and investor psychology.	K5 (Evaluating)
CO5	Develop informed investment strategies by integrating behavioural insights into financial decision-making and market outcomes	K6 (Creating)

Reference Books

1. Chandra Prasanna (2016): *Behavioral Finance*, Tata Mc Graw Hill Education(India) Private Limited, Chennai.
2. Acket Lucy F and DeavesRichard(2011): *Understanding Behavioral Finance*, CENGAGE Learning.
3. Wood, Arnold Ed(2010), *Behavioral Finance and Investment Management*, Charlottesville, Virginia: Research Foundation of CFA Institute.
4. PompianM(2006): *Behavioral Finance and Wealth Management: How to build optimal portfolio's That account for Investor Biases*, New Jersey: John Wiley and Sons.
5. Peterson Richard(2007): *Inside the investors Brain: The power of mind over money*, Hoboken, N.J.: John Wiley and Sons.

STRATEGIC FINANCIAL MANAGEMENT

JMB FM 05

Credits: 3

Hours 40 L

Objectives:

1. To understand the basic knowledge of financial management and its functions, frameworks, and tools of strategic financial management
2. To apply financial strategies for investment, financing, and dividend decisions in alignment with organizational goals.
3. To analyze capital structure, cost of capital, risk-return trade-offs, and their impact on shareholder value to evaluate alternative investment proposals.
4. To evaluate the knowledge of factors influencing dividend, capital structure, working capital of a firm.
5. To develop innovative financial strategies for value creation, long-term sustainability, and competitive advantage.

Unit I

8 Hours

Strategic Financial Management: Objectives and Functions. Valuation of Securities- Approaches to corporate valuation, valuation of equities including cash flow, dividend earning approach, valuation of debts and preference shares.

Unit II

8 Hours

Capital Structure: factors affecting capital structure, Capital structure theories. Operating Leverage, Financial Leverage and Combined Leverage, EBIT and EPS analysis, ROI and ROE analysis.

Unit III

8 Hours

Dividend policy: Factors affecting dividend decisions. Theories of Dividend policies, corporate dividend behaviour of companies, Legal and procedural aspects.

Unit IV

8 Hours

Institutional setup for term finance and working capital finance: term lending institutions and commercial banks, NBFCs..Commercial Banking, Working Capital, Venture Capital Venture capital funds: Stages in Venture capital financing, Business plan, elements of a business plan, the process of venture capital financing, methods of venture capital financing, future. Prospects of venture capital financing.

Unit V

8 Hours

Project planning and analysis: project - Meaning and concept - Project life cycle - generation and screening of ideas - Analysis of market and demand - Technical and Financial Analysis

S. No	Course Outcome	Bloom's Taxonomy
CO1	Understand the basic knowledge of financial management and its functions.	K2 (Understanding)
CO2	Apply financial strategies for investment, financing, and dividend decisions in alignment with organizational goals.	K3 (Applying)
CO3	Analyze capital structure, cost of capital, risk-return trade-offs, and their impact on shareholder value to evaluate alternative investment proposals..	K4 (Analyzing), K5
CO4	Evaluate the knowledge of factors influencing dividend, capital structure, working capital of a firm	K5 (Evaluating)
CO5	Develop innovative financial strategies for value creation, long-term sustainability, and competitive advantage	K6 (Creating)

Reference Books:

1. Rajiv Srivastava and Anil Misra- Financial Management-OXFORDUniversity Press.
2. Prasannachandra -Financial Management- Tata Mc GrawHill
3. I M Pandey -Financial Management-Vikas Publishing House Pvt. Lt. New Delhi
4. [Lawrence D. Schall](#) & [Charles W. Haley](#) -Introduction to Financial Management-McGraw Hill.

1. Hill

INFORMATION TECHNOLOGY (IT) GROUP

E-BUSINESS

JMB IT 04

Credits: 3

Contact Hours 40 L

Course Objectives

- To understand the foundations of the digital economy and distinguish between various e-business and e-commerce models.
- To explore tools and strategies for launching and managing an online business.
- To analyze mobile commerce, IT-enabled services, and pervasive computing in business.
- To examine the structure, implementation, and impact of e-governance models.
- To evaluate ethical, regulatory, and legal issues governing digital business and service delivery.
- To assess emerging technological trends shaping the future of e-business and governance.

Unit - I: 8 hrs

The Digital Economy and E-Commerce Foundations: Understanding the Internet Economy - Evolution and characteristics of the digital economy, Current trends and future outlook; Introduction to E-Commerce - Definitions and scope, Historical emergence and milestones; E-Commerce Business Models - B2B, B2C, C2C, C2B, B2A, C2A models, Hybrid and emerging models, Case studies of major e-commerce ventures

Unit - II: 8 hrs

Setting Up and Managing an E-Business: Launching an E-Business - Steps in starting an online business, Tools and platforms for e-business; Building and Operating an E-Commerce Website - Web development technologies, User interface and experience design; Customer Acquisition and Retention - Digital marketing and net-based promotional strategies, CRM and personalization; Payment Systems and Security: Online payment options and platforms, Cybersecurity issues and solutions; Legal and Ethical Concerns - E-commerce regulations, privacy, data protection, Ethical marketing, consumer rights, intellectual property

Unit - III: 8 hrs

IT Enabled Services and Pervasive Technologies: Introduction to IT Enabled Services (ITES) - Categorization: General Services, Specialized Services, Role of BPO in e-business; ITES in India - Industry size, trends, and global contribution; Mobile Commerce and Pervasive Computing - Mobile payments, omnichannel commerce, IoT integration; Legal Framework - IT Act of India: key provisions and business implications

Unit - IV: 6 hrs

E-Government and E-Governance: Fundamentals of E-Governance - Definitions, concepts, and objectives, Stages and maturity models of e-governance; National E-Governance Initiatives - National E-Governance Plan (NEGP), Mission Mode Projects and implementation frameworks, Role of ICT in public service delivery.

Unit - V: 12 hrs

E-Governance Models and Applications: Categories and Models of E-Governance - Technology policy, infrastructure, training, and consulting funds, Models: Digital Governance, Broadcasting/Wider Dissemination, Critical Flow, Interactive Service, Govt-to-Citizen-to-Govt; Major E-Governance Service Areas: Public grievance redressal (telephone, ration card, land records, police records), Rural and urban digital service delivery

Contemporary Issues and Future Trends: Trends in E-Business and E-Governance - Artificial intelligence in e-business, Big data and analytics, Blockchain and smart contracts; Sustainability and Ethical Considerations -Data privacy, green IT, social responsibility

Course Outcomes (COs)

S. No	Course Outcome	Bloom's Taxonomy
CO1	Understand digital economy concepts and apply e-business models in diverse business contexts.	K2 (Understanding)
CO2	Analyze strategies for setting up and managing e-commerce platforms.	K4 (Analyzing)
CO3	Evaluate applications of ITES, mobile commerce, and legal frameworks in e-business.	K5 (Evaluating)
CO4	Interpret and assess e-governance strategies and their impact on public service delivery.	K4 (Analyzing)
CO5	Formulate insights into future trends in e-business using AI, blockchain, and ethical frameworks.	K6 (Creating)

Suggested Readings:

- Joseph, E- Commerce: A Managerial Perspective, Prentice Hall
- Stain, L.D., Web Security: Step-by Step Reference Guide, Addison Wesley 3.
- Burnham, C., Web Hosting, McGrawHill Publication
- Gupta, M.P., Kumar, P. and Bhattacharya, J., Government Online, McGrawHill
- Heeks, R., Implementing and Managing e-Government, Sage
- Satyanarayana, J., E-Government: The Science of Possible, Prentice Hall

BUSINESS DATA WAREHOUSE AND DATA MINING

JMB IT 05

Credits: 3

Contact Hours 40 L

Course Objectives

- To understand the role and architecture of data warehouses in business intelligence.
- To develop multidimensional data models and explore OLAP operations for business analytics.
- To analyze preprocessing steps for mining and implement feature extraction methods.
- To apply various data mining techniques for classification, clustering, and association rule mining.
- To examine advanced mining areas including text, web, spatial, and multimedia mining.
- To evaluate ethical, legal, and implementation issues associated with data mining.

Unit - I: 6 hrs

Introduction to Data Warehousing and Data Mining: Fundamentals and Definitions: Data warehousing and its business value, Introduction and evolution of data mining, goals of data mining, Myths about data mining, The Data Mining process; Business Relevance - Data warehousing vs. OLTP systems, Roles of data warehousing and mining in business decisions; Basic Architecture and Components - Overall architecture of data warehouse systems, Layers: staging, integration, access, Enterprise Data Warehouse (EDW); Knowledge Discovery in Databases (KDD) - Knowledge Extraction through Data Mining, Steps in KDD process and business applications

Unit - II: 7 hrs

Data Warehouse Modeling and Implementation: Multidimensional Data Modeling - Star, snowflake, and fact constellation schemas, Dimensional modeling and its business use cases; OLAP (Online Analytical Processing) - Concepts of OLAP cubes, OLAP operations: roll-up, drill-down, slice, dice, pivot, OLAP vs. OLTP, applications in business analytics; ETL Processes - Data extraction, transformation, and loading, Data integration and metadata management; Data Quality and Warehouse Implementation Approaches - Methods for improving data quality, Warehousing architectures (centralized, federated, real-time), Challenges and best practices in implementation

Unit - III: 7 hrs

Data Preprocessing and Exploration: Data Preparation Techniques - Data cleaning, integration, transformation, Data reduction, discretization, concept hierarchy; Feature Engineering -Feature extraction and transformation for mining; Visualization and Statistical Summaries -Data summarization, data visualization for business; Issues and Challenges - High dimensionality, scalability, missing values

Unit - IV: 10 hrs

Data Mining Methods: Association Rule Mining - Mining frequent patterns, market basket analysis, Apriori algorithm and advanced techniques, Constraint-based and correlation mining; Classification and Prediction - Decision trees, Bayesian classifiers, SVM, rule-based classifiers, Regression, prediction accuracy, and evaluation, Ensemble methods and business use cases; Clustering -Clustering algorithms: k-means, hierarchical, density-based, grid-based, Clustering

high-dimensional data, outlier detection, Applications in segmentation, targeting, fraud detection

Unit - V: 10 hrs

Advanced Mining Topics and Applications: Web, Text, and Multimedia Mining - Concepts and business applications; Spatial and Temporal Data Mining - Techniques and relevant uses; Business Intelligence and Case Studies -CRM, financial analytics, marketing, social media, retail, insurance; Trends in Data Mining -Big Data, cloud data warehousing, real-time analytics, AI-driven mining
Data Mining Implementation and Ethics: Evaluation and Validation - Accuracy, overfitting, underfitting, cross-validation; Business Integration - Aligning mining outcomes with business strategy, User adoption and deployment; Privacy, Security, and Ethical Issues - Data privacy challenges, security in warehousing/mining, Regulations and best practices, Ethical implications in data analysis and usage

Course Outcomes (COs)

S. No	Course Outcome	Bloom's Taxonomy
CO1	Understand data warehousing components and their role in business intelligence.	K2 (Understanding)
CO2	Apply OLAP and multidimensional modeling techniques for strategic insights.	K3 (Applying)
CO3	Analyze data preprocessing methods and their impact on mining accuracy.	K4 (Analyzing)
CO4	Evaluate and compare various mining algorithms and their business applications.	K5 (Evaluating)
CO5	Develop solutions using mining techniques while addressing ethical and deployment considerations.	K6 (Creating)

Suggested Readings:

- Ali ABM Shawkat and Wasimi Saleh A: Data Mining; Method and Technique, Cengage Publication
- L. T., Moss, S. Atre, A. Wesley: Business Intelligence Roadmap: The Complete Project Lifecycle for Decision- Support Applications, Information, Technology Series.
- Ralph Hughes: Agile Data Warehousing; Delivering World-Class Business Intelligence Systems Using Scrum and XP, Ceregenics Inc.
- S. Rizzi & M. Golfarelli: Data Warehouse Design; Modern Principles and Methodologies, Tata McGrawHill Education
- Chris Eaton, Dirk Deroos, Tom Deutsch et al., “Understanding Big Data”, McGrawHill, 2012.
- Alberto Cordoba, “Understanding the Predictive Analytics Lifecycle”, Wiley, 2014.
- Eric Siegel, Thomas H. Davenport, “Predictive Analytics: The Power to Predict Who Will Click, Buy, Lie, or Die”, Wiley, 2013.
- James R Evans, “Business Analytics – Methods, Models and Decisions”, Pearson 2013.
- R. N. Prasad, Seema Acharya, “Fundamentals of Business Analytics”, Wiley, 2015.
- S M Ross, “Introduction to Probability and Statistics for Engineers and Scientists”, Academic Foundation, 2011.
- David Hand, Heiki Mannila, Padhria Smyth, “Principles of Data Mining”, PHI, 2013.

1. g, S. Chand and Company Ltd, 2007.