



RAJALAKSHMI ENGINEERING COLLEGE
CURRICULUM AND SYLLABUS
B.Tech. COMPUTER SCIENCE AND BUSINESS SYSTEMS
REGULATION 2023

VISION

To promote competent industry relevant education, skillful research and innovation for socially responsible computer science professionals with human values.

MISSION

- To impart high technical knowledge strong in fundamentals, practical skills and creative thinking that solves real world problems.
- To grow and become competent through innovation.
- To discover new knowledge through inventive research that encourages entrepreneurship and economic development of global society.
- To provide a creative balance of academic, professional and ethical values.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. To equip students with state-of-the-art contemporary technology in computer science and basic engineering science.
2. To expose students to the business principles aligned with their domain.
3. To educate on the service orientation principles for various business disciplines.
4. To encourage innovative research through creative thinking and critical analytical ability.
5. To inculcate ethical and moral values in the individuals benefitting the society.

PROGRAM OUTCOMES (POs)

A graduate of the Computer Science and Business Systems program will demonstrate:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OBJECTIVES (PSOs)

A graduate of the Computer Science and Business Systems program will demonstrate:

1. The students graduating will have sound knowledge in Computer Science with equal appreciation of humanities, management sciences and human values.
2. The students will explore emerging topics such as Analytics, Machine Learning, Cloud Computing, and Internet of Things and apply the knowledge to design and develop solutions to societal needs.
3. The students will be industry ready with required business skills in service orientation.

CURRICULUM**B.Tech COMPUTER SCIENCE AND BUSINESS SYSTEMS
Regulation 2023 | Total Credits: 165****CHOICE BASED CREDIT SYSTEM****SEMESTER I**

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	HS23112	Business Communication and Value Science – I	HS	2	2	0	0	2
2.	MA23115	Discrete Mathematics	BS	4	3	1	0	4
3.	MA23114	Probability and Calculus	BS	4	3	1	0	4
4.	GE23117	தமிழர் மரபு / Heritage of Tamils	HS	1	1	0	0	1
LAB ORIENTED THEORY COURSES								
5.	CB23131	Fundamentals of Computer Science	PC	6	2	0	4	4
6.	EE 23131	Principles of Electrical Engineering	ES	4	2	0	2	3
7.	PH23133	Physics for Computing Science	BS	5	3	0	2	4
MANDATORY COURSES								
8.	MC23111	Indian Constitution and Freedom Movement	MC	3	3	0	0	0
TOTAL				29	19	2	8	22

SEMESTER II

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	MA23211	Linear Algebra	BS	4	3	1	0	4
2.	BA23212	Fundamentals of Economics	MS	2	2	0	0	2
LAB ORIENTED THEORY COURSES								
3.	MA23231	Statistical Modeling	BS	5	3	0	2	4
4.	CB23231	Data Structures and Algorithms	PC	7	2	1	4	5
5.	EC23242	Principles of Electronics	ES	4	2	0	2	3
LABORATORY COURSES								
6.	CS23221	Python Programming Lab	PC	4	0	0	4	2
7.	HS23223	Business Communication and Value Science – II	HS	4	0	0	4	2
MANDATORY COURSES								
8.	GE23217	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HS	1	1	0	0	1
TOTAL				31	13	2	16	23

SEMESTER III

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	CB23311	Formal Language and Automata Theory	PC	3	3	0	0	3
2.	CB23312	Computer Organization and Architecture	PC	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
3.	CB23331	Computational Statistics	PC	5	3	0	2	4
4.	CB23332	Software Engineering	PC	5	3	0	2	4
5.	CB23333	Database Technology	PC	5	3	0	2	4
6.	CS23333	Object Oriented Programming Using Java	PC	7	1	0	6	4
MANDATORY COURSES								
7.	MC23313	Environmental Sciences	MC	3	3	0	0	0
TOTAL				31	19	0	12	22

SEMESTER IV

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	CB23411	Introduction to Innovation, IP Management and Entrepreneurship	EEC	3	3	0	0	3
2.	BA23412	Fundamentals of Management	MS	2	2	0	0	2
LAB ORIENTED THEORY COURSES								
3.	CB23431	Operating System Concepts	PC	5	3	0	2	4
4.	CB23432	Software Design with UML	PC	4	2	0	2	3
5.	CB23433	Analysis of Algorithms and Design	PC	5	2	1	2	4
6.	MA23437	Optimization Techniques	BS	5	3	0	2	4
LABORATORY COURSES								
7.	HS23421	Business Communication and Value Science – III	HS	4	0	0	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
8.	GE23421	Soft Skills-I	EEC	2	0	0	2	1
TOTAL				30	15	1	14	23

SEMESTER V

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	BA23511	Principles of Financial Management	MS	2	2	0	0	2
2.		Open Elective I	OE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
3.	CB23531	Computer Network Technology	PC	5	3	0	2	4
4.	CB23532	Artificial Intelligence	PC	5	3	0	2	4
5.		Elective I	PE	5	2	1	2	4
6.	CB23521	Design Thinking for Innovation in Computer Science and Business Systems	EEC	3	1	0	2	2
EMPLOYABILITY ENHANCEMENT COURSES								
7.	GE23521	Soft Skills- II	EEC	2	0	0	2	1
8.	CB23621	Industrial Project	EEC	0	0	0	0	1
TOTAL				25	13	2	10	21

SEMESTER VI

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.	BA23611	Financial and Cost Accounting	MS	2	2	0	0	2
2.	BA23612	Business Strategy	MS	2	2	0	0	2
LAB ORIENTED THEORY COURSES								
3.	CB23631	Machine Learning	PC	4	2	1	2	4
4.	CB23632	Cloud, Micro services and Application	PC	5	2	1	2	4
5.	CB23633	Usability Design of Software Applications	PC	4	2	0	2	3
6.		Elective II	PE	5	3	0	2	4
LABORATORY COURSES								
7.	HS23621	Business Communication & Value Science – IV	HS	4	0	0	4	2
EMPLOYABILITY ENHANCEMENT COURSES								
8.	GE23622	Problem Solving Techniques	EEC	2	0	0	2	1
TOTAL				29	15	0	14	22

SEMESTER VII

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY COURSES								
1.		Open Elective - II	OE	3	3	0	0	3
LAB ORIENTED THEORY COURSES								
2.	CB23731	Data Visualization Techniques	PC	4	2	0	2	3
3.	CB23732	IT Project Management	PC	4	2	0	2	3
4.		Elective III	PE	3	3	0	0	3
5.		Elective IV	PE	5	2	1	2	4
LABORATORY COURSES								
6.	CB23721	Project Evaluation I	EEC	4	0	0	4	2
TOTAL				22	13	1	8	18

SEMESTER VIII

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
LAB ORIENTED THEORY COURSES								
1.		Elective V	PE	3	3	0	0	3
2.		Elective VI	PE	4	2	0	2	3
LABORATORY COURSES								
3.	CB23821	Project Evaluation II	EEC	16	0	0	16	8
TOTAL				23	5	0	18	14

TOTAL NO. OF CREDITS: 165

PROFESSIONAL ELECTIVES

Business Analytics								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CB23A11	Fundamentals of Statistics	PE	3	3	0	0	3
2.	CB23A12	Digital Marketing & Web Analytics	PE	3	3	0	0	3
3.	CB23A13	Operation & Supply Chain Analytics	PE	3	3	0	0	3
4.	CB23A14	Enterprise Resource planning	PE	3	3	0	0	3
5.	CB23A31	Data Science for Business Analytics	PE	5	3	0	2	4
6.	CB23A32	Programming for Data Analytics	PE	5	3	0	2	4

Business Systems								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
7.	BA23B11	Behavioral Economics	PE	3	3	0	0	3
8.	BA23B31	Computational Finance & Modeling	PE	4	2	0	2	3
9.	BA23B12	Industrial Psychology	PE	4	3	0	0	3
10.	BA23B13	Advance Finance	PE	4	3	0	0	3
11.	BA23B14	Essentials of Human Resources Management	PE	3	3	0	0	3
12.	BA23B15	Marketing Research & Marketing Management	PE	3	3	0	0	3
13.	BA23B32	FinTech Foundations	PE	3	2	0	2	3
14.	BA23B16	Services Science and Service Operational Management	PE	3	3	0	0	3

AI Systems								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
15.	CB23C11	Cognitive Science and Analytics	PE	3	3	0	0	3
16.	CB23C31	Image Processing and Pattern Recognition	PE	4	2	0	2	3
17.	CB23C12	Generative Artificial Intelligence	PE	3	3	0	0	3
18.	CB23C32	Conversational Systems	PE	4	2	0	2	3
19.	CB23C33	Algorithmic Business Thinking	PE	5	3	0	0	3
20.	AI23632	Foundations of Natural Language Processing	PE	5	3	0	2	4

21.	IT23531	Computer Vision	PE	5	3	0	2	4
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Data Analytics

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
22.	CB23D31	Data Mining and Analytics	PE	5	3	0	2	4
23.	CB23D32	Decision Support Systems	PE	3	3	0	2	4
24.	CB23D33	Advanced Social, Text and Media Analytics	PE	5	3	0	2	4
25.	CB23D34	Agile Business Intelligence	PE	4	2	0	2	3
26.	AI23531	Deep learning	PE	5	3	0	2	4
27.	AI23A36	Big Data Analytics	PE	4	2	0	2	3

Cloud, IoT and Security

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
28.	CB23E31	Information Security	PC	5	3	0	2	4
29.	CB23E32	Fundamentals of IoT	PE	5	2	1	2	4
30.	CB23E33	Mobile Computing	PE	4	2	0	2	3
31.	CB23E34	Cyber security for Business	PE	4	2	0	2	3
32.	CB23E35	Enterprise Systems	PE	4	2	0	2	3
33.	CR23A34	Security and Privacy in cloud	PE	4	2	0	2	3

Programming and Testing

S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
34.	CB23F31	Modern Web Applications	PE	4	2	0	2	3
35.	CB23F32	Web Media Technology	PE	4	2	0	2	3
36.	CB23F33	Advanced Scripting Language	PE	4	2	0	2	3
37.	IT23B31	C# and .Net programming	PE	4	2	0	2	3
38.	IT23431	Software Testing	PE	4	2	0	2	3
39.	IT23B33	DevOps	PE	4	2	0	2	3
40.	CB23F34	IT Workshop	PE	4	2	0	2	3
41.	CB23F35	Compiler Design Techniques	PE	5	2	1	2	4

Emerging Technologies								
S.No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
42.	CB23G11	Quantum Computation and Quantum Information	PE	3	3	0	0	3
43.	CB23G31	Robotics and Embedded Systems	PE	4	2	0	2	3
44.	CB23G32	Extended Reality Applications	PE	4	2	0	2	3
45.	CS23A32	Robotic Process Automation	PE	5	1	0	4	3
46.	CR23A33	Cryptocurrency and Blockchain Technologies	PE	4	2	0	2	3

Summary:

B.Tech Computer Science and Business Systems										
S.No.	Category	Credits per semester								Total Credits
		1	2	3	4	5	6	7	8	
1.	HS	3	3		2		2			10
2.	BS	12	8		4					24
3.	ES	3	3							6
4.	PC	4	7	22	11	8	11	3		66
5.	MS		2		2	2	4	3		13
6.	PE					4	4	7	6	21
7.	OE					3		3		6
8.	EEC				4	4	1	2	8	19
9.	Mandatory Course	0	0	0	0	0	0	0	0	0
Total		22	23	22	23	21	22	18	14	165

I SEMESTER

Subject Code	Subject Name	Category	L	T	P	C
HS23112	BUSINESS COMMUNICATION AND VALUE SCIENCE – I For I Semester B.Tech. - CSBS	HS	2	0	0	2

Objectives:						
●	To enable learners understand what life skills are and their importance in leading a happy life.					
●	To equip students with better grammar and vocabulary skills					
●	To improve the learners' basic proficiency in workplace communication					
●	To aid students write effectively in all kinds of communicative contexts.					
●	Introduce them to key concepts of values, life skills and business communication.					

UNIT-I	HUMAN VALUES	6
Values – Self exploration – Values of individuals: Presentation on favourite personality and the skills and values they demonstrate – interviewing a maid, watchman, sweeper, cab driver, beggar and narrate what you think are the values that drive them – Writing: Good and bad writing - Common errors, punctuation rules, use of words - newspaper report on an IPL match – record conversation between a celebrity and an interviewer.		
UNIT-II	GRAMMAR AND LANGUAGE DEVELOPMENT	6
Parts of Speech - Applications of tenses - Sentence formation, sentence structure, show sequence - Voices – Questioning – Vocabulary: Word formation:- Synonyms, antonyms, abbreviations - compound words –single word substitution.		
UNIT-III	ESSENTIALS OF TECHNICAL COMMUNICATION	6
Email - : Formal and informal emails - words from General Service List (GSL) by West, Academic word list (AWL) - technical specific terms related to the field of technology - phrases, idioms, significant abbreviations - formal business vocabulary.		
UNIT-IV	BASIC WRITING SKILLS	6
Reading articles – Summary writing, story writing - writing your comprehensive CV - Create a podcast on a topic - Promote a play through a social media and gather audience		
UNIT-V	APPLICATION OF LIFE SKILLS	6
Life Skills: Movie based learning – identifying skills and values - critical life skills - appreciation of diversity		
		Total Contact Hours : 30

Course Outcomes:	
On completion of the course, students will be able to	
●	Recognize the need for life skills and values
●	Frame grammatically correct sentences with appropriate vocabulary
●	Communicate proficiently at the workplace.
●	Write efficiently in various communicative contexts.
●	Understand and follow the basic values and dogmas in life

SUGGESTED ACTIVITIES

- Ice breaker
- Story telling
- Just a Minute (JAM)
- Green Screen
- Vocabulary building
- Case study

SUGGESTED EVALUATION METHODS

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Continuous Assessment Tests

Reference Books / Web links:	
1	Alan Mc'Carthy and O'dell , "English vocabulary in use" – fourth edition, Cambridge University Press, 2017.
2	APAART: Speak Well 1 (English language and communication)
3	APAART: Speak Well 2 (Soft Skills)
4	Dr. Saroj Hiremath, "Business Communication" – fourth edition, NIRALI PRAKASHAN Publication,2017
Web References	
1	Train your mind to perform under pressure- Simon sinek https://curiosity.com/videos/simon-sinek-on-training-your-mind-to-perform-under-pressure-capture-your-flag/
2	Brilliant way one CEO rallied his team in the middle of layoffs https://www.inc.com/video/simon-sinek-explains-why-you-should-put-people-before-numbers.html
3	Will Smith's Top Ten rules for success https://www.youtube.com/watch?v=bBsT9omTeh0
Online Resources	
1	https://www.coursera.org/learn/learning-how-to-learn
2	https://www.coursera.org/specializations/effective-business-communication

Course Code	Course Title	Category	L	T	P	C
MA23115	DISCRETE MATHEMATICS	BS	3	1	0	4
For I sem. B.Tech. – CSBS						

Objectives:

- To extend student's Logical and Mathematical maturity and ability to deal with abstraction.
- To give an understanding of relations and functions and to determine their properties.
- To Model problems in Computer Science using graphs and trees.
- To provide the basic principles of sets and operations in sets and to prove basic set equalities.
- To construct truth tables and logic gates in Boolean algebra.

UNIT-I	MATHEMATICAL LOGIC	12
Propositional calculus - Propositions and Connectives, Syntax - Semantics – Truth assignments and Truth tables - Validity and Satisfiability, tautology – Functionally complete set of connectives - Equivalence and normal forms - Compactness and resolution - Formal reducibility - Natural deduction system and axiom system.		
UNIT-II	COMBINATORICS	12
Basic counting sum and product- Balls and bins problems – Generating functions - Recurrence relations- Proof Techniques – Principle of Mathematical Induction - Pigeon hole principle.		
UNIT-III	GRAPH THEORY	12
Graphs and digraphs - Complement – Isomorphism - Connectedness and Reachability - Adjacency matrix - Eulerian paths and Circuits in graphs and digraphs - Hamiltonian paths , Circuits and tournaments in graphs - Trees - Planar graphs :Euler's formula, dual of a planar graph, independence number and clique number, chromatic number - Statement of Four-color theorem.		
UNIT-IV	ABSTRACT ALGEBRA	12
Set – Relation: Equivalence and Partial Ordered Relations - Algebraic System: Groups, sub groups, homomorphism, Cosets, Lagrange's theorem – Ring and Field (definition).		
UNIT-V	BOOLEAN ALGEBRA	12
Introduction of Boolean algebra - Truth table - Basic logic gate - Basic postulates of Boolean algebra -Principle of duality - Canonical form - Karnaugh map.		
Total Contact Hours: 60		

Course Outcomes:

On completion of the course, students will be able to

- Demonstrate the ability to write and evaluate a proof or outline the basic structure and give examples of each proof technique described.
- Apply counting principles to determine probabilities in engineering problems.
- Demonstrate different traversal methods for trees and graphs arising in the field of engineering and technology.
- Analyse the concepts and properties of algebraic structures in the solving complex engineering problems.
- Construct truth tables and logic gates in Boolean algebra and provide valid conclusions.

SUGGESTED ACTIVITIES

- Problem solving sessions
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

Text Book(s):

1.	M. Morris Mano ,”Digital Logic & Computer Design”- Pearson 2017.
2.	C. L. Liu,”Elements of Discrete Mathematics”, (Second Edition), McGraw Hill, New Delhi,1985.
3.	R. A. Brualdi ,”Introductory Combinatorics”, North-Holland, New York,2004.
4.	J. A. Bondy and U. S. R. Murty ,”Graph Theory with Applications”, Macmillan Press, London, 1976.
5.	I. N. Herstein ,”Topics in Algebra”, John Wiley and Sons, 2013.

Reference Books(s) / Web links:

1.	Gilbert Strang “Introduction to linear algebra”, 5th Edition,, 2016.
2.	N. Deo “Graph Theory with Applications to Engineering and Computer Science”, Prentice Hall, Englewood Cliffs, 1979.
3.	E. Mendelsohn, “Introduction to Mathematical Logic,(Second Edition)”, Van-Nostrand, London, 1996.
4.	L. Zhongwan ,“Mathematical Logic for Computer Science”, World Scientific, Singapore, 1998.
5.	Tremblay, J.P. and Manohar. R, " Discrete Mathematical Structures with Applications to Computer Science";Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

Course Code	Course Title	Category	L	T	P	C
MA23114	PROBABILITY AND CALCULUS	BS	3	1	0	4
For I sem. B.Tech. - CSBS						

Objectives:
<ul style="list-style-type: none"> To practice the basic rules and methods of differential calculus in the solution of Complex engineering problems.
<ul style="list-style-type: none"> To analyse multiple integrals using different methods and analyse the problems in engineering and technology.
<ul style="list-style-type: none"> To manipulate data and synthesis of the information to provide valid conclusions.
<ul style="list-style-type: none"> To apply the concepts of probability and interpretation of data, and synthesis of the information to provide valid conclusions.
<ul style="list-style-type: none"> To exhibit various probability distributions to solve engineering problems.

UNIT-I	DIFFERENTIAL CALCULUS	12
Limits and Continuity – Differentiation – Rules of Differentiation – Maxima and Minima of single variable		
UNIT-II	INTEGRAL CALCULUS	12
Definite and indefinite integrals – Integration by parts – Double and Triple integrals in Cartesian form – Area and Volume.		
UNIT-III	INTRODUCTION TO STATISTICS	12
Definition of Statistics: Basic objectives, applications in various branches of science with examples - Collection of Data: Internal and external data, Primary and secondary Data - Population and sample, Representative sample - Descriptive Statistics: Classification and tabulation of univariate data, graphical representation, Frequency curves - Descriptive measures - Central tendency and Dispersion - Bivariate data: Summarization, marginal and conditional frequency distribution		
UNIT-IV	PROBABILITY AND RANDOM VARIABLES	12
Random experiments, sample space, event - Definition of Combinatorial Probability - Conditional Probability - Bayes Theorem - Random Variables: Discrete and Continuous Random Variables - Mathematical expectation and its properties - Moments (including variance) and their properties - Moment Generating Function.		
UNIT-V	PROBABILITY DISTRIBUTIONS	12
Discrete and Continuous distributions: Binomial, Poisson and Geometric distributions, Uniform, Exponential, Normal, Chi-square, t and F distributions		
Total Contact Hours: 60		

Course Outcomes:
On completion of the course students will be able to
<ul style="list-style-type: none"> Apply the basic rules and methods of differential calculus in the solution of Complex engineering problems.
<ul style="list-style-type: none"> Evaluate multiple integrals using different methods and analyse the problems in engineering and technology.
<ul style="list-style-type: none"> Manage the data and synthesis of the information to provide valid conclusions.
<ul style="list-style-type: none"> Apply the concepts of probability in the solution of complex engineering problems.
<ul style="list-style-type: none"> Demonstrate various probability distributions in solving engineering problems.

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> Problem solving sessions Activity Based Learning Implementation of small module (Explain probability distribution and descriptive statistics using R program)

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

Text Book(s):

1	A. Goon, M. Gupta and B. Dasgupta, “Fundamentals of Statistics”, vol. I & II, World Press, 2019.
2	Grewal B.S., “ Higher Engineering Mathematics ”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
3	S.M. Ross, “A first course in Probability”, Prentice Hall, 1997.
4	I.R. Miller, J.E. Freund and R. Johnson, “Probability and Statistics for Engineers”, (9th Edition), PHI,2017.
5	T. Veerarajan, ‘Probability, Statistics and Random Processes with Queuing Theory and Queuing Networks’,McGraw Hill, 2016.

Reference Books(s) / Web links:

1.	A.M. Mood, F.A. Graybill and D.C. Boes, “Introduction to the Theory of Statistics”, McGraw Hill Education, 2017.
2.	Peter V. O’Neil, “Advanced Engineering Mathematics”, (Seventh Edition), Thomson Learning, 2020.
3.	M. D. Greenberg, “Advanced Engineering Mathematics”, (Second Edition) Pearson Education,2012.
4.	P. N. Wartikar and J. N. Wartikar, “Applied Mathematics”, Vol. I & II, Vidyarthi Prakashan, 2019.
5.	S.M. Ross, “Introduction of Probability Models”, Academic Press, N.Y, 1997.

Course Code	Course Title	Category	L	T	P	C
GE23117	HERITAGE OF TAMILS	HS	1	0	0	1

UNIT I LANGUAGE AND LITERATURE 3

Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

UNIT II HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE 3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.

UNIT III FOLK AND MARTIAL ARTS 3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

UNIT IV THINAI CONCEPT OF TAMILS 3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.

UNIT V CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE 3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

TOTAL: 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணிணித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Subject Code	Subject Name (Lab oriented Theory Course)	Category	L	T	P	C
CB23131	FUNDAMENTALS OF COMPUTER SCIENCE	PC	2	0	4	4

Objectives:

- To develop simple algorithms for arithmetic and logical problems.
- To develop C Programs using basic programming constructs.
- To develop C programs using arrays and strings.
- To develop applications in C using functions, pointers and structures.
- To do input/output and file handling in C.

UNIT-I	GENERAL PROBLEM SOLVING CONCEPTS AND C LANGUAGE	6
Algorithm and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops- Introduction- C Structure- syntax and constructs of ANSI C - Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, proper variable naming and Hungarian Notation - Standard I/O, Formatted Output – printf- Formatted Input – scanf- Statements and Blocks.		
UNIT-II	TYPES OF OPERATOR, EXPRESSIONS AND CONTROL FLOW	6
Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment and Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation, If-Else-If, Switch, Loops – while, do, for, break and continue, goto Labels - structured and unstructured programming.		
UNIT-III	ARRAYS, STRINGS AND FUNCTIONS	6
Arrays – string – string operations – functions - types, Basics of functions, parameter passing and returning type, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialization, Recursion, Variable- length argument lists, C Pre-processors, Standard Library Functions and return types.		
UNIT-IV	POINTERS AND ARRAYS	6
Pointers and addresses, Pointers and Function Arguments, Pointers and Arrays, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional arrays and row/column major formats, Initialization of Pointer Arrays, Command line arguments, Pointers to functions, complicated declarations and evaluations.		
UNIT-V	STRUCTURES AND FILES IN C	6
Basic Structures, Structures and Functions, Array of structures, Pointer of Structures, Self-referential Structures, Table look up, Typedef, Unions, File in C: Buffer and Streams – File operations – File Accessing Modes – File I/O functions - Binary and Text file accessing – Random File accessing.		
Total Contact Hours		: 30

List of Experiments				
1	Algorithm and flowcharts of small problems like GCD			
	Structured code writing with:			
2	Small but tricky codes			
3	Proper parameter passing			
4	Command line Arguments			
5	Variable parameter			
6	Pointer to functions			
7	User defined header			
8	Make file utility			
9	Multi file program and user defined libraries			
10	Interesting substring matching / searching programs			
11	Mini Project			
		Contact Hours	:	60
		Total Contact Hours	:	90

Course Outcomes:

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

- Formulate simple algorithms for arithmetic and logical problems.
- Implement conditional branching, iteration and recursion.
- Decompose a problem into functions and synthesize a complete program using divide and conquer approach.
- Use arrays, pointers, structures and files to formulate algorithms and programs.
- Apply programming to solve matrix addition and multiplication problems and searching and sorting problems

Text Book (s):

- 1** Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Second Edition, PHI.
- 2** Byron Gottfried, "Programming with C", Second Edition, Schaum Outline Series.

Reference Books(s) / Web links:

- 1** Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill.
- 2** Yashavant Kanetkar, "Let Us C", BPB Publications.

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C	
EE 23131	PRINCIPLES OF ELECTRICAL ENGINEERING	ES	2	0	2	3	
Objectives:							
●	To introduce electric circuits and provide knowledge on the analysis of circuits using network theorems.						
●	To impart knowledge on series and parallel RC, RL and RLC circuits.						
●	To provide knowledge on the principles of electrostatics and electromechanical energy conversion devices.						
●	To learn the electrical measurement concepts and different types of wiring system.						
●	To provide exposure on analysis of the electrical circuits and transducers through experimentation.						
UNIT-I	INTRODUCTION						6
Fundamental linear passive and active elements to their functional current-voltage relation, voltage source and current sources, ideal and practical sources, Kirchhoff's laws and applications to network solutions using mesh and nodal analysis, Concept of work, power, energy, and conversion of energy.							
UNIT-II	DC CIRCUITS						6
Current-voltage relations of the electric network by mathematical equations to analyze the network, (Superposition theorem, Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem) Simplifications of networks using series-parallel, Star/Delta transformation.							
UNIT-III	AC CIRCUITS						6
AC waveform definitions, form factor, peak factor, study of R-L, R-C, RLC series circuit, R-L-C parallel circuit, phasor representation in polar and rectangular form, concept of impedance, admittance, active, reactive and complex power, power factor, Concept of 3 phase Balanced AC Circuits.							
UNIT-IV	PRINCIPLE OF ELECTROSTATIC AND ELECTROMECHANICS						6
Electrostatic field, electric field strength, concept of permittivity in dielectrics, energy stored in capacitors, charging and discharging of capacitors, Electromagnetism, magnetic field and Faraday's law, Magnetic material and B-H Curve self and mutual inductance, Ampere's law, Electromechanical energy conversion.							
UNIT-V	MEASUREMENTS AND SENSORS						6
Introduction to measuring devices/sensors and transducers (Piezoelectric and thermo-couple) related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems, (Current & Single-phase power) Concept of indicating and integrating instruments, Electrical Wiring types and accessories, Illumination system, Basic layout of the distribution system, Necessity of earthing, Types of earthing, Safety devices & system, Principle of batteries and types.							
						Total Contact Hours	: 30
List of Experiments							
1	Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits.						
2	Determination of resistance temperature coefficient.						
3	Verification of Network Theorem (Superposition, Thevenin, Norton, Maximum Power Transfer theorem).						
4	Simulation of R-L-C series circuits for $X_L > X_C$, $X_L < X_C$ & $X_L = X_C$.						
5	Simulation of Time response of RC circuit.						
6	Demonstration of measurement of electrical quantities in DC and AC systems.						
						Contact Hours	: 30
						Total Contact Hours	: 60
Course Outcomes:							
On completion of the course, the students will be able to							
●	analyse DC and AC circuits and apply circuit theorems.						
●	realize series and parallel RC, RL and RLC circuits.						
●	understand the principles of electrostatics and electromechanical energy conversion devices.						
●	realise the electrical measurement concepts and different types of wiring system.						
●	experimentally analyze the electric circuits and transducers.						
Text Book (s):							
1	A. E. Fitzgerald, Kingsely Jr Charles, D. Umans Stephen, "Electric Machinery", Sixth Edition Tata McGraw Hill.						
2	B.L.Theraja, "A Textbook of Electrical Technology", Vol. I,"Basic Electrical Engineering" S. Chand and Company Ltd.,New Delhi.						
3	V. K. Mehta, "Basic Electrical Engineering", S. Chand and Company Ltd., New Delhi.						
4	J. Nagrath and Kothari, "Theory and problems of Basic Electrical Engineering", Second Edition Prentice Hall of India Pvt. Ltd.						
Reference Books(s) / Web links:							

1	T. K. Nagsarkar and M. S. Sukhija, "Basic of Electrical Engineering", Oxford University Press.
2	D. J. Griffiths "Introduction to Electrodynamics", Cambridge University Press.
3	William H. Hayt & Jack E. Kemmerly "Engineering Circuit Analysis, McGraw-Hill Book Company Inc.
4	Smarjith Ghosh," Fundamentals of Electrical and Electronics Engineering ", Prentice Hall (India) Pvt. Ltd.

Subject Code	Subject Name	Category	L	T	P	C
PH23133	PHYSICS FOR COMPUTING SCIENCE For I sem. B. E. - CSBS	BS	3	0	2	4

Objectives:						
•	To enhance the fundamental knowledge of oscillations and its applications.					
•	To understand the fundamentals of waves and optics as applicable to computing.					
•	To become proficient in properties of semiconductors and fiber optics.					
•	To understand the principles of laser and role plays in engineering and technology.					
•	To familiarize the basic principles of heat transfer and electromagnetism for computer applications.					

UNIT-I	OSCILLATION	9
Periodic motion-simple harmonic motion-characteristics of simple harmonic motion-vibration of simple springs mass system –resonance: definition, damped harmonic oscillator – heavy, critical and light damping- energy decay in a damped harmonic oscillator- quality factor- forced mechanical and electrical oscillators.		
UNIT-II	FUNDAMENTALS OF WAVE OPTICS	9
Theory of interference fringes-types of interference-Fresnel’s prism-Newton’s rings, Diffraction-Two kinds of diffraction-Difference between interference and diffraction-Fresnel’s half period zone and zone plate-Fraunhofer diffraction at single slit-plane diffraction grating - Temporal and Spatial Coherence. Polarization - Brewster’s law - double refraction- Concept of production of polarized beam of light from two SHM acting at right angle; plane, elliptical and circularly polarized light, Brewster’s law, double refraction.		
UNIT-III	SEMICONDUCTOR PHYSICS AND FIBER OPTICS	9
Conductor, Semiconductor and Insulator: Basic concept of Band theory- Hall effect - determination of Hall coefficient –Applications. Fiber optics- Types of optical fibers and Applications.		
UNIT-IV	LASER	9
Einstein’s theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: Ruby Laser, CO ₂ and Neodymium lasers; Properties of laser beams: monochromaticity, coherence, directionality and brightness- laser speckles- applications of lasers in engineering.		
UNIT-V	THERMODYNAMICS AND ELECTROMAGNETISM	9
Zeroth law of thermodynamics, first law of thermodynamics, brief discussion on application of 1st law, second law of thermodynamics and concept of Carnot’s Engine, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics. Electromagnetism: Ampere’s circuit law and Biot-Savart’s law-Continuity equation for current densities – Maxwell’s equations in vacuum and non-conducting medium.		
		Contact Hours : 45

List of Experiments		
1	Determination of wave length of light by Newton’s Ring method	
2	Determination of wave length of light by Laser diffraction method	
3	Determination of Planck’s constant	
4	Determination of Hall coefficient of semiconductor	
5	Determination of laser and optical fiber parameters	
6	Magnetic field along the axis of current carrying coil – Stewart and Gee	
7	Determination of Stefan’s Constant.	
		Contact Hours : 15
		Total Contact Hours : 60

Course Outcomes	
On completion of the course, students will be able to	
•	Apply the mathematical model of oscillations to various physical systems
•	Understand the various phenomena involving waves and their applications
•	Understand the fundamental concepts of semiconducting materials properties and fiber optics in computational sciences.
•	Use the concepts of Laser in engineering and technology.
•	Apply the concepts of thermodynamics and electromagnetism for various systems.

Text Books:	
1	Beiser A, "Concepts of Modern Physics", Fifth Edition, McGraw Hill International.
2	David Halliday, Robert Resnick, Jearl Walker, "Fundamentals of Physics", Wileyplus.

Reference Books / Web links:	
1	Ajoy Ghatak, "Optics" Fifth Edition, Tata McGraw Hill, 2012.
2	Sears & Zemansky, "University Physics", Addison-Wesley, 2015.
3	Jenkins and White, "Fundamentals of Optics", Third Edition, McGraw-Hill, 2017.

CO - PO – PSO matrices of course

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High) If there is no correlation, put "- "

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CO 1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO 3	2	2	1	-	-	-	-	-	-	-	-	-	1	1	-
CO 4	3	2	2	-	-	-	-	-	-	-	-	-	1	-	-
CO 5	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-
Average	2.4	1.6	1.3	-	-	-	-	-	-	-	-	-	1	1	-

Course code	Course Title (Theory course)	Category	L	T	P	C
MC23111	Indian Constitution and Freedom Movement	MC	3	0	0	0
Common to all branches of B.E/B. Tech Programmes – First / Second/third Semester						

Objectives:
<ul style="list-style-type: none"> To apprehend the sacrifices made by the freedom fighters.
<ul style="list-style-type: none"> To inculcate the values enshrined in the Indian constitution.
<ul style="list-style-type: none"> To instil a sense of responsibility as the citizens of India.
<ul style="list-style-type: none"> To familiarise about the functions of the various levels of Government.
<ul style="list-style-type: none"> To be informed about Constitutional and Non- Constitutional bodies.

UNIT-I	INDIAN FREEDOM MOVEMENT	9
British Colonialism in India-Colonial administration till 1857- Revolt of 1857- Early Resistance to British Rule- Rise of Nationalism in India-Indian Freedom Struggle under Mahatma Gandhi-Non- Cooperation Movement- Civil Disobedience Movement- Quit India Movement-British Official response to National movement- Independence of India Act 1947-Freedom and Partition.		
UNIT-II	CONSTITUTION OF INDIA	9
Historical Background – Indian Constitution: Constitution’ meaning of the term, Sources and constitutional history, Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.		
UNIT-III	STRUCTURE AND FUNCTIONS OF CENTRAL GOVERNMENT	9
Union Government – Structure of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.		
UNIT-IV	STRUCTURE AND FUNCTION OF STATE GOVERNMENT AND LOCAL BODY	9
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts- Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation, Pachayati Raj: Introduction, Elected officials and their roles, Village level: Role of Elected and Appointed officials.		
UNIT-V	CONSTITUTIONAL FUNCTIONS AND BODIES	9
Indian Federal System – Centre – State Relations – President’s Rule – Constitutional Functionaries – Assessment of working of the Parliamentary System in India- CAG, Election Commission, UPSC, GST Council and other Constitutional bodies-. NITI Aayog, Lokpal, National Development Council and other Non –Constitutional bodies.		
Total Contact Hours: 45		

Course Outcomes: Upon completion of the course, students will be able to:
<ul style="list-style-type: none"> appreciate the sacrifices made by freedom fighters during freedom movement.
<ul style="list-style-type: none"> be responsible citizens and abide by the rules of the Indian constitution.
<ul style="list-style-type: none"> be aware of the functions of the Indian government.
<ul style="list-style-type: none"> be knowledgeable about the functions of the state Government and the Local bodies.
<ul style="list-style-type: none"> apply the knowledge on constitutional functions and role of constitutional bodies and non-constitutional bodies.

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> Famous speeches from around the world relating to independence Case study Quiz on Portfolio and Cabinet Discussions on International Associations like the UN, BRICS, QUAD Presentation on issues around the world

SUGGESTED EVALUATION METHODS

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Continuous assessments (CAT)

Text Book(s):

1. M. Laxmikanth , “Indian Polity:, McGraw-Hill, New Delhi.
2. Durga Das Basu, “Introduction to the Constitution of India “, Lexis Nexis, New Delhi. 21sted 2013.
3. P K Agarwal and K N Chaturvedi ,PrabhatPrakashan, New Delhi, 1sted , 2017.

Reference Books(s) / Web links:

1. Sharma, Brij Kishore, “Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, “Indian Political System “, New Academic Publishing House, Jalaendhar
3. Bipan Chandra, India’s Struggle for Independence, Penguin Books, 2016.
4. Maciver and Page, “Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.2nded, 2014.
5. Bipan Chandra, History of Modern India, Orient Black Swan, 2009.

SEMESTER II

Course Code	Course Title	Category	L	T	P	C
MA23211	LINEAR ALGEBRA	BS	3	1	0	4
For II sem. B.Tech. - CSBS						

Objectives:
<ul style="list-style-type: none"> To express the matrix algebra techniques in the solutions of relevant problems in engineering. To provide the concept of applications of matrices in computer generated images. To obtain the necessary basic concepts of a few vector spaces in designing and solving problems. To acquire knowledge in linear transformations using Eigen values and Eigen vectors and to apply them in solving problems that occur in the field of Engineering and Technology. To explain the concept of vector spaces to use in the principal component analysis.

UNIT-I	MATRICES AND DETERMINANTS	12
Introduction to Matrices and Determinants - Solution of Linear Equations: Cramer's rule - Inverse of a Matrix.		
UNIT-II	APPLICATION OF MATRICES	12
Vectors and linear combinations - Rank of a matrix - Gaussian elimination - LU Decomposition - Solving Systems of Linear Equations using the tools of Matrices.		
UNIT-III	VECTOR SPACE	12
Vector space – Dimension, Basis, Orthogonality – Projections - Gram-Schmidt orthogonalization and QR decomposition.		
UNIT-IV	EIGENVALUE PROBLEMS	12
Eigenvalues and Eigenvectors - Positive definite matrices - Linear transformations - Hermitian and unitary matrices.		
UNIT-V	PRINCIPAL COMPONENT ANALYSIS	12
Singular value decomposition - Principal component analysis - Introduction to their applications in Image Processing and Machine Learning.		
		Total Contact Hours: 60

Course Outcomes:
After completing the course, the students will be able to
<ul style="list-style-type: none"> Demonstrate matrix algebra techniques in the solutions of relevant problems in engineering. Apply the concept of LU decomposition of matrices in the solution of complex engineering problems. Use the concepts of vector spaces in the solutions of problems in data science. Interpret the concepts of Eigen value problems in expander graphs and also to find the page rank algorithm. Apply the concept of principal component analysis in image processing, pattern recognition and time series prediction.

SUGGESTED ACTIVITIES
<ul style="list-style-type: none"> Problem solving sessions. Flipped classroom Activity Based Learning

SUGGESTED EVALUATION METHODS
<ul style="list-style-type: none"> Problem solving in Tutorial sessions Assignment problems Quizzes and class test Discussion in classroom

Text Book(s):	
1.	Grewal B.S., “ Higher Engineering Mathematics ”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2.	T Veerarajan , Linear Algebra and Partial Differential Equations, Mc Graw Hill Education,2019.
3.	Peter V. O'Neil, “Advanced Engineering Mathematics”, 7th Edition, 2020.
4.	Friedberg, S.H., Insel, A.J. and Spence, E., “Linear Algebra”, Pearson Education, 5th Edition, New Delhi, 1989.
5.	Williams, G, “Linear Algebra with Applications”, Jones & Bartlett Learning, First Indian Edition, New Delhi, 2017.

Reference Books(s) / Web links:	
1.	Michael. D. Greenberg, “Advanced Engineering Mathematics”, 2nd Edition, 2012.
2.	Gilbert Strang, “Introduction to linear algebra”, 5th Edition, 2016.
3.	Wartikar& J. N. Wartikar, “Applied Mathematics” (Vol. I & II), P. N. 2019.
4.	R C Gonzalez and R E Woods, “Digital Image Processing”, 3rd Edition, 1992.
5.	Richard Branson, "Matrix Operations", Schaum's outline series, McGraw Hill, New York, 1989.

Subject Code	Subject Name (Theory course)	Category	L	T	P	C
BA23212	FUNDAMENTALS OF ECONOMICS	MS	2	0	0	2

Objectives:	
●	To explain the fundamental principles of micro economics relevant to managing an organization.
●	To describe the fundamental principles of macroeconomics to have the understanding of economic environment of business.
●	To understand the various aspects of India's economy.

UNIT-I	INTRODUCTION	6
Principles of Demand and Supply- Supply Curves of Firms - Elasticity of Supply; Demand Curves of Households- Elasticity of Demand; Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve)		
UNIT-II	CONSUMER ANALYSIS	6
Welfare Analysis- Consumers' and Producers' Surplus - Price Ceilings and Price Floors; Consumer Behavior - Axioms of Choice - Budget Constraints and Indifference Curves; Consumer's Equilibrium- Effects of a Price Change, Income and Substitution Effects -Derivation of a Demand Curve		
UNIT-III	PRODUCTION AND COSTING	6
Applications- Tax and Subsidies - Intertemporal Consumption - Suppliers' Income Effect; Theory of Production - Production Function and Iso-quants - Cost Minimization; Cost Curves- Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm Under Perfect Competition; Monopoly and Monopolistic Competition		
UNIT-IV	MACROECONOMIC REFORMS	6
National Income and its Components- GNP, NNP, GDP, NDP; Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector- Taxes and Subsidies; External Sector- Exports and Imports; Money- Definitions; Demand for Money- Transactionary and Speculative Demand; Supply of Money- Bank's Credit Creation Multiplier; Integrating Money and Commodity Markets- IS, LM Model		
UNIT-V	POLICY GOVERNANCE	6
Business Cycles and Stabilization- Monetary and Fiscal Policy - Central Bank and the Government; The Classical Paradigm- Price and Wage Rigidities - Voluntary and Involuntary Unemployment		
		Total Contact Hours : 30

Course Outcomes:	
On completion of the course, students will be able to	
●	Become familiar with both principles of micro and macroeconomics.
●	Understand about approaches to consumer behaviour and relation between production and cost function.
●	Describe and discuss on interaction of product and factor market.
●	Get awareness about importance and development of Indian economy and economic reforms.
●	Have thorough knowledge in the areas of inflation, unemployment, monetary policy, fiscal policy and international trade.

Text Books:	
1	Pindyck, Robert S., and Daniel L. Rubinfeld, "Microeconomics", 7 th edition Pearson
2	Dornbusch, Fischer and Startz," Macroeconomics", 12 th edition McGraw Hill
3	Paul Anthony Samuelson, William D. Nordhaus, "Economics", 19 th edition, McGraw Hill
Reference Books / Web links:	
1	Hal R, Varian, "Intermediate Microeconomics: A Modern Approach", 8 th edition
2	N. Gregory Mankiw, "Principles of Macroeconomics", 6 th edition, Cengage India

CO - PO – PSO MATRICES OF THE COURSE

PO/PSO CO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
BA19212.1	2	2	1	2	1	1	3	3	3	3	3	3	2	1	3
BA19212.2	2	2	1	2	1	2	2	3	2	3	3	3	3	1	3
BA19212.3	2	2	1	2	3	1	1	3	3	3	3	3	3	2	3
BA19212.4	2	3	2	3	2	2	2	2	2	3	3	3	3	2	3
BA19212.5	2	3	1	2	2	1	1	3	3	3	3	3	1	2	2
Average	2	2.4	1.2	2.2	1.8	1.4	1.8	2.8	2.6	3	3	3	2.4	1.6	1.6

Correlation levels 1, 2 or 3 are as defined below:

1:Slight(Low) 2: Moderate (Medium) 3: Substantial (High)

No correlation:“-“

Course Code	Course Title	Category	L	T	P	C
MA23231	STATISTICAL MODELING	BS	3	0	2	4
For II sem. B.Tech. - CSBS						

Objectives:

- To gather data from a population subset and make accurate and reliable inferences about the population based on the sample data.
- To identify the strength and direction of a linear relationship between two variables and using regression and correlation to predict dependency for data-driven decisions regarding our processes.
- To formulate and test a hypothesis, using critical values to draw conclusions and determining probability of making errors in hypothesis tests.
- To Characterize, compare, and contrast different nonparametric hypothesis tests.
- To Model time series to analyses the underlying structure(s) in both the time and frequency domains.

UNIT-I	SAMPLING AND ESTIMATION THEORY	9
Random sampling - Sampling from finite and infinite populations - Estimates and standard error (sampling with replacement and sampling without replacement) - Sampling distribution of sample mean - Stratified random sampling - Point estimation - Criteria for good estimates (un-biasedness, consistency) - Methods of estimation including maximum likelihood estimation: Concept and Examples - Complete sufficiency and its application in estimation.		
UNIT-II	LINEAR STATISTICAL MODELS	9
Scatter diagram - Linear Regression and Correlation - Least squares method - Rank correlation - Multiple regression and Multiple correlation - Analysis of variance (one way, two way with as well as without interaction).		
UNIT-III	TEST OF HYPOTHESIS	9
Concept and formulation : Type I and Type II errors, Neyman Pearson lemma - Procedures of testing: Z test: Single mean, difference of means – t: Single mean, difference of means - F test - Chi square test.		
UNIT-IV	NON PARAMETRIC TESTS	9
Non-parametric Inference: Sign test, Wilcoxon signed rank test, Mann-Whitney test, Run test, Kolmogorov-Smirnov test. Spearman's and Kendall's test. Tolerance region- Comparison with parametric inference - Use of order statistics.		
UNIT-V	BASICS OF TIME SERIES ANALYSIS & FORECASTING	9
Stationary - ARIMA Models: Identification, Estimation and Forecasting.		
Total Contact Hours: 45		

Description of the Experiments		Total Contact Hours: 30
1.	Introduction to R, Functions,	
2.	Control flow and Loops	
3.	Working with Vectors and Matrices	
4.	Reading in and Writing Data	
5.	Working with Data	
6.	Manipulating Data	
7.	Simulation	
8.	Linear model	
9.	Data Frame	
10.	Graphics in R	

Course Outcomes:

On completion of the course, students will be able to

- Apply the concept of sampling distribution and estimation theory to the solution of forecasting problems in engineering.
- Use the concepts of regression and correlation in real life problems such as predict trends and adjust product and services or advertising and marketing campaigns. That is, analyze complex engineering problems reaching substantiated conclusions using R programming.
- Use the concepts of Testing of Hypothesis in the solution of real life and industrial problems.
- Formulate, test and interpret various nonparametric tests for problems in engineering and technology. That is, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- Run and interpret time series models and regression models and reaching substantiated conclusions in relevant engineering problems using time series.

SUGGESTED ACTIVITIES

- Problem solving sessions using R programming
- Activity Based Learning
- Implementation of small module

SUGGESTED EVALUATION METHODS

- Problem solving in Tutorial sessions
- Assignment problems
- Quizzes and class test
- Discussion in classroom

Text Book(s):

- | | |
|----|--|
| 1. | I.R. Miller, J.E. Freund and R. Johnson , "Probability and Statistics for Engineers ",4th Edition, 2018. |
| 2. | A. Goon, M. Gupta and B.Dasgupta , "Fundamentals of Statistics ",Vol. I & Vol. II, 2019. |
| 3. | Chris Chatfield , "The Analysis of Time Series: An Introduction" Chapman and Hall/CRC, 1996. |
| 4. | D.C. Montgomery & E.Peck, "Introduction to Linear Regression Analysis" III edition, 2006. |

Reference Books(s) / Web links:

- | | |
|----|--|
| 1. | A.M. Mood, F.A. Graybill & D.C. Boes , "Introduction to the Theory of Statistics" III edition, 2017. |
| 2. | N. Draper & H. Smith, "Applied Regression Analysis" III edition, 1998. |
| 3. | Garrett Grolemond, "Hands-on Programming with R, Reilly Media, R,2014". |
| 4. | Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics" I edition, 2014. |

Subject Code	Subject Name (Lab oriented Theory Courses)	Category	L	T	P	C
CB23231	DATA STRUCTURES AND ALGORITHMS	PC	2	1	4	5

Objectives:	
●	To learn about basic terms and searching techniques
●	To learn linear and its applications.
●	To learn nonlinear and its applications.
●	To analyze the concepts of sorting and Hashing
●	To be able to incorporate various techniques in real time scenarios.

UNIT-I	BASIC TERMINOLOGIES & INTRODUCTION TO ALGORITHM AND SEARCHING	9
Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Searching- Linear Search and Binary Search techniques and their complexity analysis.		
UNIT-II	LINEAR DATA STRUCTURE (STACKS AND QUEUE)	9
ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation– Corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues: Algorithms and their analysis.		
UNIT-III	LINEAR DATA STRUCTURE (LIST ADT)	9
Abstract Data Type (ADT) - List ADT- Arrays based Implementation-linked list implementation-singly linked lists-circularly linked lists-doubly linked list-Application of list-polynomial manipulation-all operations (insertion, deletion, and merge, traversal).		
UNIT-IV	NON - LINEAR DATA STRUCTURE (TREES & GRAPHS)	9
Tree ADT-tree traversals-Binary Tree ADT-expression Trees-applications of Trees-Binary search tree ADT-Threaded Binary Tree-AVL Tree-B-Tree-B+Tree. Graph ADT-Representation of graph-Types of graph-Breadth-first traversal-Depth-first-Traversal-Applications of Graph.		
UNIT-V	SORTING AND HASHING	9
Sorting-Bubble sort-Selection Sort-Insertion Sort-Shell sort-Divide and Conquer Methods: Quick Sort and Merge Sort. Hashing-Hash functions-Separate chaining-Open Addressing-Rehashing- Extendible hashing.		
Contact Hours		: 45

List of Experiments	
1.	Implementations of Stack and Queue
2.	Applications of Stack and Queue (Tower of Hanoi, Infix, Postfix and Prefix Conversion, Expression Evaluation)
3.	Implementations of Singly, Doubly and Circular List
4.	Polynomial Manipulations
5.	Implementations Binary Search Tree and AVL Tree (All Operations)
6.	Implementation of BFS and DFS
7.	Linear and Binary Search Operations
8.	Implementation of Bubble Sort, Quick and Merge Sort
9.	Implementation of Hashing Techniques

10.	Mini Projects		
	<ul style="list-style-type: none"> • Snakes Game • Sudoku • Travel Planner • Cash Flow Minimiser • Text Editor Cut, Copy, Paste 		
		Contact Hours	60
		Total Contact Hours	105

Course Outcomes:	
On completion of the course, students will be able to	
•	Analyze the various data structure concepts.
•	Apply the different linear data structures to problem solutions.
•	Apply the different non-linear data structures to problem solutions.
•	Critically analyze the various sorting and hashing algorithms.
•	Design the real life projects by applying the data structure concepts

Text Book(s):	
1	E. Horowitz, S. Sahni, S. A-Freed, "Fundamentals of Data Structures", Universities Press, Second Edition, 2008.
2	Alfred V. Aho, John E. Hopperoft, Jeffrey D. Ullman, "Data Structures and Algorithm", Pearson Education, 1983.

Reference Books(s) / Web links:	
1	Donald E. Knuth , "The Art of Computer Programming: Fundamental Algorithms", Volume 1.
2	Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms".
3	Pat Morin , "Open Data Structures: An Introduction (Open Paths to Enriched Learning)", 31st ed. Edition.

Course Code	Course Title (Theory course)	Category	L	T	P	C
EC23242	Principles of Electronics		2	0	2	3

Objectives:
<ul style="list-style-type: none"> To study the operation of semiconductor diodes and their characteristics. To acquire knowledge about the operation and characteristics of BJT under various configurations. To introduce the structure and terminal characteristics of FET and MOSFET. To understand the concepts of feedback and operational amplifiers with its applications. To gain knowledge about digital logic circuits.

UNIT-I	SEMICONDUCTORS DIODES AND CIRCUITS	9
Introductory idea of semiconductors: Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone. Diodes and Diode Circuits: V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance and Varactor diode. Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.		
UNIT-II	BIPOLAR JUNCTION TRANSISTORS	9
Transistor: Formation of PNP / NPN junctions, energy band diagram; Transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode.		
UNIT-III	FIELD EFFECT TRANSISTORS	9
Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD configurations; CMOS: Basic Principles		
UNIT-IV	OPERATIONAL AMPLIFIERS	9
Introduction to integrated circuits, operational amplifier and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Proportional, Integral, Derivative circuits.		
UNIT-V	DIGITAL ELECTRONICS FUNDAMENTALS	9
Basic idea of switching circuit, Realization of Logic gates, multiplexers and demultiplexers, Flip flop, Registers and Counters.		
Total Contact Hours:45		

Description of the Experiments	Total Contact Hours:30
1. VI Characteristics of PN Junction Diode.	
2. VI Characteristics of Zener Diode.	
3. Rectifier circuits.	
4. Characteristics of BJT in Common Emitter Configuration.	
5. JFET Characteristics.	
6. Inverting and Non-Inverting amplifier using IC741.	
7. Implementation of Adders and Subtractors using logic gates.	

Course Outcomes:
On completion of the course, students will be able to
<ul style="list-style-type: none"> Demonstrate the characteristics of the diode. Analyse the BJT terminal characteristics and its utilization. Develop a high degree of familiarity with the FET and MOSFET. Design suitable amplifiers for any specific applications. Construct simple digital logic circuits.

SUGGESTED ACTIVITIES (if any) (UNIT/ Module Wise) – Could suggest topic
<ul style="list-style-type: none"> Problem solving sessions – Unit-4 & Unit-5 Flipped classroom – Unit-3: CMOS Principles

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Assignment problems - Unit-5

Text Book(s):

1. Adel S. Sedra and Kenneth Carless Smith, “Microelectronics Circuits”, Fifth Edition, Oxford University Press,
2. Jacob Millman, Christos Halkias and Chetan Parikh, “Millman’s Integrated Electronics”, Second Edition, Tata
3. M. Morris Mano, “Digital Logic & Computer Design”, Pearson India Education Services, 2016.

Reference Books(s) / Web links:

- Electronic Devices and Circuit Theory, Robert L. Boylestad, Louis Nashelsky.
- Solid State Electronic Devices, 6th Edition, Ben Streetman, Sanjay Banerjee
- Electronic Principle, Albert Paul Malvino.
- Electronics Circuits: Discrete & Integrated, D Schilling C Below TApelewiczRSaccardi.
- Microelectronics, Jacob Millman, Arvin Grabel.
- Electronics Devices & Circuits, S. Salivahanan, N. Suresh Kumar, A. Vallavaraj
- Electronic Devices & Circuit Theory, 11th Edition, Robert L. Boylestad, Louis Nashelsky.

Lab equipment required:

S. No	Name of the Equipment	Quantity Required	Remarks
1.	Dual Regulated Power Supply	15	(0-30)V
2.	CRO	15	(0-30)MHz
3.	Function Generator	15	(0-3)MHz
4.	Fixed Power Supply	15	15V
5.	Digital trainer kit	15	

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

- Experiment based viva

Web links for virtual lab (if any)

- <https://be-iitkgp.vlabs.ac.in/exp/characteristics-diode/>
- <https://be-iitkgp.vlabs.ac.in/exp/full-wave-rectification/>
- <https://be-iitkgp.vlabs.ac.in/exp/common-emitter-characteristics/>
- <https://be-iitkgp.vlabs.ac.in/exp/non-inverting-amplifiers/>

Course Code	Course Title (Laboratory Course)	Category	L	T	P	C
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CS23221	Python Programming Lab	PC	0	0	4	2
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Objectives:

<ul style="list-style-type: none"> Learn the basics of Python Programming and Control statements
<ul style="list-style-type: none"> Demonstrate various Python data structures like Lists, Tuples, Sets and dictionaries
<ul style="list-style-type: none"> Understand about Strings, Functions, Modules and Regular Expressions in Python Programming
<ul style="list-style-type: none"> Understand the concepts of file handling using Python
<ul style="list-style-type: none"> Understand the concepts of Numpy, Pandas, sciPy modules

Description of the Experiments	Total Contact Hours:60
1. Experiments based on Variables, Datatypes and Operators in Python.	
2. Implement various control statements in python.	
3. Implement various String & List operations.	
4. Implement Inbuilt functions, User-defined functions and Lambda functions.	
5. Implementation of Tuples, sets, Dictionary and its operations.	
6. Implementation of Exception Handling and I/O files.	
7. Experiments based on Packages : math, datetime, platform, re	
8. Experiments based on Packages : NumPy, pandas, matplotlib	
9. Experiments based on Packages : collections	
10. Experiments based on Packages :SciPy	
11. Mini Project	

Course Outcomes:

On completion of the course students will be able to:
<ul style="list-style-type: none"> Use the basics of Python Programming in problem solving and conditionals and loops.
<ul style="list-style-type: none"> Use of Python Data structures such as List, Sets, Tuples, Dictionary for Compound Data
<ul style="list-style-type: none"> Use Strings, Functions, Modules and Regular Expressions in Python Programming
<ul style="list-style-type: none"> Implement the concepts of file handling and Exceptional handling.
<ul style="list-style-type: none"> Apply Numpy, Pandas and SciPy for numerical and statistical data

SUGGESTED EVALUATION METHODS (if Any) (UNIT/ Module Wise) – could suggest topic

<ul style="list-style-type: none"> Experiment based viva Quizzes Mind map Logical thinking – solving case study problems Implementation of small Systems

Web links for virtual lab (if any)
<ul style="list-style-type: none">• https://www.python.org/shell/
<ul style="list-style-type: none">• https://python-iitk.vlabs.ac.in/
<ul style="list-style-type: none">• https://www.hackerrank.com/domains/python

Subject Code	Subject Name	Category	L	T	P	C
HS23223	BUSINESS COMMUNICATION AND VALUE SCIENCE – II For II sem. B.Tech. - CSBS	HS	0	0	4	2

Objectives:	
<input type="checkbox"/>	Develop effective writing, reading, presentation and group discussion skills
<input type="checkbox"/>	Expose students to the key concepts of organizational structure
<input type="checkbox"/>	Help students identify personality traits and evolve as a better team player.
<input type="checkbox"/>	Introduce them to key concepts of a) Morality b) Behavior and beliefs c) Diversity & Inclusion
<input type="checkbox"/>	Inculcate social consciousness among the students and make them realize their responsibility in addressing the social issues

UNIT-I	LAUNCHING E MAGAZINE	12
<p>Writing: - Writing techniques of Catherine Morris and Joanie McMahon's – Creating and launching E-magazine. Speaking: Icebreaker - Participating in 'Join Hands Movement' - Individual identification of social issues – addressing social issues - Reading: Sharing the learning points from GD – SATORI. Group Practical –Research read and generates a report based on social causes and findings. Grade points on the Leader board. Practical: Plan, design and launching an E Magazine – contributing article to the magazine – Quiz Time</p>		
UNIT-II	FORMULATING AN ORGANIZATIONAL STRUCTURE	12
<p>Each group forming an NGO - create vision, mission, value statement, and tagline and design a logo. Introduction to basic presentation skills & ORAI app - Groups to present their NGOs – Presentation recording and sharing the findings from recording. Writing: individual write up for E- magazine and evaluation - preparation and publication of second episode of E Magazine. Speed Reading session: Introduction to skimming and scanning; SATORI – Join the dots - Quiz Time</p>		
UNIT-III	TEAM PLAY	12
<p>Ad campaign - Brain storming session - discussing and exploring the means of articulating and amplifying the social issue their NGOs are working for - Designing skits: write the script articulating the message of their respective NGOs - Enact the play - reviews. Group Activity: Prepare and publish the third episode of the E Magazine. Berbin's 8 Team roles and Lindgren's big 5 personality traits – SATORI joining dots and Quiz Time.</p>		
UNIT-IV	DIVERSITY AND INCLUSION	12
<p>Learn from movies - film on diversity – discussion on key take away of the film - Theory to connect and concept of empathy. Create story – Group activity – a person's life affected by the social issue – narration of story in first person - Feedbacks by other groups. Research on a book, incident or film based on the topic of your respective NGO - Write a review in a blog on the topics they are covering in their research. Diversity & Inclusion - Different forms of Diversity in our society - Debate on diversity with an angle of ethics, morality and respect for individual. Prepared speech - Every student will narrate the challenges faced by a member of a diverse group. Video recording interviews of people from diverse groups with 5 questions. Practical: Touch the target, film: 'The Fish and I' by Babak Habibifar.</p> <p>Group Activity: Discussion on TCS values, Respect for Individual and Integrity. Preparation of final episode of the E Magazine. Revisit your resume: Include your recent achievements in your resume. SATORI and Quiz Time.</p>		
UNIT-V	ORGANIZING AWARENESS CAMPAIGN	12
<p>Project- Community service – work with an NGO and make a presentation - 1) Each team to look for an NGO/ social group in the city which is working on the issue their college group is supporting. 2) Spend a day with the NGO/ social group to understand exactly how they work and the challenges they face. 3) Render voluntary service to the group for one day 4) Invite the NGO/ social group to address their university students for couple of hours. Plan the entire event, decide a suitable venue in the university, gather audience, invite faculty members etc. (they need to get their plan ratified their professor). Outcome-- Host an interactive session with the NGO spokesperson 5) The groups to present their experience of a day with the NGO and inspire students to work for the cause.</p>		
Total Contact Hours		: 60

Course Outcomes:

On completion of the course, students will be able to

CO1	Understand and use tools of structured communication including presentation
CO2	Develop materials to create an identity for an organization dedicated to a social cause
CO3	Identify individual personality types and role in a team.
CO4	Understand the basic concepts of Morality and Diversity
CO5	Organize an event to generate awareness and get support for a cause

SUGGESTED ACTIVITIES

- Story Lines
- One truth and two lies
- Hang Man
- Pictionary
- Word Scramble
- Case study

SUGGESTED EVALUATION METHODS

- Assignment topics
- Quizzes
- Class Presentation/Discussion
- Case Study

Reference Books / Web links:

1	Guiding Souls : Dialogues on the purpose of life; Dr. A.P.J Abdul Kalam ;Publishing Year2005; Co-author--Arun Tiwari
2	The Family and the Nation; Dr. A.P.J Abdul Kalam; Publishing year: 2015; Coauthor: Acharya Mahapragya

Course Code	Course Title	Category	L	T	P	C
GE23217	TAMILS AND TECHNOLOGY	HS	1	0	0	1

UNIT I WEAVING AND CERAMIC TECHNOLOGY 3

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II DESIGN AND CONSTRUCTION TECHNOLOGY 3

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

UNIT III MANUFACTURING TECHNOLOGY 3

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel - Copper and gold Coins as source of history - Minting of Coins – Beads making - industries Stone beads - Glass beads - Terracotta beads - Shell beads/ bone beads - Archeological evidences - Gem stone types described in Silappathikaram.

UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY 3

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING 3

Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

TOTAL: 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருறை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International 42 Institute of Tamil Studies.
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)