Sri Krishna College of Engineering and Technology

An Autonomous Institution, Affiliated to Anna University

Coimbatore – 641 008

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

CURRICULUM AND SYLLABI

B.Tech. COMPUTER SCIENCE AND BUSINESS SYSTEMS

REGULATION 2022 [2023 – 2027 Batch]

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

VISION AND MISSION OF THE DEPARTMENT

VISION

To produce industry ready professionals with information technology acquaintance and human values to contribute to the society at large.

MISSION

- ➢ To develop and to promote student ability thereby to compete globally through excellence in education.
- ➢ To inculcate varied skill sets that meets industry standards and to practice moral values.
- ➢ To enrich high integrity to lead and to serve the society.

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

PROGRAMME OUTCOMES

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

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

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 modeling 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.

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS
PROGRAMME EDUCATIONAL OBJECTIVES & PROGRAMME SPECIFIC OUTCOMES

PROGRAMME EDUCATIONALOBJECTIVES

PEO1 Challenges in their profession through the application of theory and principles of computer engineering.

PEO2 Problem solving skills in computer science and business systems by applying mathematical, scientific, engineering and business fundamentals and also to pursue higher studies.

PEO3 Good scientific and engineering breadth so as to comprehend, analysis, design, and create novel products and solutions for the real-life problems.

PEO4 Possess professional and ethical attitude, effective communication skills, team working skills, multi-disciplinary approach, and an ability to relate engineering issues to broader social context with leadership qualities and progress through life-long learning.

PROGRAMME SPECIFIC OUTCOMES

At the end of the programme, Graduate shall have

PSO 1 Enriched knowledge in aiding academic excellence in order to adopt to changing demands in the cutting-edge technology.

PSO 2 Design varied solutions for real time problems with critical thinking and implement them by using modern software tools with reasoning in lieu of deploying them in the society towards beneficial grounds.

PSO 3 Knowledge of mathematics, science, business systems fundamentals, and an engineering specialization to the solution of complex engineering problems.

Mapping of PO's to PEO's

Programme Educational Objectives (PEO)	Programme Outcomes (PO)											
	1	2	3	4	5	6	7	8	9	10	11	12
PEO 1	3	3	3	3	3	2	2	2	2	3	3	3
PEO 2	3	3	3	3	3	2	2	2	3	3	3	3
PEO 3	3	3	3	3	3	3	2	2	2	3	3	3
PEO 4	2	3	3	3	3	3	3	3	3	3	3	3

Mapping of PO's to PSO's

Programme Specific Outcomes (PSO)	Programme Outcomes (PO)											
	1	2	3	4	5	6	7	8	9	10	11	12
PSO 1	3	3	3	3	3	2	2	2	2	2	2	2
PSO 2	3	3	3	3	3	3	2	2	3	2	3	3
PSO 3	3	3	3	3	3	3	2	2	3	2	3	2

Mapping of PSO's to PEO's

Programme Specific Outcomes (PSO)	Programme Educational Objectives (PEO)			
	1	2	3	4
PSO 1	3	3	3	2
PSO 2	3	3	3	3
PSO 3	3	3	3	3

1	Reasonably agreed	2	Moderately agreed	3	Strongly agreed

B.TECH. COMPUTER SCIENCE AND BUSINESS SYSTEMS
REGULATION 2022 [2023 – 2027 Batch]

SEMESTER I

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credits	Int/Ext	Category
1	23MA102	Discrete Mathematics for Computer Science	3/1/0	4	4	40/60	BSC
2	23MA103	Probability and Statistics	3/1/0	4	4	40/60	BSC
3	23TA101	Heritage of Tamils	1/0/0	1	1	40/60	HSMC
4	23EE112	Principles of Electrical Engineering	3/0/2	5	4	50/50	ESC
5	23CB101	Computer Programming	1/0/4	5	3	50/50	ESC
6	23PH103	Physics for Computing Science	3/0/2	5	4	50/50	BSC
7	23EN102	Business Communication and Value Science I	2/0/2	4	3	50/50	HSMC
MANDATORY COURSE							
8	23MCXXX	Mandatory Course I	2/0/0	2	0	0/100	MC
			Total	**30**	**23**	**700**	

SEMESTER II

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
1	23MA202	Linear Algebra	3/1/0	4	4	40/60	BSC
2	23EN201	Business Communication and Value Science II	2/1/0	3	3	40/60	HSMC
3	23MG211	Fundamentals of Economics	3/0/0	3	3	40/60	ESC
4	23CB201	Data Structures	1/0/4	5	3	50/50	PCC
5	23TA201	Tamils and Technology	1/0/0	1	1	40/60	HSMC
6	23EC211	Principles of Electronics Engineering	3/0/2	5	4	50/50	ESC
7	23MA203	Statistical Methods and Modelling	3/0/2	5	4	50/50	BSC
MANDATORY COURSE							
8	23MCXXX	Mandatory Course II	2/0/0	2	0	0/100	MC
			Total	**28**	**22**	**700**	

SEMESTER III

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
1	23CB301	Formal Languages and Automata Theory	3/1/0	4	4	40/60	PCC
2	23CB302	Computer Organization and Architecture	3/0/0	3	3	40/60	ESC
3	23CB303	Object Oriented Programming	1/0/4	5	3	50/50	PCC
4	23CB304	Database Management Systems	1/0/4	5	3	50/50	PCC
5	23MA302	ComputationalStatistics Using Python	3/0/2	5	4	50/50	BSC
6	23CB305	Software Engineering	3/0/2	5	4	50/50	PCC
MANDATORY COURSE							
7	22MCXXX	Mandatory Course III	2/0/0	2	0	0/100	MC
			Total	**29**	**21**	**600**	

SEMESTER IV

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
1	23CB401	Introduction to Innovation, IP Management and Entrepreneurship	3/0/0	3	3	40/60	ESC
2	23EN401	Business Communication and Value Science III	3/0/0	3	3	40/60	HSMC
3	23GE201	Universal Human Values	3/0/0	3	3	40/60	HSMC
4	23CB402	Design and Analysis of Algorithms	1/0/4	5	3	50/50	PCC
5	23MA408	Operations Research	3/0/2	5	4	50/50	BSC
6	23CB403	Operating Systems	3/0/2	5	4	50/50	PCC
MANDATORY COURSE							
7	23MCXXX	Mandatory Course IV	2/0/0	2	0	0/100	MC
			Total	**26**	**20**	**600**	

SEMESTER V							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Int/Ext**	**Category**
1	23CB501	Fundamentals of Cloud ApplicationDevelopment	3/1/0	4	4	40/60	PCC
2	23CB502	Data Visualization	3/0/0	3	3	40/60	PCC
3	23CB503	Design Thinking	3/0/0	3	3	40/60	PCC
4	23CB504	Artificial Intelligence	3/0/2	5	4	50/50	PCC
5	23CB505	Software Design withUML	3/0/2	5	4	50/50	PCC
6	23CB9XX	Professional Elective– 1	3/0/0	3	3	40/60	PEC
PROJECT WORK							
7	23CB507	Mini Project - 1	0/0/4	4	2	60/40	PW
			Total	**27**	**23**	**700**	

SEMESTER VI							
S No.	**Course Code**	**Course**	**L/T/P**	**Contact hrs/week**	**Credit**	**Int/Ext**	**Category**
1	23XXXXX	Open Elective – 1	3/0/0	3	3	40/60	OEC
2	23CB9XX	Professional Elective – 2	3/0/0	3	3	40/60	PEC
3	23EN603	Business Communication and Value Science IV	2/0/0	2	2	40/60	HSMC
4	23CB601	Machine Learning	3/1/0	4	4	40/60	PCC
5	23CB602	Computer Networks	3/0/2	5	4	50/50	PCC
6	23CB603	Information Security	3/0/2	5	4	50/50	PCC
EMPLOYABILITY ENHANCEMENT SKILLS							
7	23EES01	Employability Enhancement Skills			2		EES
			Total	**22**	**22**	**600**	

SEMESTER VII							
S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
1	23CB9XX	Professional Elective – 3	3/0/0	3	3	40/60	PEC
2	23CB9XX	Professional Elective – 4	3/0/0	3	3	40/60	PEC
3	23CB9XX	Professional Elective – 5	3/0/0	3	3	40/60	PEC
4	23CB7XX	Emerging Elective – 1	3/0/0	3	3	40/60	EEC
5	23CB7XX	Emerging Elective – 2	3/0/0	3	3	50/50	EEC
6	23XXXXX	Open Elective – 2	3/0/0	3	3	40/60	OEC
PROJECT WORK							
7	23CB701	Mini Project – 2	0/0/4	4	2	60/40	PW
			Total	22	20	700	

SEMESTER VIII							
S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
PROJECT WORK							
1	23CB801	Project Evaluation	0/0/24	24	12	60/40	PW
			Total	24	12	100	

HUMANITIES SCIENCE AND MANAGEMENT COURSES (16 credits)

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
1.	23TA101	Heritage of Tamils	1/0/0	1	1	40/60	HSMC
2.	23EN102	Business Communication and Value Science I	2/0/2	4	3	50/50	HSMC
3.	23TA201	Tamils and Technology	1/0/0	1	1	40/60	HSMC
4.	23EN201	Business Communication and Value Science II	2/1/0	3	3	40/60	HSMC
5.	23EN401	Business Communication and Value Science III	3/0/0	3	3	40/60	HSMC
6.	23GE201	Universal HumanValues	3/0/0	3	3	40/60	HSMC
7.	23EN603	Business Communication and Value Science IV	2/0/0	2	2	40/60	HSMC

BASIC SCIENCES COURSES (28 credits)

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
1	23MA102	Discrete Mathematics for Computer Science	3/1/0	4	4	40/60	BSC
2	23MA103	Probability and Statistics	3/1/0	4	4	40/60	BSC
3	23PH103	Physics for Computing Science	3/0/2	5	4	50/50	BSC
4	23MA202	Linear Algebra	3/1/0	4	4	40/60	BSC
5	23MA203	Statistical Methods and Modelling	3/0/2	5	4	50/50	BSC
6	23MA308	Computational Statistics using Python	3/0/2	5	4	50/50	BSC
7	23MA408	Operations Research	3/0/2	5	4	50/50	BSC

ENGINEERING SCIENCES COURSES (20 credits)

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
1	23EE112	Principles of Electrical Engineering	3/0/2	5	4	50/50	ESC
2	23CB101	Computer Programming	1/0/4	5	3	50/50	ESC
3	23MG211	Fundamentals of Economics	3/0/0	3	3	40/60	ESC
4	23EC211	Principles of Electronics Engineering	3/0/2	5	4	50/50	ESC
5	23CB301	Computer Organization and Architecture	3/0/0	3	3	40/60	ESC
6	23CB401	Introduction to Innovation, IP Management and Entrepreneurship	3/0/0	3	3	40/60	ESC

PROFESSIONAL CORE COURSES (54 credits)

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
1.	23CB201	Data Structures	1/0/4	5	3	50/50	PCC
2.	23CB301	Formal Languages and Automata Theory	3/1/0	4	4	40/60	PCC
3.	23CB303	Object Oriented Programming	1/0/4	5	3	50/50	PCC
4.	23CB304	Database Management Systems	1/0/4	5	3	50/50	PCC
5.	23CB305	Software Engineering	3/0/2	5	4	50/50	PCC
6.	23CB402	Design and Analysisof Algorithms	1/0/4	5	3	50/50	PCC
7.	23CB403	Operating Systems	3/0/2	5	4	50/50	PCC
8.	23CB501	Fundamentals of Cloud Application Development	3/1/0	4	4	40/60	PCC
9.	23CB502	Data Visualization	3/0/0	3	3	40/60	PCC
10.	23CB503	Design Thinking	3/0/0	3	3	40/60	PCC
11.	23CB504	Artificial Intelligence	3/0/2	5	4	50/50	PCC
12.	23CB505	Software Design with UML	3/0/2	5	4	50/50	PCC
13.	23CB601	Machine Learning	3/1/0	4	4	40/60	PCC
14.	23CB602	Computer Networks	3/0/2	5	4	50/50	PCC
15.	23CB603	Information Security	3/0/2	5	4	50/50	PCC

MANDATORY COURSES

S.No.	Course Code	Course Title	Category
1	23MC101	Induction Program	MC
2	23MC102	Environmental Sciences	MC
3	23MC103	Soft Skills	MC
4	23MC105	General Aptitude	MC
5	23MC106	Life Skills and Ethics	MC
6	23MC107	Stress Management	MC
7	23MC108	Constitution of India	MC
8	23MC109	Essence of Indian Traditional Knowledge	MC

EMPLOYABILITY ENHANCEMENT SKILLS

S. No.	Course Code	Course Title	Duration	Credit	Category
1	23EES01	Employability Enhancement Skills	4 Weeks	2	EES

PROFESSIONAL ELECTIVE COURSES (PEC)

S.No.	Course Code	Course	L	T	P	Credit	Int/Ext
Digital Technology and Data Science							
1	23CB911	Conversational Systems	3	0	0	3	40/60
2	23CB912	Compiler Design	3	0	0	3	40/60
3	23CB921	Robotics and its Applications	3	0	0	3	40/60
4	23CB922	Modern Web Applications	3	0	0	3	40/60
5	23CB923	Data Mining and Analytics	3	0	0	3	40/60
6	23CB931	Cognitive Science and Analytics	3	0	0	3	40/60
7	23CB932	Internet of Things	3	0	0	3	40/60
8	23CB933	Cryptology	3	0	0	3	40/60
9	23CB941	Quantum Computation and Quantum Information	3	0	0	3	40/60
10	23CB942	Social Information Network	3	0	0	3	40/60
11	23CB943	Mobile Computing	3	0	0	3	40/60
12	23CB963	Image Processing and Pattern Recognition	3	0	0	3	40/60
13	23CB964	Advanced Java Programming	3	0	0	3	40/60
Business Systems							
1	23CB951	Behavioural Economics	3	0	0	3	40/60
2	23CB952	Computational Finance &Modeling	3	0	0	3	40/60
3	23CB953	Industrial Psychology	3	0	0	3	40/60
4	23CB961	Enterprise Systems	3	0	0	3	40/60
5	23CB962	Advance Finance	3	0	0	3	40/60
6	23CB967	Financial Management	3	0	0	3	40/60
7	23CB968	Financial and Cost Accounting	3	0	0	3	40/60
8	23CB969	Fundamentals of Management	3	0	0	3	40/60
9	23CB970	Human Resource Management	3	0	0	3	40/60
10	23CB971	Business Strategy	3	0	0	3	40/60

EMERGING ELECTIVE COURSES

S No.	Course Code	Course	L/T/P	Contact hrs/week	Credit	Int/Ext	Category
1.	23CB702	Usability Design of Software Applications	3/0/0	3	3	40/60	EEC
2.	23CB703	IT Project Management	3/0/0	3	3	40/60	EEC
3.	23CB704	Marketing Research and Marketing Management	3/0/0	3	3	40/60	EEC
4.	23CB705	Services Science and Service Operations Management	3/0/0	3	3	40/60	EEC
5.	23CB706	Augmented Reality and Virtual Reality	3/0/0	3	3	40/60	EEC

OPEN ELECTIVE COURSES OFFERED TO OTHER DEPARTMENTS

S.No.	Course Code	Course	L	T	P	Credit	Int/Ext
1	23CB001	Java Programming	3	0	0	3	40/60
2	23CB002	Usability Design	3	0	0	3	40/60
3	23CB003	Financial Modelling	3	0	0	3	40/60
4	23CB004	Artificial Intelligence and Expert Systems	3	0	0	3	40/60
5	23CB005	Intellectual Property and Entrepreneurship	3	0	0	3	40/60

VALUE ADDED COURSES

S. No.	Course Code	Course	Credit	Category
1	23VA801	Amazon Web Services	1	VAC
2	23VA802	Industry 4.0	1	VAC
3	23VA803	Mobile Applications and Services	1	VAC
4	23VA804	ReactJS	1	VAC
5	23VA805	Spring Boot	1	VAC

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

S. No	Stream	Credits/Semester								Credits	AICTE NORMS
		I	II	III	IV	V	VI	VII	VIII		
	Humanities Science and Management (HSMC)	4	4		6		2			16	12
2.	Basic Sciences (BSC)	12	8	4	4					28	24
3.	Engineering Sciences (ESC)	7	7	3	3					20	29
4.	Professional Core(PCC)		3	14	7	18	12			54	49
5.	Professional Electives (PEC)					3	3	9		15	18
6.	Open Electives (OEC) / Emerging Elective (EEC)						3	9		12	12
7.	Project Work (PW)					2		2	12	16	15
8.	Employability Enhancement Skills (EES)						2			2	
9.	Mandatory Course (MC)									Non credit	
	Total	**23**	**22**	**21**	**20**	**23**	**22**	**20**	**12**	**163**	**159**

23MA102   **DISCRETE MATHEMATICS FOR COMPUTER SCEINCE**   **3/1/0/4**

Nature of Course: J (Problem Analytical)

Pre requisites: Nil

Course Objectives:

1   To know the fundamental concepts of Group theory

2   To analyze and simplify the digital circuits or digital gates using Boolean concept

3   To acquaint with the concepts of calculus needed for problems in all engineering disciplines

Course Outcomes:

Upon completion of the course, students shall have ability to

C102.1	Recall the basic concepts of set and algebraic theory	[R]
C102.2	Understand how logic relates to computing problems to study logic design of digital systems.	[U]
C102.3	Apply the concept of integral calculus to compute area and volume of any graphical problems	[AP]
C102.4	Apply the notions of finitely generated group and exemplify the elementary properties of an abstract group, ring and field	[AP]
C102.5	Apply combinatorial principles and techniques to solve counting problems	[AP]

Course Contents:

Boolean algebra: Introduction of Boolean algebra, truth table, basic logic gate, basic postulates of Boolean algebra, principle of duality, canonical form, Karnaugh map.

Calculus: Basic concept of Differential calculus and integral calculus – evaluation of double and triple integrals (cartesian Coordinates) - Change the order of integration (cartesian Coordinates) - application of double (area) and triple (volume) integral (cartesian Coordinates). **Abstract algebra**: Set: definition – simple problems, Relation: types – simple problems, Group: monoid - semigroup – group – Abelian group – simple problems, Ring: definition – simple problems, field: definition – simple problems.

Combinatorics: Basic counting, balls and bins problems, generating functions, recurrence relations. Proof techniques, principle of mathematical induction, pigeonhole principle – simple problems.

Total Hours: 60

Text Books:

1.   I. N. Herstein, Topics in Algebra, John Wiley and Sons. 2nd Edition 1975.

2.   M. Morris Mano, Digital Logic & Computer Design, Pearson, 2017.

3.   B. S. Grewal, Higher Engineering Mathematics, Khanna Publication, Delhi, 2018.

Reference Books:

1   Gilbert Strang: Introduction to linear algebra, Fourth Edition, 2021.

2 Peter V. O'Neil, Advanced Engineering Mathematics, 7th Edition, Thomson Learning,2021.

3 M. D. Greenberg, Advanced Engineering Mathematics, 2nd Edition, Pearson Education, 1998.

4 P. N. Wartikar and J. N. Wartikar, Applied Mathematics. Vol. I & II, Vidyarthi Prakashan, 1975.

Web References:

1 https://www.investopedia.com/terms/b/boolean-algebra.asp

2 https://mathworld.wolfram.com/AbstractAlgebra.html

3 https://reference.wolfram.com/language/guide/GroupTheory.html

Online Resources:

1 https://www.coursera.org/learn/single-variable-calculus

2 https://www.coursera.org/learn/linearalgebra1

3 https://www.pearson.com/en-us/search.html/Mathematics/Advanced+Math

Continuous Assessment			Total Continuous Assessment	End Semester Examination	Total
Formative Assessment	Summative Assessment	Total			
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component	FA (16%) [80 Marks]
C102.1	Remember	Quiz	20
C102.2	Understand	Seminar	20
C102.3	Apply	Tutorial	20
C102.4	Apply	Assignment	20
C102.5	Apply	Quiz	

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	30	20	20
Understand	30	20	20
Apply	40	60	60

Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1 : 100 Marks			CA 2 : 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C102.1	3	3	1	-	-	-	-	-	-	-	-	-	-	2	3
C102.2	2	2	1	-	-	-	-	-	-	-	-	-	-	1	2
C102.3	1	1	1	-	-	-	-	-	-	-	-	-	-	1	2
C102.4	3	2	1	-	-	-	-	-	-	-	-	-	-	1	2
C102.5	3	2	1	-	-	-	-	-	-	-	-	-	-	1	2

23MA103   **PROBABILITY AND STATISTICS**   **3/1/0/4**

Nature of Course: J (Problem Analytical)
Pre requisites: Nil

Course Objectives:
1   To study the basic probability concepts
2   To learn the applications of statistics in business decision making
3   To learn the concepts of evaluation using statistical analysis

Course Outcomes:
Upon completion of the course, students shall have ability to
C103.1   Recall the concepts of basic probability.   [R]
C103.2   Understand the types of data and graphical representation in statistics.   [U]
C103.3   Examine distribution in cluster analysis of similar binary variables.   [AP]
C103.4   Apply the concepts of sampling techniques.   [AP]
C103.5   Apply the concepts of distributions which is the basic for analytics and   [AP]
          inferential statistics.

Course Contents:

Probability: Concept of experiments, sample space, event. Definition of Combinatorial Probability-Definition of conditional probability, Baye's Theorem (Statement only) – Simple problems. Probability distributions: discrete & continuous distributions- Binomial, Poisson, Geometric, Uniform, Exponential, Normal, Chi-square, t, F distributions (No derivations of mean, variance and moment generating function & Simple problems only). Expected values & moments: mathematical expectation & its properties (statements only), Moments (first four moments including variance, skewness (Karl Pearson's)) & their properties (Statements only), Moment generating function- Definition – Simple problems.

Introduction to Statistics: 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: Simple bar diagram, Pie chart, Pareto chart-Frequency curves: Histogram, Frequency curve, Frequency polygon, Ogives- Descriptive measures: Central tendency- Mean, Median and Mode, Dispersion-Range, Quartile deviation, Standard deviation. Bivariate data. Summarization, marginal and conditional frequency distribution (Problems only). Scatter diagram. Linear regression - Least squares method – correlation (Karl Pearson's)- Rank correlation (Spearman's).

Sampling Techniques: 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 (Theory only).

                                                            Total Hours: 60

Text Books:
1.   S.M. Ross, Introduction of Probability Models, 11th edition, Academic Press, 2014.
2.   A. Goon, M. Gupta and B. Das Gupta, Fundamentals of Statistics (vol. I and vol. II), World Press, 2016.

Reference Books:

1. S.M. Ross, A first course in Probability, 9th edition, Pearson Education,2013.
2. I.R. Miller, J.E. Freund and R. Johnson, Probability and Statistics for Engineers, Pearson Education, 9th edition, 2017.

Web References:

1. http://nptel.ac.in/courses/111104079/
2. https://archive.nptel.ac.in/courses/111/105/111105090/
3. https://archive.nptel.ac.in/courses/111/105/111105041/
4. http://freevideolectures.com/Course/3028/Econometric-Modelling/22#

Online Resources:

1. https://www.coursera.org/learn/stanford-statistics
2. https://ocw.mit.edu/courses/res-6-012-introduction-to-probability-spring-2018/
3. https://ocw.mit.edu/courses/18-05-introduction-to-probability-and-statistics-spring-2014/

Continuous Assessment			Total Continuous Assessment	End Semester Examination	Total
Formative Assessment	**Summative Assessment**	**Total**			
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component**	**FA (16%) [80 Marks]**
C103.1	Remember	Quiz	20
C103.2	Understand	Seminar	20
C103.3	Apply	Tutorial	20
C103.4 & C103.5	Apply	Assignment	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	

Remember	30	20	20
Understand	30	20	20
Apply	40	60	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1 : 100 Marks			CA 2 : 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C103.1	1	1	1	-	-	-	-	-	-	-	-	-	-	2	2
C103.2	2	2	2	-	-	-	-	-	-	-	-	-	-	1	2
C103.3	3	3	2	-	-	-	-	-	-	-	-	-	-	1	2
C103.4	3	3	2	-	-	-	-	-	-	-	-	-	-	1	2
C103.5	3	3	2	-	-	-	-	-	-	-	-	-	-	1	2

22TA101　　　　　　　　　**HERITAGE OF TAMILS**　　　　　　　　　**1/0/0/1**

Nature of Course:　　C (Theory Concept)

Pre requisites:　　　NIL

Course Objectives:
1　　To know various concepts of Tamil Language families.
2　　To know about the essentialities of Heritage.
3　　To understand the Aram concepts of Tamils and the cultural influence.

Course Outcomes:
Upon completion of the course, students shall have ability to

C101.1	Know about the language families in India, impact of religions and the contribution of Bharathiyar and Bharathidhasan.	[U]
C101.2	Observe the growth of sculpture, making of musical instruments and the role of temples in socio and economic lives.	[U]
C101.3	Understand the significance of folklore and martial arts.	[U]
C101.4	Learn the sangam literature, sangam age and overseas conquest of Cholas.	[U]
C101.5	Understand the contribution of Tamils to Indian Freedom Struggle, role of Siddha medicine and print history of Tamil Books.	[U]

Course Contents:
Language and Literature: 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.

Heritage - Rock Art Paintings to Modern Art – Sculpture: 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. **Folk And Martial Arts:** Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

Thinai Concept Of Tamils - 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. Contribution of Tamils to Indian national movement and indian culture: 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 Hours:　15

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	பொருநை – 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.

Continuous Assessment				End Semester Examination	Total
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment		
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)	FA (16%) [80 Marks]
C101.1	Understand	Quiz	20
C101.2	Understand	Seminar	20
C101.3	Understand	Seminar	20
C101.4	Understand	Quiz	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	40	40	40

Understand	60	60	60
Apply	-	-	-
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1 : 100 Marks			CA 2 : 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-
C101.2	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-
C101.3	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-
C101.4	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
C101.5	-	-	-	-	-	-	-	1	1	-	-	-	-	-	-

23EE112   **PRINCIPLES OF ELECTRICAL ENGINEERING**   3/0/2/4

Nature of Course: G(Theory Analytical)

Pre requisites: Nil

Course Objectives:
1. To import the basic concepts in AC circuit and DC Electrical circuits and to analyze the electrical circuit parameters of dc circuits by applying networktheorems.
2. To understand and apply the principle of electrostatics and electro mechanics in single phase transformer.
3. To learn the basic signal measuring devices and electrical wiring systems.

Course Outcomes:

Upon completion of the course, students shall have the ability to

C112.1	Extend the basic concepts of work, power, energy for electrical, mechanical and thermal systems	[U]
C112.2	Apply knowledge of Kirchhoff's laws and network theorems to solve electrical networks	[AP]
C112.3	Experiment with the construction, principle of operation, specifications and applications of capacitors and batteries	[A]
C112.4	Apply fundamental concepts of magnetic and electromagnetic circuits for operation of single-phase transformer	[AP]
C112.5	Distinguish of single phase and three phase ac circuits with wiring systems and the use of measuring instruments	[A]

Course Contents:

Introduction and overviews: Electron Devices, Circuits and Systems, Integrated Circuits, Analog and digital signals. **Basic Concepts and Circuit Analysis**: Concept of Potential difference, voltage, current, Fundamental linear passive and active elements to their functional current-voltage relation, Terminology and symbols in order to describe electric networks, Concept of work, power, energy and conversion of energy. DC Circuits-Current-voltage relations of electric network by mathematical equations to analyse the network (Thevenin's theorem, Norton's Theorem, Maximum Power Transfer theorem) voltage source and current sources, ideal and practical, Kirchhoff's laws and applications to network solutions using mesh analysis, Simplifications of networks using series- parallel, Star/Delta transformation. Superposition theorem. AC Circuits-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, apparent and complex power, power factor, 3 phase Balanced AC Circuits.

Principle of Electro mechanics and Electrostatics: Electrostatic field, electric field intensity, electric field strength, absolute permittivity, relative permittivity, capacitor composite, dielectric capacitors, capacitors in series& parallel, energy stored in capacitors, charging and discharging of capacitors, Principle of batteries, types, construction and application. Electro-mechanics: Electricity and Magnetism, magnetic field and faraday's law, self and mutual inductance, Ampere's law, Magnetic circuit, Magnetic material and B-H

Curve, Single phase transformer, principle of operation, EMF equation, voltage ratio, current ratio, KVA rating, efficiency and regulation, Electromechanical energy conversion, Basic concept of indicating and integrating instruments.

Measurements and Sensors: Introduction to measuring devices/sensors and transducers related to electrical signals, Elementary methods for the measurement of electrical quantities in DC and AC systems and their practical application. Electrical Wiring and Illumination system: Basic layout of distribution system, Types of Wiring System &Wiring Accessories, Necessity of earthing, Types of earthing, Different types of lamps (Incandescent, Fluorescent, Sodium Vapour, Mercury Vapour, Metal Halide, CFL, LED)

Total Hours:45

Lab Components

1	Familiarization of electrical Elements, sources, measuring devices and transducers related to electrical circuits	[R]
2	Determination of resistance temperature coefficient	[U]
3	Verification of Network Theorem (Superposition, Thevenin, Norton, Maximum Power Transfer theorem).	[AP]
4	Examine the Simulation of R-L-C series circuits for XL>XC , XL< XC & XL= XC	[A]
5	Test for Time response of RC circuit	[A]
6	Verification of relation in between voltage and current in three phase balanced star and delta connected loads	[AP]
7	Demonstration of measurement of electrical quantities in DC and AC systems	[A]

Total Hours:30

Text Books:

1. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, Electric Machinery, Tata McGraw Hill, 7th edition 2020.
2. B.L.Theraja- A Textbook of Electrical Technology, Volume- I, S.Chand and Company Ltd., New Delhi, 2015.
3. V. K. Mehta, - Basic Electrical Engineering, S. Chand and Company Ltd., New Delhi,2012
4. J. Nagrath and Kothari – Theory and problems of Basic Electrical Engineering, Prentice Hall of India Pvt. Ltd, 2nd edition, 2017.

Reference Books:

1. Edward Hughes – Electrical Technology- 10thedition, Pearson Education Publication,2011.
2. Vincent. Del. Toro, Electrical Engineering Fundamentals,2nd edition Prentice Hall India, 2015.
3. Sudhakar Shyam Mohan, Circuits and Networks: Analysis and Synthesis,5th edition, Tata McGraw-Hill Education, 2015.

Web References:

1. http://nptel.ac.in/course.php?disciplineId=108
2. https://ocw.mit.edu/courses/find-by
   topic/#cat=engineering&subcat=electricalengineering&spec=electricpower
3. https://nptel.ac.in/video.php?subjectId=117103063
4. https://onionesquereality.wordpress.com/.../more-video- lectures-iit-open
5. https://nptel.iitg.ernet.in/Elec_Comm_Engg/.../Video-ECE.pdf

Online Resources:

1. Electricity & Magnetism, Part 1- PHYS 102.1x (edx.in)
2. Fundamentals of Electrical Engineering@coursera
3. Circuits and Electronics@edxonline
4. https://www.coursera.org/learn/electronics
5. NPTEL e learning courses

Continuous Assessment									End Semester Examination	Total
Theory				**Practical**			**Total (A+B)**	**Total Continuous Assessment**		
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)				
80	**120**	**200**	**100**	**75**	**25**	**100**	**200**	**50**	**50**	**100**

Formative Assessment based on Capstone Model - Theory			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment,Case Study, Seminar, Group Assignment)**	**FA(10%) [80 Marks]**
C112.1	Understand	Quiz & Assignment	**20**
C112.2	Apply	Assignment	**20**
C112.3	Analyze	Case study	**20**
C112.4	Apply	Group Assignment	**20**
C112.5	Analyze		

Assessment based on Summative and End Semester Examination - Theory			
Bloom's Level	**Summative Assessment (15%) [120 Marks]**		**End Semester Examination (35%) [100 Marks]**
	CIA1: (60 Marks)	**CIA2: (60 Marks)**	
Remember	10	10	10
Understand	30	10	10

Bloom's Level		
Apply	30	30	40
Analyze	30	50	40
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination - Practical

Bloom's Level	Continuous Assessment (25%) [100 Marks]		End Semester Examination (15%) [100 Marks]
	FA: (75 Marks)	SA: (25 Marks)	
Remember	10	10	10
Understand	30	30	30
Apply	40	40	40
Analyse	20	20	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (50%)								End Semester Examination (50%)
CA 1 (100 Marks)			CA 2 (100 Marks)			Practical Exam (100 Marks)		Theory Examination (35%) Practical Examination (15%)
SA 1 (60M)	FA 1		SA 2 (60M)	FA 2		FA (75M)	SA (25M)	
	Component-I (20 Marks)	Component-II (20 Marks)		Component-I (20 Marks)	Component-II (20 Marks)			

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C112.1	3	2	1	1	-	-	-	-	-	-	-	-	-	2	2
C112.2	3	2	1	1	-	-	-	-	-	-	-	-	-	2	1
C112.3	3	2	1	1	-	-	-	-	-	-	-	-	-	2	1
C112.4	3	2	1	1	-	-	-	-	-	-	-	-	-	2	1
C112.5	3	2	1	1	-	-	-	-	-	-	-	-	-	2	1

23CB101   **COMPUTER PROGRAMMING**   **1/0/4/3**

Nature of Course: F (Theory Programming)
Prerequisites: Nil

Course Objectives:
  1   To understand problem solving concepts and learn operators and
       expressions in C.
  2   To gain knowledge about the control structures in C and write C programs
       using arrays, functions, pointers, structures and files.
  3   To learn Unix system interface and programming method

Course Outcomes:
Upon completion of the course, students shall have ability to
C101.1   Apply problem solving techniques to solve real world problems   [AP]
C101.2   Examine C fundamental constructs and control structures   [AP]
C101.3   Analyze the concept of pointers and arrays in programs and execute it.   [A]
C101.4   Classify the concept of structures, functions and files in programs and   [A]
         execute it.
C101.5   Understand Unix system interface and programming method   [U]

Course Contents:

General Problem-Solving concepts: Algorithm, and Flowchart for problem solving with Sequential Logic Structure, Decisions and Loops. **Imperative languages**: Introduction to imperative language; syntax and constructs of a specific language (ANSI C). Operators and Expressions: Variable Names, Data Type and Sizes (Little Endian Big Endian), Constants, Declarations, Arithmetic Operators, Relational Operators, Logical Operators, Type Conversion, Increment Decrement Operators, Bitwise Operators, Assignment Operators and Expressions, Precedence and Order of Evaluation. Control Flow with discussion on structured and unstructured programming: Statements and Blocks, If-Else-If, Switch, Loops – while, do, for, break and continue, Goto Labels, structured and un- structured programming

Functions and Program Structure with discussion on standard library: Basics of functions, parameter passing and returning type, C main return as integer, External, Auto, Local, Static, Register Variables, Scope Rules, Block structure, Initialisation, Recursion, Pre-processor, Standard Library Functions and return types. Pointers and Arrays: Pointers and address, Pointers and Function Arguments, Address Arithmetic, character Pointers and Functions, Pointer Arrays, Pointer to Pointer, Multi-dimensional array and Row/column major formats, Initialisation of Pointer Arrays, Command line arguments, Pointer to functions, complicated declarations and how they are evaluated.

Structures: Basic Structures, Structures and Functions, Array of structures, Pointer of structures, Self-referral Structures, Table look up, Typedef, Unions, Bit-fields. **Input and Output**: Standard I/O, Formatted Output – printf, Formated Input – scanf, Variable length argument list, file access including FILE structure, fopen, stdin, sdtout and stderr, Error

Handling including exit, perror and error.h, Line I/O, related miscellaneous functions. **Unix system Interface:** File Descriptor, Low level I/O – read and write, Open, create, close and unlink, Random access – lseek, Discussions on Listing Directory, Storage allocator. **Programming Method:** Debugging, Macro, User Defined Header, User Defined Library Function, makefile utility.

Total Hours:45

Lab Exercises:

1. Algorithm and flowcharts of small problems like GCD [AP]
2. Structured code writing with: [A]
     i. Small but tricky codes
     ii. Proper parameter passing
     iii. Command line Arguments
     iv. Variable parameter
     v. Pointer to functions
     vi. User defined header
     vii. Make file utility
     viii. Multi file program and user defined libraries
     ix. Interesting substring matching / searching programs
     x. Parsing related assignments

Total Hours: 30

Text Books:
1   B. W. Kernighan and D. M. Ritchi, The C Programming Language, 2ndEdition, PHI, 2008.
2   B. Gottfried, Programming in C, Second Edition, Schaum Outline Series, 1stEdition, 2008.

Reference Books:

1   Herbert Schildt, C: The Complete Reference, 4th Edition, McGraw Hill,2015.
2   Yashavant Kanetkar, Let Us C, BPB Publications,15th Edition 2017.

Web References:
1   https://onlinecourses.nptel.ac.in/noc17_cs43/
2   http://raptor.martincarlisle.com/
3   https://scratch.mit.edu/

Continuous Assessment									End Semester Examination	Total
Theory				Practical				Total (A+B)	Total Continuous Assessment	
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)				
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory			
Course Outcome	**Bloom's Level**	**Assessment Component (Choose and map components from the list - Quiz, Assignment, Case Study, Seminar, Group Assignment)**	**FA (10%) [80 Marks]**
C101.1	Apply	Quiz & Assignment	**20**
C101.2	Apply	Assignment	**20**
C101.3	Analyze	Case study	**20**
C101.4	Analyze	Group Assignment	**20**
C101.5	Understand		

Assessment based on Summative and End Semester Examination - Theory		
Bloom's Level	**Summative Assessment (15%) [120 Marks]**	
	CIA1: (60 Marks)	**CIA2: (60 Marks)**
Remember	10	10
Understand	10	30
Apply	60	10
Analyze	20	50
Evaluate	-	-
Create	-	-

Assessment based on Continuous and End Semester Examination – Practical			
Bloom's Level	**Continuous Assessment (25%) [100 Marks]**		**End Semester Examination (50%) [100 Marks]**
	FA: (75 Marks)	**SA: (25 Marks)**	
Remember	10	10	10
Understand	30	10	10
Apply	40	60	60
Analyze	20	20	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination									
Continuous Assessment (50%)									End Semester Examination (50%)
CA 1 (100 Marks)			CA 2 (100 Marks)			Practical Exam (100 Marks)			
SA 1 (60M)	FA 1		SA 2 (60M)	FA 2		FA (75M)	SA (25M)		
	Component-I (20 Marks)	Component-II (20 Marks)		Component-I (20 Marks)	Component-II (20 Marks)				

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1	3	2	3	1	-	-	1	-	-	-	1	-	2	3	1
C101.2	3	2	3	1	-	-	1	-	-	-	1	-	1	1	1
C101.3	3	2	3	1	-	-	1	-	-	-	1	-	2	2	1
C101.4	3	2	3	1	-	-	1	-	-	-	1	-	2	2	1
C101.5	3	2	3	1	-	-	1	-	-	-	1	-	1	1	1

23PH103 **PHYSICS FOR COMPUTING SCIENCE** **3/0/2/4**

Nature of Course: E (Theory Skill Based)
Pre requisites: Nil

Course Objectives:

1	To learn the basic concepts of physics needed for computing engineering
2	To apply the physics concepts in solving real time engineering problem
3	To implement and visualize theoretical aspects in the laboratory and to familiarize the students to handle various instruments and equipment

Course Outcomes:
Upon completion of the course, students shall have ability to

C103.1	Reproduce the basic concepts of lasers, fibre optics, thermodynamics, simple harmonic and damped oscillations	[R]
C103.2	Discuss the fundamental concepts of interference, diffraction and polarization	[U]
C103.3	Describe the basics of Quantum mechanics and crystallography	[U]
C103.4	Solve complex problems in everyday life using the knowledge gained from the course	[AP]
C103.5	Practice to solve problems using theoretical knowledge as a team	[AP]

Course Contents:

Oscillation and fundamental of wave optics: 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. **Interference-principle of superposition – Polarisation:** Basic definition and types of interference of light - young's double slit experiment of interference and Newton's rings - Diffraction-Two kinds of diffraction (Fresnel's diffraction and Fraunhofer's diffraction) -Difference between interference and diffraction -Fraunhofer diffraction at single slit-plane diffraction grating (multi slit diffraction). Coherence - Temporal and Spatial Coherence. Polarization definition - production of polarized beam as plane, elliptical and circularly polarized light, polarisation by reflection (Brewster's law), double refraction.

Quantum Mechanics and Crystallography:
Introduction - Planck's quantum theory - Matter waves, de-Broglie wavelength, Heisenberg's Uncertainty principle, time independent and time dependent Schrödinger's wave equation, Physical significance of wave function, Particle in a one-dimensional potential box. **Crystallography** - Basic terms-types of crystal systems, Bravais lattices, miller indices,d-spacing, Debye Scherrer powder method, Laue method- Atomic packing factor for SC, BCC, FCC and HCP structures. Semiconductor Physics - Basic concept of Band theory - classification of materials into conductor, semiconductor and Insulator.

Laser and Fiber optics:
Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: CO_2 and Neodymium lasers; Properties of laser

beams: mono-chromaticity, coherence, directionality and highly intense, applications of lasers in engineering. Fiber optics and Types of optical fibers. **Thermodynamics:** Basic definitions of Zeroth law of thermodynamics, first law of thermodynamics, Applications of 1st law, second law of thermodynamics and concept of heat Engine, entropy, change in entropy in reversible and irreversible processes, third law of thermodynamics (definition only).

Total Hours:45

Lab Component

1	Determination of Magnetic field along the axis of current carrying coil – Stewart and Gee	[E]
2	Determination of Hall co-efficient of semiconductor	[E]
3	Determination of Plank Constant	[E]
4	Determination of wavelength of light by Laser diffraction method	[E]
5	Determination of wavelength of light by Newton's ring method	[E]
6	Determination of laser and optical parameter	[E]
7	Determination of Stefan's Constant.	[E]
8	Determination of pressure required to shut off the fuel pump nozzle.	[E]
9	Determination of capacitance required to shut off the circuit in a circuit breaker.	[E]
10	Determination of earth, neutral and phase line in a circuit.	[E]

Total Hours: 30

TEXT BOOKS
1. Gary N. Felder and Kenny M.Felder, Modern Physics, Cambridge University Press, 2022.
2. David Halliday, Robert Resnick, Jearl Walker, Fundamentals of Physics, Wileyplus,2010.

REFERENCE BOOKS
1. Ajoy Ghatak, Optics Fifth Edition, Tata McGraw Hill,2020.
2. Sears & Zemansky, University Physics, Addison-Wesley,2015.
3. Jenkins and White, Fundamentals of Optics, Third Edition, McGraw-Hill,2017.

WEB RESOURCES
1   https://www.drdo.gov.in/drdo/data/Laser%20and%20its%20Applications.pdf
2   https://www3.nd.edu/~wers/ame.20231/planckdover.pdf
3   https://www.corning.com/in/en/products/communication-networks/.../fiber.html
4   https://physics.info/
5   http://www.feynmanlectures.caltech.edu/info/
6   http://nptel.ac.in/courses/113106032/4%20-%20Crystal%20structure.pdf
7   http://www.phys.ufl.edu/courses/phy2054/s09/lectures/2054_ch21A.pdf

Continuous Assessment								Total (A+B)	Total Continuous Assessment	End Semester Examination	Total
Theory				Practical							
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)					
80	120	200	100	75	25	100		200	50	50	100

Formative Assessment based on Capstone Model - Theory			
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]
C103.1	Remember	Online Quiz - I	20
C103.2	Understand	Assignment - I	20
C103.3	Understand	Online Quiz - II	20
C103.4	Apply	Assignment - II	20
C103.5	Apply		

Assessment based on Summative and End Semester Examination - Theory			
Bloom's Level	Summative Assessment (15%) [120 Marks]		End Semester Examination (35%) [100 Marks]
	CIA1: (60 Marks)	CIA2: (60 Marks)	
Remember	20	10	20
Understand	60	30	40
Apply	20	60	40
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination - Practical			
Bloom's Level	Continuous Assessment (25%) [100 Marks]		End Semester Examination (15%) [100 Marks]
	FA: (75 Marks)	SA: (25 Marks)	
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination									
Continuous Assessment (50%)									End Semester Examination (50%)
CA 1 (100 Marks)			CA 2 (100 Marks)			Practical Exam (100 Marks)			Theory Examination (35%) Practical Examination (15%)
SA 1 (60M)	FA 1		SA 2 (60M)	FA 2		FA (75M)	SA (25M)		
	Component-I (20 Marks)	Component-II (20 Marks)		Component-I (20 Marks)	Component-II (20 Marks)				

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C103.1	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-
C103.2	2	1	1	1	-	-	-	-	-	-	-	1	1	-	-
C103.3	3	2	2	1	-	-	-	-	-	-	-	1	2	-	-
C103.4	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-
C103.5	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-

23EN102   BUSINESS COMMUNICATION AND VALUE SCIENCE I   2/0/2/3

Nature of Course: E (Theory Skill based)

Pre requisites: Nil

Course Objectives:
1 Understand what life skills are and their importance in leading a happy and well -adjusted life
2 Motivate students to look within and create a better version of self
3 Introduce them to key concepts of values, life skills and business communication

Course Outcomes:
Upon completion of the course, students shall have ability to

C102.1	Understand the need for life skills and values.	[U]
C102.2	Recognize own strengths and opportunities of Business Communication	[R]
C102.3	Analyze the life skills in different fields.	[A]
C102.4	Apply the basic tenets of communication in workplace.	[AP]
C102.5	Analyze the basic communication practices in different types of situations.	[A]

Course Contents:

Introduction to Values - its importance and necessity – Overview of Business Communication (Importance of oral & written communication)- Listening skills (Hearing Vs Listening) – Body Language

Tenses – Verbs – Helpings verbs – Subject-verb agreement – Articles – Prepositions – Conjunctions – Adjectives – Adverbs – Voice – Parts of Sentence – Identification of errors – Effective Communication - Types of Communication (Verbal, Written & Non-verbal Communication) – Barriers to Effective Communication – Tips to develop communication skills – Principles of Listening – The Process of Listening – Types of Listening.

Email writing (Formal and Informal)- Its Advantages & Disadvantages – Pronunciation and Enunciation – Summary Writing – Story Writing – Vocabulary Enrichment – Life Skills – importance and necessity – Thinking skill – Social skill – Emotional skill – Howard Gardner's Multiple Intelligence – Embracing Adversity

Total Hours: 30

Lab Components
1	Immersion activity	[AP]
2	Create resume	[AP]
3	Group assignment	[AP]
4	Trek followed by project	[AP]
5	Group activities	[AP]
6	Record a conversation	[AP]

Total Hours:30

Text Books:
1. APAART: Speak Well 1 (English language and communication), Oxford, 2015.
2. APAART: Speak Well 2 (Soft Skills), Oxford, 2015.

Reference Books:
1. Alan Mc'carthy and O'dell – English Vocabulary in Use – Third Edition – Cambridge University Press 2017.
2. Dr. Saroj Hiremath – Business Communication – Nirali Prakashan,2012.

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

Continuous Assessment									End Semester Examination	Total
Theory				Practical			Total (A+B)	Total Continuous Assessment		
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)				
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory			
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]
C102.1	Understand	Technical Presentation	20
C102.2	Remember	Quiz	20
C102.3	Analyze	Group Assignment	20
C102.4	Apply	Group Activities	20

Assessment based on Summative and End Semester Examination - Theory			
Bloom's Level	**Summative Assessment (15%) [120 Marks]**		**End Semester Examination (25%) [100 Marks]**
	CIA1: (60 Marks)	**CIA2: (60 Marks)**	
Remember	30	10	20
Understand	30	10	20
Apply	10	30	20
Analyze	30	50	40
Evaluate	-	-	-
Create	-	-	-
Assessment based on Continuous and End Semester Examination – Practical			
Bloom's Level	**Continuous Assessment (25%) [100 Marks]**		**End Semester Examination(25%) [100 Marks]**
	FA: (75 Marks)	**SA: (25 Marks)**	
Remember	20	20	20
Understand	30	30	30
Apply	10	10	10
Analyze	40	40	40
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination							
Continuous Assessment (50%)							**End Semester Examination (50%)**
CA 1 (100 Marks)			**CA 2 (100 Marks)**			**Practical Exam (100 Marks)**	**Theory Examination (25%) Practical Examination (25%)**
SA 1 (60M)	**FA 1**		**SA 2 (60M)**	**FA 2**		**FA (75M)**	**SA (25M)**	
	Component-I (20 Marks)	**Component-II (20 Marks)**		**Component-I (20 Marks)**	**Component-II (20 Marks)**			

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Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C102.1	-	-	-	-	-	-	-	1	3	3	1	-	2	-	-
C102.2	-	-	-	-	-	-	-	1	2	2	1	-	1	-	-
C102.3	-	-	-	-	-	-	-	1	3	2	1	-	1	-	-
C102.4	-	-	-	-	-	-	-	1	3	2	1	-	1	-	-
C102.5	-	-	-	-	-	-	-	1	3	2	1	-	1	-	-

23MA202   **LINEAR ALGEBRA**   **3/1/0/4**

Nature of Course: J (Problem Analytical)
Pre requisites: NIL

Course Objectives:

1	To analyze and solve a linear system of equations to find the determinant.
2	To develop the use of matrix algebra techniques that are needed by engineers for practical applications.
3	To characterize the solutions to a linear system in terms of linear combinations and span.

Course Outcomes:

Upon completion of the course, students shall have ability to

C202.1	Relate characteristics of solutions of a linear system to determinant and rank of its associated matrices.	[R]
C202.2	Understand the concepts of subspaces, bases, dimension and their properties.	[U]
C202.3	Apply the formal definition of an inverse, and its algebraic properties, to solve and analyze linear systems.	[AP]
C202.4	Apply matrix algebra, to solve and analyze matrix equations using singular value decomposition and principal component analysis	[AP]
C202.5	Apply geometric and algebraic properties of vectors to compute orthogonality of the vectors.	[AP]

Course Contents:

Determinants Introduction – Properties (without proof) - Solution of system of linear equations by Cramer's rule – Inverse of a matrix (using determinant).

Matrices Introduction –Definition of vectors and linear combinations - Types of matrices : Symmetric, skew symmetric, Hermitian and unitary matrices (Simple problems)- Matrix operations - Rank of a matrix - Solution of system of linear equations by Gaussian elimination and LU decomposition. Eigen values and Eigenvectors, Linear transformation (orthogonal transformation). Singular value decomposition (simple problems) and Principal component analysis (definition)– Introduction to their application in image processing and machine learning (problems not included).

Vector Space Vector space: Definition of dimension – Basis: Definition – simple problems, Orthogonality: Definition – simple problems, Definition of Projection – Simple problems in Gram-Schmidt orthogonalization and QR decomposition (theorems not included).

                                                 Total Hours: **60**

Text Books:
1 Gilbert Strang, Introduction to linear algebra, 6th edition, Wellesley-Cambridge Press, 2023.
2 B. S. Grewal, Higher Engineering Mathematics ,43rd edition, Khanna publishers, 2015.
3 Veerarajan T, Engineering Mathematics, 2nd edition, McGraw Hill India, 2018.

Reference Books:
1 Peter V. O'Neil, Advanced Engineering Mathematics, 7th edition, Cengage Learning Custom Publishing,2012.
2 M. D. Greenberg, Advanced Engineering Mathematics, 2nd edition, Pearson, 1998.

Web References:
1 https://www.udemy.com/topic/linear-algebra
2 https://www.edx.org/course/introduction-to-linear-models-and-matrix-algebra
3 https://www.deeplearningbook.org/contents/linear_algebra.html
4 https://machinelearningmastery.com/introduction-matrices-machine-learning

Online Resources:
1 https://onlinecourses.nptel.ac.in/noc19_ma06
2 https://www.coursera.org/learn/linear-algebra-machine-learning
3 https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/

Continuous Assessment			Total Continuous Assessment	End Semester Examination	Total
Formative Assessment	**Summative Assessment**	**Total**			
80	**120**	**200**	**40**	**60**	**100**

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component**	**FA (16%) [80 Marks]**
C202.1	Remember	Quiz	20
C202.2	Understand	Seminar	20
C202.3	Apply	Tutorial	20
C202.4	Apply	Assignment	
C202.5			20
Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%)**

	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]
Remember	30	20	20
Understand	30	20	20
Apply	40	60	60
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination					
Continuous Assessment (40%) [200 Marks]					End Semester Examination (60%) [100 Marks]
CA 1 : 100 Marks			CA 2 : 100 Marks		
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)	
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component – II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C202.1	1	1	-	-	-	-	-	-	-	-	-	-	-	1	2
C202.2	2	2	-	-	-	-	-	-	-	-	-	-	-	1	2
C202.3	3	3	-	-	-	-	-	-	-	-	-	-	-	1	2
C202.4	3	3	-	-	-	-	-	-	-	-	-	-	-	1	2
C202.5	3	3	-	-	-	-	-	-	-	-	-	-	-	1	2

23EN201   BUSINESS COMMUNICATION AND VALUE SCIENCE II   2/1/0/3

Nature of Course   E (Theory Skill Based)
Pre requisites   Business Communication and Value Science I
Course Objectives:

1   To develop the art of effective writing, reading, presentation and group discussion skills.
2   To help students to identify their personality traits and evolve as a better team player.
3   To introduce the key concepts of morality, behavior and beliefs, diversity and inclusion.

Course Outcomes:
Upon completion of the course, students shall have ability to

C201.1	Remember the tools of structured written communication and basics of presentation skills.	[R]
C201.2	Apply the basic concept of speed reading, skimming and scanning.	[AP]
C201.3	Identify and apply the individual personality types and their rolein a team along with the concept of morality and diversity.	[AP]
C201.4	Understand the concept of outward behavior and internal behavior and apply them in real life situations.	[AP]
C201.5	Organize an event to generate awareness and get support for a cause through communicative ability.	[A]

Course Contents:

Good and Bad Writing. Identification of Common errors in punctuation rules, use of words - SATORI (sharing personal experience) - Introduction to basic presentation skills & ORAI app

Speed Reading - Introduction to skimming and scanning – Analysing personality traits - Dr.Meredith Belbin and his research on team work - Belbin's 8 Team Roles and Lindgren's Big 5 personality traits - Belbin's 8 team player styles

Diversity & Inclusion- Different forms of Diversity in our society – Organizing events to support - TCS values, Respect for Individual and Integrity.

Activities:
1. Immersion (interview)
2. Create CV
3. Group Assignment- Form an NGO
4. Group activities
5. Create and present a street play to articulate and amplify the social cause.

Total Hours: 45

Reference Books:

1. Dr. A.P.J. Abdul Kalam& Arun Tiwari, Guiding Souls: Dialogues on the purpose of life, Ocean Books Pvt. Ltd, 2005.
2. Dr. A.P.J. Abdul Kalam & Acharya Mahapragya, The Family and the Nation, HarperCollins Publishers India, a joint venture with India Today, New Delhi, 2015.
3. Dr. A.P.J Abdul Kalam & Y.S. Rajan, The Scientific Indian: A Twenty First Century Guide to the World Around Us, Penguin Viking, 2011.
4. Dr.A.P.J. Abdul Kalam, Forge Your Future: Candid, Forthright, Inspiring, Rajpal & Sons, 2014
5. & Peter H. Diamandis & Steven Kotler, Abundance: The Future is Better Than You Think,Simon & Schuster, 2012.
6. Simon Sinek, Start With Why: How Great Leaders Inspire Everyone to Take Action, Penguin Publishers, 2011.
7. Sandra Moriaty, Nancy D. Mitchell, William D.Wells, Advertising & IMC: Principles and Practice, Pearson Education India, 15 June 2016.

Web References:

1. https://www.eolss.net/Sample-Chapters/C14/E1-37-01-00.pdf
2. https://www.brown.edu/academics/science-and-technology-studies/frameworkmaking-ethicaldecisions
3. http://faculty.winthrop.edu/meelerd/docs/rolos/5_Ethical_Approaches.pdf

Online Resources:

1. https://youtu.be/CsaTslhSDI
2. https://m.youtube.com/watch?feature=youtu.be&v=IIKvV8_T95M
3. https://m.youtube.com/watch?feature=youtu.be&v=e80BbX05D7Y
4. https://m.youtube.com/watch?v=dT_D68RJ5T8&feature=youtube
5. https://m.youtube.com/watch?v=7sLLEdBgYYY&feature=youtube

Continuous Assessment			Total Continuous Assessment	End Semester Examination	Total
Formative Assessment	Summative Assessment	Total			
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	Bloom's Level	Assessment Component	FA (16%) [80 Marks]
C201.1	Remember	Group Assignment	20
C201.2	Apply	Technical Presentation	20
C201.3	Apply	Seminar	20

C201.4 & C201.5	Analyze	Group Activity	20

Assessment based on Summative and End Semester Examination

Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	20	20	20
Understand	-	-	-
Apply	50	50	50
Analyze	30	30	30
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1 : 100 Marks			CA 2 : 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1	-	-	-	-	3	-	-	-	3	2	1	-	2	2	-
C201.2	-	-	-	-	1	-	-	-	3	1	1	-	2	1	-
C201.3	-	-	-	-	1	-	-	-	3	2	1	-	2	3	-
C201.4	-	-	-	-	1	-	-	-	3	2	1	-	2	2	-
C201.5	-	-	-	-	1	-	-	-	3	3	1	-	2	3	-

23MG211   **FUNDAMENTALS OF ECONOMICS**   **3/0/0/3**

Nature of Course: C (Theory Concept)

Pre requisites: NIL

Course Objectives:
1   To impart the knowledge of micro economics that deals with the study of economic decision making by individuals and individual firms.
2   To make the students understand the various concepts in macroeconomics that deals with the performance and behaviour of an economy.
3. To impart the knowledge of the economic behaviour of firms operating in perfect and imperfect competition.

Course Outcomes:
Upon completion of the course, students shall have ability to

C211.1	Understand basic principles and concepts of Microeconomics and apply them to solve the business problems.	[U]
C211.2	Examine the behaviour and performance of an economy of a nation.	[AP]
C211.3	Understand basic principles and concepts of Macroeconomics and apply them to solve the business problems.	[U]
C211.4	Understand the concepts of banking and central bank's monetary policy in economic development of a nation.	[U]
C211.5	Classify the behaviour of firms operating in perfect and imperfect completions.	[A]

Course Contents:

Introduction: Economics –meaning - Elasticity of demand - Elasticity of Supply; principles of Demand and Supply – Microeconomics and Macroeconomics.

Microeconomics:— Supply Curves of Firms —Demand Curves of Households —Equilibrium and Comparative Statics (Shift of a Curve and Movement along the Curve); Welfare Analysis —Consumers' and Producers' Surplus — Price Ceilings and Price Floors; Consumer Behaviour—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; 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

Macroeconomics: 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; 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 Hours: 45

Text Books:

1 Pindyck, Robert S., and Daniel L. Rubinfeld, Microeconomics,7th Edition, Pearson Education, 2009.
2 Dornbusch, Fischer and Startz. Macroeconomics, 12th Edition, McGraw Hill Education, 2018.
3 Paul Anthony Samuelson, Economics, William D. Nordhaus, 19th Edition, McGraw HillEducation, 2010.

Reference Books:

1 Hal R, Varian, Intermediate Microeconomics: A Modern Approach, W.W Norton and Company, 2009.
2 N. Gregory Mankiw, Principles of Macroeconomics, Cengage Learning India Pvt. Ltd., 2015.
3 S. Sankaran, Business Economics, Margham Publication, Chennai. Margham Publications, 2012.

Web References:

1 https://www.rbi.org.in
2 https://data.oecd.org/economy.htm
3 https://www.focus-economics.com
4 www.mospi.gov.in
5 https://www.ibef.org

Continuous Assessment			Total Continuous Assessment	End Semester Examination	Total
Formative Assessment	**Summative Assessment**	**Total**			
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component**	**FA (16%) [80 Marks]**
C211.1	Understand	Quiz	20
C211.2	Apply	Tutorial	20
C211.3	Understand	Group Assignment	20
C211.4	Understand		
C211.5	Analyze	Presentation	20

Assessment based on Summative and End Semester Examination

Bloom's Level	Summative Assessment (24%) [120 Marks]		End Semester Examination (60%) [100 Marks]
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	
Remember	20	20	10
Understand	50	40	50
Apply	30	10	20
Analyse	-	30	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (40%) [200 Marks]						End Semester Examination (60%) [100 Marks]
CA 1 : 100 Marks			CA 2 : 100 Marks			
SA 1 (60 Marks)	FA 1 (40 Marks)		SA 2 (60 Marks)	FA 2 (40 Marks)		
	Component - I (20 Marks)	Component - II (20 Marks)		Component - I (20 Marks)	Component - II (20 Marks)	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C211.1	-	3	2	-	-	2	2	1	1	-	-	1	2	2	-
C211.2	-	2	1	-	-	1	1	1	1	-	-	1	1	1	-
C211.3	-	3	2	-	-	2	2	1	1	-	-	1	2	2	-
C211.4	-	1	1	-	-	1	1	1	1	-	-	1	1	1	-
C211.5	-	2	1	-	-	1	1	1	1	-	-	1	1	1	-

23CB201   **DATA STRUCTURES**   **1/0/4/3**

Nature of Course: F (Theory Programming)
Pre requisites: Computer Programming

Course Objectives:
 1   To understand the algorithms and data structures used for solving a problem
 2   To learn linear data structures such as linked list, stack and queue
 3   To gain knowledge in non-linear data structures such as trees and graphs

Course Outcomes:
Upon completion of the course, students shall have ability to
C201.1   Analyze time and space complexity of an algorithm   [A]
C201.2   Understand linear and non-linear data structures   [U]
C201.3   Apply the suitable data structure to solve the problem   [AP]
C201.4   Distinguish the different searching and sorting algorithms   [A]
C201.5   Understand the concept of file structures   [U]

Course Contents:

Basic Terminologies & Introduction to Algorithm and Data Organisation: Algorithm specification, Recursion, Performance analysis, Asymptotic Notation - The Big-O, Omega and Theta notation, Programming Style, Refinement of Coding - Time-Space Trade Off, Testing, Data Abstraction

Linear Data Structure: Array, Stack, Queue, Linked-list and its types, Various Representations, Operations & Applications of Linear Data Structures. Non-linear Data Structure: Trees (Binary Tree, Threaded Binary Tree, Binary Search Tree, B & B+ Tree, AVL Tree, Splay Tree) and Graphs (Directed, Undirected), Various Representations, Operations (search and traversal algorithms and complexity analysis) & Applications of Non-Linear Data Structures

Searching and Sorting on Various Data Structures: Sequential Search, Binary Search,Breadth First Search, Depth First Search, Insertion Sort, Selection Sort, Shell Sort, Divide and Conquer Sort, Merge Sort, Quick Sort, Heap Sort, Introduction to Hashing File: Organisation (Sequential, Direct, Indexed Sequential, Hashed) and various types of accessing schemes.

Total Hours: 45

Lab Exercises:
 1. Write a C program that uses functions to perform the following: a) Create a singly linked list of integers. b) Delete a given integer from the above linked list. c) Display the contents of the above list after deletion.
 2. Write a C program that uses functions to perform the following: a) Create a doubly linked list of integers. b) Delete a given integer from the above doubly linked list. c) Display the contents of the above list after deletion.
 3. Write a C program that uses stack operations to convert a given infix expression into its postfix Equivalent, Implement the stack using an array.
 4. Write C programs to implement a double ended queue ADT using i) array and ii) doubly

linked list respectively.

5. Write a C program that uses functions to perform the following: a) Create a binary search tree of characters. b) Traverse the above Binary search tree recursively in Postorder.
6. Write a C program that uses functions to perform the following: a) Create a binary search tree of integers. b) Traverse the above Binary search tree non recursively in inorder.
7. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Insertion sort b) Merge sort
8. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order: a) Quick sort b) Selection sort
9. Write a C program to implement all the functions of a dictionary (ADT) using hashing.
10. Write C programs for implementing the following graph traversal algorithms:
    a) Depth firsttraversal b)Breadth first traversal

Total Hours: 30

Text Books:

1. E. Horowitz and S. Sahni, Fundamentals of Data Structures, University Press, 2nd edition, 2008.
2. V. Aho, J.E. Hopcroft and J. D. Ullman," Data Structures and Algorithms", 1st Edition, Pearson India,2002.

Reference Books:

1. Donald E. Knuth, The Art of Computer Programming: Volume 1: Fundamental Algorithms, 3rd edition, Addison Wesley; 1997.
2. Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, 4th edition, MIT Press, 2022.
3. Pat Morin, Open Data Structures: An Introduction (Open Paths to Enriched Learning), 31st ed. Edition, 31st ed. Edition, UBC Press, 2013.

Web References:
1   http://nptel.ac.in/courses//106103069/
2   https://www.coursera.org/learn/data-structures
3   http://web.stanford.edu/class/cs97si/

Continuous Assessment							Total (A+B)	Total Continuous Assessment	End Semester Practical Examination	Total
Theory				Practical						
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)				
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory			
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]
C201.1	Analyze	Quiz	20
C201.2	Understand	Tutorial	20
C201.3	Apply	Group Assignment	20
C201.4	Analyze		
C201.5	Understand	Assignment	20

Assessment based on Summative Assessment - Theory		
Bloom's Level	Summative Assessment (15%) [120 Marks]	
	CIA1: (60 Marks)	CIA2: (60 Marks)
Remember	10	10
Understand	30	30
Apply	30	30
Analyze	30	30
Evaluate	-	-
Create	-	-

Assessment based on Continuous and End Semester Examination - Practical			
Bloom's Level	Continuous Assessment (25%) [100 Marks]		End Semester Examination (50%) [100 Marks]
	FA: (75 Marks)	SA: (25 Marks)	
Remember	30	30	30
Understand	30	20	30
Apply	20	30	20
Analyze	20	20	20
Evaluate	20	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination									
Continuous Assessment (50%)									End Semester Practical Examination (50%)
CA 1 (100 Marks)			CA 2 (100 Marks)			Practical Exam (100 Marks)			
SA 1 (60M)	FA 1		SA 2 (60M)	FA 2		FA (75M)	SA (25M)		
	Component-I (20 Marks)	Component-II (20 Marks)		Component-I (20 Marks)	Component-II (20 Marks)				

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1	3	3	2	3	-	1	1	1	1	1	2	1	1	3	2
C201.2	3	2	2	2	-	1	1	1	1	1	2	1	1	2	1
C201.3	3	3	2	2	-	1	1	1	1	1	2	1	1	3	2
C201.4	3	2	2	2	1	1	1	1	1	1	2	1	1	2	1
C201.5	2	2	2	1	1	1	1	1	1	1	1	1	1	2	1

23TA201   **TAMILS AND TECHNOLOGY**   **1/0/0/1**

Nature of Course: C (Theory Concept)

Pre requisites: NIL

Course Objectives:

1   To know about weaving, ceramic, design and construction technologies in sangam age.
2   To know the significance of technologies such as manufacturing, agriculture and irrigation.
3   To understand the development of Scientific Tamils and Tamil Computing.

Course Outcomes:

Upon completion of the course, students shall have ability to

C201.1	Describe about the weaving industry in sangam age and ceramic technology.	[U]
C201.2	Observe the design of houses, sculptures and construction of temples.	[U]
C201.3	Relate the various manufacturing materials and stone types in Silappathikaram.	[U]
C201.4	Understand the significance of agriculture and irrigation technology in ancient period.	[U]
C201.5	Explain the growth of scientific Tamil, Tamil computing and digitization of Tamil books.	[U]

Course Contents:

Weaving and Ceramic Technology: Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries. **Design and Construction Technology:** 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.

Manufacturing Technology: 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 beats - Archeological evidences - Gem stone types described in Silappathikaram. **Agriculture and Irrigation Technology:** 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.

Scientific Tamil & Tamil Computing: 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 Hours: 15

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 பொருநை – 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.

Continuous Assessment			Total Continuous Assessment	End Semester Examination	Total
Formative Assessment	**Summative Assessment**	**Total**			
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)			
Formative Assessment based on Capstone Model			
Course Outcome	**Bloom's Level**	**Assessment Component**	**FA (16%) [80 Marks]**
C201.1	Understand	Seminar	20
C201.2	Understand	Quiz	20
C201.3, C201.4	Understand	Quiz	20
C201.5	Understand	Seminar	20

Assessment based on Summative and End Semester Examination			
Bloom's Level	**Summative Assessment (24%) [120 Marks]**		**End Semester Examination (60%) [100 Marks]**
	CIA1 : [60 Marks]	**CIA2 : [60 Marks]**	
Remember	40	40	40
Understand	60	60	60
Apply	-	-	-
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination						
Continuous Assessment (40%) [200 Marks]						**End Semester Examination (60%) [100 Marks]**
CA 1 : 100 Marks			**CA 2 : 100 Marks**			
SA 1 (60 Marks)	**FA 1 (40 Marks)**		**SA 2 (60 Marks)**	**FA 2 (40 Marks)**		
	Component - I (20 Marks)	**Component - II (20 Marks)**		**Component - I (20 Marks)**	**Component - II (20 Marks)**	

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
C201.1	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1
C201.2	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1
C201.3	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1
C201.4	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1
C201.5	-	-	-	-	-	-	-	-	-	1	-	1	-	-	1

23EC211   **PRINCIPLES OF ELECTRONICS ENGINEERING**   **3/0/2/4**

Nature of Course: G (Theory Analytical)

Pre requisites: Nil

Course Objectives:
1   To enable the students to understand the basic concepts of semiconductors and diode characteristics
2   To enable the students to understand the bipolar junction transistor and fluid effect transistor configurations with its characteristics
3   To allow students to gain knowledge in Feedback amplifier, Operational amplifier and fundamentals of digital circuits

Course Outcomes:
Upon completion of the course, students shall have ability to
C211.1   Understand the basics of semiconductors   [U]
C211.2   Analyze the diode characteristics and its applications   [A]
C211.3   Apply the concepts of BJT's, FET and its characteristics   [AP]
C211.4   Analyze the characteristics of Feedback amplifier and Operational Amplifier   [A]
C211.5   Understand the fundamentals of digital circuits and its implementation   [U]

Course Contents:
Semiconductors and Diodes: Crystalline material: Mechanical properties, Energy band theory, Fermi levels; Conductors, Semiconductors & Insulators: electrical properties, band diagrams. Semiconductors: intrinsic & extrinsic, energy band diagram, P&N-type semiconductors, drift & diffusion carriers. Diodes and Diode Circuits**:** Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion zone, V-I characteristics, Zener breakdown, Avalanche breakdown and its reverse characteristics; Junction capacitance. Linear piecewise model; Rectifier circuits: half wave, full wave, PIV, DC voltage and current, ripple factor, efficiency, idea of regulation.
Bipolar Junction and Field effect Transistors: Formation of PNP / NPN junctions; transistor mechanism and principle of transistors, CE, CB, CC configuration, transistor characteristics: cut-off active and saturation mode, transistor action, injection efficiency, base transport factor and current amplification factors for CB and CE modes. Biasing and Bias stability: calculation of stability factor Field Effect Transistors**:** 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-Inverter
Feed Back, Operational Amplifiers and Digital Electronics Fundamentals: Concept (Block diagram), properties, positive and negative feedback, loop gain, open loop gain, feedback factors; topologies of feedback amplifier; effect of feedback on gain, output impedance, input impedance, sensitivities (qualitative), bandwidth stability. Introduction to integrated circuits, operational amplified and its terminal properties; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant-gain multiplier, Voltage follower, Comparator, Integrator, Differentiator Digital Electronics Fundamentals**:** Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using two and three variable K- map Definitions: Logic ICs, half and full adder/subtractor, multiplexers(4:1 and 8:1), demultiplexers(1:4 and 1:8), flip-flops – SR, JK, T, D, Master/Slave FF (Operation and excitation table), Introduction to shift registers and its types, Introduction to counters – Synchronous counter and Binary Ripple Counter.

        Total Hours:45

List of experiments:
1. Examine Forward and Reverse Characteristic of PN junction diode   [U]
2. Examine Forward and Reverse Characteristics of Zener diode   [U]
3. Classify Input and output characteristics of Bipolar junction transistors   [A]
4. Understand Drain and transfer characteristics of JFET   [U]
5. Design of Integrator and differentiator using op amp ic741   [AP]
6. Design of Adder and subtractor using op amp IC 741   [AP]
7. Implement basic logic functions using combinational circuits.   [A]

Total Hours:30

Text Books:

1. Salivahanan, Electron Devices and Circuits, 5th edition, McGraw Hill Education India Private Ltd., 2022.
2. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, 6th edition, New Age International Pvt. Ltd.,2021.
3. M. Morris Mano, Michael D.Ciletti., Digital Design, 6th Edition, Pearson education, 2018.

Reference Books:

1. Ben Streetman, Sanjay Banerjee Solid State Electronic Devices 6th Edition, prentice hall,2000.

2. Albert Paul Malvino, Electronic Principle, Tata Mcgraw-Hill Publishing Company Limited,9th edition 2021.

3. Jacob Millman, Chritos C Halkias, Satyabrata Jit, Electronic Devices and Circuits, 4th edition (SIE), McGraw Hill Education India Private Ltd, 2015

4. Sedra and Smith, Microelectronic Circuits, Oxford University Press, 8th Edition, 2019.

5. Robert Boylestad and Louis Nashelsky, Electron Devices and Circuit Theory, 11th edition, Pearson New International Edition, 2013.

Web References:
1. http://www.learnabout-electronics.org/
2. https://www.electronics-tutorials.ws/
3. http://engineering.nyu.edu/gk12/amps-cbri/pdf/Basic%20Electronics.pdf

Online Resources:
1. https://freevideolectures.com/course/1990/circuits-and-electronics

2. https://nptel.ac.in/courses/117103063/

3. https://www.allaboutcircuits.com/video-lectures/

Continuous Assessment									End Semester Examination	Total
Theory				Practical			Total (A+B)	Total Continuous Assessment		
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)				
80	120	200	100	75	25	100	200	50	50	100

Formative Assessment based on Capstone Model - Theory			
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]
C211.1	Understand	Quiz	20
C211.2	Analyze	Assignment	20
C211.3	Apply	Assignment	20
C211.4	Analyze	Group Assignment	20
C211.5	Understand		

Assessment based on Summative and End Semester Examination - Theory			
Bloom's Level	Summative Assessment (15%) [120 Marks]		End Semester Examination (35%) [100 Marks]
	CIA1: (60 Marks)	CIA2: (60 Marks)	
Remember	-	-	10
Understand	40	40	30
Apply	30	30	20
Analyze	30	30	40
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination - Practical			
Bloom's Level	Continuous Assessment (25%) [100 Marks]		End Semester Examination (15%) [100 Marks]
	FA: (75 Marks)	SA: (25 Marks)	
Remember	-	-	-
Understand	40	40	40
Apply	40	40	40
Analyze	20	20	20
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination							
Continuous Assessment (50%)							End Semester Examination (50%)
CA 1 (100 Marks)			CA 2 (100 Marks)			Practical Exam (100 Marks)	Theory Examination 35%) Practical Examination (15%)
SA 1 (60M)	FA 1		SA 2 (60M)	FA 2		FA (75M) / SA (25M)	
	Component-I (20 Marks)	Component-II (20 Marks)		Component-I (20 Marks)	Component-II (20 Marks)	FA (75M)	SA (25M)

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C211.1	3	3	2	1	-	-	-	-	-	-	1	1	1	-	3
C211.2	3	2	2	1	-	-	-	-	-	-	1	1	1	-	3
C211.3	3	2	2	1	-	-	-	-	-	-	1	1	1	-	3
C211.4	3	2	2	1	-	-	-	-	-	-	1	1	1	-	3
C211.5	3	3	2	2	-	-	-	-	-	-	1	1	1	-	3

23MA203 **STATISTICAL METHODS AND MODELLING** **3/0/2/4**

Nature of Course: G (Theory Analytical)
Pre Requisites: Probability and Statistics

Course Objectives:
1 To study the linear statistical models
2 To learn the concept of testing hypothesis using statistical analysis
3 To understand the fundamental concepts of estimation methods

Course Outcomes:
Upon completion of the course, students shall have ability to

C203.1	Remember the basic concepts of linear statistical models and Estimation methods.	[R]
C203.2	Learn the concept of testing of hypothesis using statistical analysis.	[U]
C203.3	Interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test	[AP]
C203.4	Apply the knowledge of time series analysis in economics and engineering.	[AP]
C203.5	Apply non-parametric methods in estimation.	[AP]

Course Contents:

Linear Statistical Models (no derivations): Simple linear regression & correlation, multiple regression & multiple correlation (three variables), Analysis of variance: one way, two way (no RBD, Latin square design)

Estimation (no derivations): Definition of Point estimation, criteria for good estimates (un-biasedness, consistency)- Simple problems, Method of estimation: Maximum likelihood estimation - **Sufficient Statistic (no derivations)**: Concept & examples, complete sufficiency, their application in estimation (Simple problems) - **Test of hypothesis**: Concept & formulation, Type I and Type II errors, Neyman Pearson lemma(statement only),Procedures of testing: Small samples- Student's t test, F test , Chi square test- Large samples -Mean and proportions only.

Non-parametric Inference (no derivations): Comparison with parametric inference, Use of order statistics. Signtest, Wilcoxon signed rank test, Tolerance region (simple problems) - **Basics of Time Series Analysis & Forecasting:** Stationary, ARIMA Models: Identification, Estimation and Forecasting (simple problems). **Programming Method: R statistical programming language.**

Total Hours:45

Lab Exercises:

Implementation of the following Experiments   [U]
    1.   Introduction to R, Functions, Control flow and Loops

2. Working with Vectors and Matrices
3. Reading in Data, Writing Data, Working with Data, Manipulating Data
4. Simulation
5. Linear model
6. Data Frame
7. Graphics in R
8. Building ARIMA Models
9. Fitting the multiple regression

Total Hours:30

Text Books:
1. I.R. Miller, J.E. Freund and R. Johnson, Probability and Statistics for Engineers, 9th edition, Pearson Education, 2017.
2. A. Goon, M. Gupta and B. Das Gupta, Fundamentals of Statistics (Vol. I and Vol.II), World Press,2016.
3. Chris Chatfield, The Analysis of Time Series: An Introduction, 6th Edition, CRC Press, 2003.

Reference Books:
1. D.C. Montgomery & E.Peck, Introduction to Linear Regression Analysis, 5th Edition,2012.
2. A.M. Mood, F.A. Graybill & D.C. Boes, Introduction to the Theory of Statistics, Wiley, New York, 1974
3. N. Draper & H. Smith, Applied Regression Analysis, Wiley, 2014.
4. Garrett Grolemund, Hands-on Programming with R, O'Reilly Media, Inc, 2014.
5. Jared P. Lander, R for Everyone: Advanced Analytics and Graphics, Pearson education, 2013.

Web References:
1 https://archive.nptel.ac.in/courses/111/104/111104075/
2 https://www.coursera.org/learn/linear-regression-model

Continuous Assessment									End Semester Examination	Total
Theory				**Practical**			**Total (A+B)**	**Total Continuous Assessment**		
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment	Summative Assessment	Total (B)				
80	**120**	**200**	**100**	**75**	**25**	**100**	**200**	**50**	**50**	**100**

Formative Assessment based on Capstone Model - Theory			
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]
C203.1	Remember	Quiz & Assignment	**20**

C203.2	Understand	Assignment		**20**
C203.3	Apply	Case study		**20**
C203.4	Apply	Group Assignment		**20**
C203.5	Apply			

Assessment based on Summative and End Semester Examination - Theory

Bloom's Level	Summative Assessment (15%) [120 Marks]		End Semester Examination (35%) [100 Marks]
	CIA1: (60 Marks)	CIA2: (60 Marks)	
Remember	20	-	20
Understand	40	20	20
Apply	40	80	60
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination - Practical

Bloom's Level	Continuous Assessment (25%) [100 Marks]		End Semester Examination (15%) [100 Marks]
	FA: (75 Marks)	SA: (25 Marks)	
Remember	20	-	20
Understand	40	20	40
Apply	40	80	40
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessment based on Continuous and End Semester Examination

Continuous Assessment (50%)								End Semester Examination (50%)
CA 1 (100 Marks)			CA 2 (100 Marks)			Practical Exam (100 Marks)		Theory Examination (35%) Practical Examination (15%)
SA 1 (60M)	FA 1		SA 2 (60M)	FA 2		FA (75M)	SA (25M)	
	Component-I (20 Marks)	Component-II (20 Marks)		Component-I (20 Marks)	Component-II (20 Marks)			

Course Outcome (CO)	Programme Outcomes (PO)												Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C203.1	1	1	1	-	-	-	-	-	-	-	-	-	-	1	2
C203.2	2	2	2	1	1	-	-	-	-	-	-	-	-	1	2
C203.3	3	3	2	1	1	-	-	-	-	-	-	-	-	1	2
C203.4	3	3	2	-	1	-	-	-	-	-	-	-	-	1	2
C203.5	3	3	2	-	1	-	-	-	-	-	-	-	-	1	2